SP/YO/040/2017(C)
Government of India
Ministry of Science & Technology
Department of Science & Technology
(SEED Division)

Technology Bhavan,
New Mehrauli Road,
New Delh-110016
Dated : 13/12/2018

ORDER

Sub:- **Financial assistance for the project titled "Nano-sensor for fluid mass flow rate measurement for biomedical applications" sponsored to Dr. M.Shanmugavalli, Department of Instrument and Control Engineering, Saranathan College of Engineering, Venkateswara Nagar, Trichy-Madurai Main Road (NH 45 B), Edamalaipatti Pudhur(Post), Panjappur, Thiruchirappalli - 620012,Tamil Nadu.**

In continuation of this Department's Sanction Order dated 13.03.2018, sanction of the President is conveyed to the payment of **Rs.3,59,995/-** (Rupees Three Lakh Fifty Nine Thousand Nine Hundred Ninety Five only) to the Principal, Saranathan College of Engineering, Venkateswara Nagar, Trichy-Madurai Main Road (NH 45 B), Edamalaipatti Pudhur(Post), Panjappur, Thiruchirappalli - 620012,Tamil Nadu being the second instalment of grant under the non-recurring grant for implementation of the said project during 2019-20. The details of which may be seen in the below given table:

Sl.No	Equipment details for 2nd year	Amount
1.	Sensors and Instrumentation (10 Nos)	Rs. 2,00,000/-
2.	Fabrication of prototype equipment.	Rs. 1,60,000/-
	Total	Rs. 3,60,000/-

2. Sanction of the President is also conveyed for the carry forward of **Rs. 5/-** under the non-recurring grant from the last financial year to the current financial year 2019-20.

3. This sanction is subject to the condition that the grantee organization will furnish to the Department of Science & Technology, financial year wise Utilization Certificate (UC) in the proforma prescribed as per GFR 2017 and audited statement of expenditure (SE) along with up to date progress report at the end of each financial year duly reflecting the interest earned/ accrued on the grants received under the project. This is also subject to the condition of submission of the final statement of expenditure, utilization certificate and project completion report within one year from the scheduled date of completion of the project.

4. The grantee organization will have to enter & upload the Utilization Certificate in the PFMS portal besides sending it in physical form to this Division. The subsequent/ final installment will be released only after confirmation of the acceptance of the UC by the Division and entry of previous Utilization Certificate in the PFMS.

5. If the grant has been released under capital head through separate sanction order under the same project for purchase of equipment(s), separate SE/UC has to be furnished for the released Capital head grant.

6. The grant-in-aid being released is subject to the condition that

(a) a transparent procurement procedure in line with the Provision of General Financial Rules 2017 will be followed by the Institute/Organization under the appropriate rules of the grantee organization while procuring capital assets sanctioned for the above mentioned project and a certificate to this effect will be submitted by the Grantee organization immediately on receipt of the grant.
(b) While submitting Utilization Certificate/Statement of Expenditure, the organization has to ensure submission of supporting documentary evidences with regard to purchase of equipment/capital assets as per the provisions of GFR 2017. Subsequent release of grants under the project shall be considered only on receipt of the said documents.

13/12/2019

7. "In terms of Rule 230(8) of GRF 2017, the grantee organization will maintain separate audited account for the project and the entire amount of grant will be kept in an interest bearing bank account. For Grants released during F.Y. 2017-18 and onwards, all interests and other earnings, generated against released grant shall be remitted to Consolidated Fund of India, immediately after finalization of accounts, as it shall not be adjusted towards future release of grant. A Certificate to this effect shall have to be submitted along with statement of expenditure/Utilization Certificate for considering subsequent release of grant/closure of project account".

8. (a). DST reserves sole rights on the assets out of grants. Assets acquired wholly or substantially out of government grants (except those declared as obsolete and unserviceable or condemned in accordance with the procedure laid down in GFR 2017), shall not be disposed of without obtaining the prior approval of DST.
(b). DST reserves rights to close the project activity any time based on the review of progress of the project.
(c). A prior intimation to DST by grantee is must before leaving the country for attending conference/availing any short term fellowship abroad during the project tenure.

9. The account of the grantee organization shall be open to inspection by the sanctioning authority and audit (both by C & AG of India and Internal Audit by the Principal Accounts Office of the DST), whenever the organization is called upon to do so, as laid down under Rule 236(1) of General Financial Rules 2017.

10. Due acknowledgment of technical support / financial assistance resulting from this project grant should mandatorily be highlighted by the grantee organization in bold letters in all publications / media releases as well as in the opening paragraphs of their Annual Reports during and after the completion of the project.

11. Failure to comply with the terms and condition of the Bond will entail full refund with interest in terms of Rule 231 (2) of GFR 2017.

12. The expenditure involved is dubitable to Demand No.86, Department of Science & Technology for the year 2019-20:

3425	:	Other Scientific Research (Major Head)
60	:	Others
60.200	:	Assistance to Other Scientific Bodes (Minor Head)
70	:	Innovation, Technology Development and Deployment
70.00.35	:	Grants for Creation of Capital Assets for the year 2019-20 (Plan)

*(Previous: SSP-SEED-3425.60.200.08.11.35)

13. The amount of **Rs.3,59,995/- (Rupees Three Lakh Fifty Nine Thousand Nine Hundred Ninety Five only)** will be drawn by the Drawing and Disbursing Officer, DST and will be disbursed to Principal, Saranathan College of Engineering, Venkateswara Nagar, Trichy-Madurai Main Road (NH 45 B), Edamalaipatti Pudhur(Post), Panjappur, Thiruchirappalli - 620012,Tamil Nadu. The bank details for electronic transfer of funds through RTGS are given below:

Institution Account Name	Principal, Saranathan College of Engineering
Saving Bank Account Number	023001000138318
Name of Bank	City Union Bank Ltd
Branch Name	23, Kaliamman Koil Street, Opp. To Trichy Annadhana Samajam Tiruchirapalli-620 002
IFSC Code	CIUB0000023
MICR Code	620054002

13/12/2019

14. As per Rule 234 of GFR 2017, this sanction has been entered at S. No. **131** in the register of grants maintained in the Division for the scheme (Scheme for Young Scientist and Technologists –SYST).

15. This issues with the concurrence of IFD Vide their Concurrence Dy. No. C/4617/IFD/2019-20 dated 13th December, 2019.

16. Niti Aayog Darpan Unique I.D. of the institute is 'TN/2017/0172903'.

13/12/2019

(Dr. Rashmi Sharma)
Scientist-'E'
011-26590541

To
The Pay and Accounts Officer,
Department of Science & Technology,
New Delhi.

Copy for information and necessary action to: -

1. Cash Section (3 copies) for making the payment to the grantee.
2. Account Section.
3. Director of Audit, (Scientific Department), AGCR Building, New Delhi – 110 002.
4. Principal, Saranathan College of Engineering, Venkateswara Nagar, Trichy-Madurai Main Road (NH 45 B), Edamalaipatti Pudhur(Post), Panjappur, Thiruchirappalli - 620012,Tamil Nadu.
5. Dr. M.Shanmugavalli, Department of Instrument and Control Engineering, Saranathan College of Engineering, Venkateswara Nagar, Trichy-Madurai Main Road (NH 45 B), Edamalaipatti Pudhur(Post), Panjappur, Thiruchirappalli - 620012,Tamil Nadu.
6. Head (SEED)
7. Sanction Folder

13/12/2019

(Dr. Rashmi Sharma)
Scientist-'E'
011-26590541

SP/YO/040/2017(G)
Government of India
Ministry of Science & Technology
Department of Science & Technology
(SEED Division)

Technology Bhavan,
New Mehrauli Road
New Delhi-110016
Dated:13/12/2019

ORDER

Sub:- **Financial assistance for the project titled "Nano-sensor for fluid mass flow rate measurement for biomedical applications" sponsored to Dr. M.Shanmugavalli, Department of Instrument and Control Engineering, Saranathan College of Engineering, Venkateswara Nagar, Trichy-Madurai Main Road (NH 45 B), Edamalaipatti Pudhur(Post), Panjappur, Thiruchirappalli - 620012,Tamil Nadu.**

In continuation of this Department's Sanction Order dated 13.03.2018, sanction of the President is conveyed to the payment of **Rs.69,000/-** (Rupees Sixty Nine Thousand only) to the Principal, Saranathan College of Engineering, Venkateswara Nagar, Trichy-Madurai Main Road (NH 45 B), Edamalaipatti Pudhur(Post), Panjappur, Thiruchirappalli - 620012,Tamil Nadu being the second instalment of grant for implementation of the said project during 2019-20.

2. This sanction is subject to the condition that the grantee organization will furnish to the Department of Science & Technology, financial year wise Utilization Certificate (UC) in the proforma prescribed as per GFR 2017 and audited statement of expenditure (SE) along with up to date progress report at the end of each financial year duly reflecting the interest earned/ accrued on the grants received under the project. This is also subject to the condition of submission of the final statement of expenditure, utilization certificate and project completion report within one year from the scheduled date of completion of the project.

3. The grantee organization will have to enter & upload the Utilization Certificate in the PFMS portal besides sending it in physical form to this Division. The subsequent/ final installment will be released only after confirmation of the acceptance of the UC by the Division and entry of previous Utilization Certificate in the PFMS.

4. If the grant has been released under capital head through separate sanction order under the same project for purchase of equipment(s), separate SE/UC has to be furnished for the released Capital head grant.

5. The grant-in-aid being released is subject to the condition that

(a) a transparent procurement procedure in line with the Provision of General Financial Rules 2017 will be followed by the Institute/Organization under the appropriate rules of the grantee organization while procuring capital assets sanctioned for the above mentioned project and a certificate to this effect will be submitted by the Grantee organization immediately on receipt of the grant.

(b) While submitting Utilization Certificate/Statement of Expenditure, the organization has to ensure submission of supporting documentary evidences with regard to purchase of equipment/capital assets as per the provisions of GFR 2017. Subsequent release of grants under the project shall be considered only on receipt of the said documents.

6. **"In terms of Rule 230(8) of GRF 2017, the grantee organization will maintain separate audited account for the project and the entire amount of grant will be kept in an interest bearing bank account. For Grants released during F.Y. 2017-18 and onwards, all interests and other earnings, generated against released grant shall be remitted to Consolidated Fund of India, immediately after finalization of accounts, as it shall not be adjusted towards future release of grant. A Certificate to this effect shall have to be submitted along with statement of expenditure/Utilization Certificate for considering subsequent release of grant/closure of project account".**

13/12/2019

7. (a). DST reserves sole rights on the assets out of grants. Assets acquired wholly or substantially out of government grants (except those declared as obsolete and unserviceable or condemned in accordance with the procedure laid down in GFR 2017), shall not be disposed of without obtaining the prior approval of DST.
(b). DST reserves rights to close the project activity any time based on the review of progress of the project.
(c). A prior intimation to DST by grantee is must before leaving the country for attending conference/availing any short term fellowship abroad during the project tenure.

8. The account of the grantee organization shall be open to inspection by the sanctioning authority and audit (both by C & AG of India and Internal Audit by the Principal Accounts Office of the DST), whenever the organization is called upon to do so, as laid down under Rule 236(1) of General Financial Rules 2017.

9. Due acknowledgment of technical support / financial assistance resulting from this project grant should mandatorily be highlighted by the grantee organization in bold letters in all publications / media releases as well as in the opening paragraphs of their Annual Reports during and after the completion of the project.

10. Failure to comply with the terms and condition of the Bond will entail full refund with interest in terms of Rule 231 (2) of GFR 2017.

11. The expenditure involved is dubitable to Demand No.86, Department of Science & Technology for the year 2019-20:

3425	:	Other Scientific Research (Major Head)
60	:	Others
60.200	:	Assistance to Other Scientific Bodes (Minor Head)
70	:	Innovation, Technology Development and Deployment
70.00.31	:	Grants-in-aid General for the year 2019-20 (Plan)

*(Previous: SSP-SEED-3425.60.200.08.11.31)

12. The amount of **Rs.69,000/- (Rupees Sixty Nine Thousand only)** will be drawn by the Drawing and Disbursing Officer, DST and will be disbursed to Principal, Saranathan College of Engineering, Venkateswara Nagar, Trichy-Madurai Main Road (NH 45 B), Edamalaipatti Pudhur(Post), Panjappur, Thiruchirappalli - 620012,Tamil Nadu. The bank details for electronic transfer of funds through RTGS are given below:

Institution Account Name	Principal, Saranathan College of Engineering
Saving Bank Account Number	023001000138318
Name of Bank	City Union Bank Ltd
Branch Name	23, Kaliamman Koil Street, Opp. To Trichy Annadhana Samajam Tiruchirapalli-620 002
IFSC Code	CIUB0000023
MICR Code	620054002

14. As per Rule 234 of GFR 2017, this sanction has been entered at S. No. **130** in the register of grants maintained in the Division for the scheme (Scheme for Young Scientist and Technologists –SYST).

15. This issues with the concurrence of IFD Vide their Concurrence Dy. No. C/4616/IFD/2019-20 dated 13th December, 2019.

13/12/2019

16. Niti Aayog Darpan Unique I.D. of the institute is 'TN/2017/0172903'.

13/12/2019

(Dr. Rashmi Sharma)
Scientist-'E'
011-26590541

To
The Pay and Accounts Officer,
Department of Science & Technology,
New Delhi.

Copy for information and necessary action to: -

1. Cash Section (3 copies) for making the payment to the grantee.
2. Account Section.
3. Director of Audit, (Scientific Department), AGCR Building, New Delhi – 110 002.
4. Principal, Saranathan College of Engineering, Venkateswara Nagar, Trichy-Madurai Main Road (NH 45 B), Edamalaipatti Pudhur(Post), Panjappur, Thiruchirappalli - 620012,Tamil Nadu.
5. Dr. M.Shanmugavalli, Department of Instrument and Control Engineering, Saranathan College of Engineering, Venkateswara Nagar, Trichy-Madurai Main Road (NH 45 B), Edamalaipatti Pudhur(Post), Panjappur, Thiruchirappalli - 620012,Tamil Nadu.
6. Head (SEED)
7. Sanction Folder

13/12/2019

(Dr. Rashmi Sharma)
Scientist-'E'
011-26590541

SP/YO/040/2017(C)

Government of India
Ministry of Science & Technology
Department of Science & Technology
(SEED Division)

Technology Bhavan,
New Delh-110016
Dated : 13/03/2018

ORDER

Sub:-Financial assistance for the project titled **"Nano-sensor for fluid mass flow rate measurement for biomedical applications"** under the guidance of **Dr. M. Shanmugavalli,** Department of Instrument and Control Engineering, Saranathan College of Engineering, Tiruchirappalli, Tamil Nadu-620 012

As per the sanction of the President vide order no. SP/YO/040/2017(G), sanction is also accorded to the release of **Rs.20,40,880/- (Rupees Twenty Lakh Forty Thousand Eight Hundred Eighty only)** to **Saranathan College of Engineering, Tiruchirappalli, Tamil Nadu-620 002** being the first installment of grant under "Capital Component" for implementation of the above mentioned project.The details of the equipment to be procured are given below:

S. No.	Proposed Budget Head	1st year	2nd year	3rd year	Total
Capital Assets					
1.	Hydraulic setup. (01 no.)	3,23,310/-	--------	--------	3,23,310/-
2.	D-Space card.(01 no.)	6,71,460/-	--------	--------	6,71,460/-
3.	Piezo electric actuator and sensor. (01 no.)	3,46,110/-	--------	--------	3,46,110/-
4.	Sensors and instrumentation. (10 no.)	1,00,000/-	2,00,000/-	--------	3,00,000/-
5.	Fabrication of prototype equipment	6,00,000/-	1,60,000/-	--------	7,60,000/-
A	*TOTAL*	**20,40,880/-**	**3,60,000/-**	--------	**24,00,880/-**

3. This sanction is subject to the condition that the grantee organization will furnish to the Department of Science & Technology, financial year wise Utilization Certificate (UC) in the proforma prescribed as per GFR 2017 and audited statement of expenditure (SE) along with up to date progress report at the end of each financial year duly reflecting the interest earned/ accrued on the grants received under the project. This is also subject to the condition of submission of the final statement of expenditure, utilization certificate and project completion report within one year from the scheduled date of completion of the project.

4. The grantee organization will have to enter & upload the Utilization Certificate in the PFMS portal besides sending it in physical form to this Division. The subsequent/ final installment will be released only after confirmation of the acceptance of the UC by the Division and entry of previous Utilization Certificate in the PFMS.

13/03/2018

5. If the grant has been released under capital head through separate sanction order under the same project for purchase of equipment(s), separate SE&UC has to be furnished for the released Capital head grant.

6. The grant-in-aid being released is subject to the condition that

(a) a transparent procurement procedure in line with the Provision of General Financial Rules 2017 will be followed by the Institute/Organization under the appropriate rules of the grantee organization while procuring capital assets sanctioned for the above mentioned project and a certificate to this effect will be submitted by the Grantee organization immediately on receipt of the grant.

(b) While submitting Utilization Certificate&Statement of Expenditure, the organization has to ensure submission of supporting documentary evidences with regard to purchase of equipment/capital assets as per the provisions of GFR 2017. Subsequent release of grants under the project shall be considered only on receipt of the said documents.

7. **The grantee organization will maintain separate audited account for the project and the entire amount of grant will be kept in an interest bearing bank account. The interest earned / accrued should be reported to DST (financial year wise) while submitting the Statement of Expenditure&Utilization Certificate. The interest thus earned will be treated as a credit to the grantee organization, which will be adjusted towards future release of grant.**

8. DST reserves sole rights on the assets out of grants. Assets acquired wholly or substantially out of government grants (except those declared as obsolete and unserviceable or condemned in accordance with the procedure laid down in GFR 2017), shall not be disposed of without obtaining the prior approval of DST.

9. The account of the grantee organization shall be open to inspection by the sanctioning authority and audit (both by C & AG of India and Internal Audit by the Principal Accounts Office of the DST), whenever the organization is called upon to do so, as laid down under Rule 236(1) of General Financial Rules 2017.

10. Due acknowledgment of technical support / financial assistance resulting from this project grant should mandatorily be highlighted by the grantee organization in bold letters in all publications / media releases as well as in the opening paragraphs of their Annual Reports during and after the completion of the project.

11. Failure to comply with the terms and condition of the Bond will entail full refund with interest in terms of Rule 231 (2) of GFR 2017.

12. The expenditure involved is dubitable to Demand No.84, Department of Science & Technology for the year 2017-18:

3425	:	Other Scientific Research (Major Head)
60	:	Others
60.200	:	Assistance to Other Scientific Bodes (Minor Head)
70	:	Innovation, Technology Development and Deployment
70.00.35	:	Grants-in-aid Capital for the year 2017-18 (Plan)

***(Previous**:SSP-SEED-3425.60.200.08.11.35)

13/03/2018

13. The amount **Rs.20,40,880/- (Rupees Twenty Lakh Forty Thousand Eight Hundred Eighty only)** will be drawn by the Drawing and Disbursing Officer, DST and will be disbursed to **Saranathan College of Engineering, Tiruchirappalli, Tamil Nadu-620 002.** The bank details for electronic transfer of funds through RTGS are given below:-

Institution Account Name	Saranathan College of Engineering, Tiruchirappalli, Tamil Nadu
Saving Bank Account Number	023001000138318
Name of Bank	City Union Bank Ltd.
Branch Name	23, KaliammanKoil Street, Opp. To TrichyAnnadhanaSamajam Tiruchirapalli-620 002.
RTGS/IFS Code	CIUB0000023
MICR Code	620054002

14. As per Rule 234 of GFR 2017, this sanction has been entered at S. No. 196 in the register of grants maintained in the Division for the scheme **(Scheme for Young Scientist and Technologists).**

15. This issues with the concurrence of IFD Vide their Concurrence Dy. No. C/5366/IFD 2017-18 Dated: 13/03/2018.

13/03/2018

(Dr. Rashmi Sharma)
Scientist-'E'
011-26590541

To
The Pay and Accounts Officer,
Department of Science & Technology,
New Delhi.
Copy for information and necessary action to:-

1. Cash Section (3 copies) for making the payment to the grantee.
2. Account Section.
3. Director of Audit, (Scientific Deptt), AGCR Building, New Delhi – 110 002.
4. Sanction Folder
5. Head (SEED)
6. Dr. M.Shanmugavalli,Department of Instrument and Control Engineering, Saranathan College of Engineering, Tiruchirappalli, Tamil Nadu-620 012.

13/03/2018

(Dr. Rashmi Sharma)
Scientist-'E'
011-26590541

SP/YO/040/2017(G)
Government of India
Ministry of Science & Technology
Department of Science & Technology
(SEED Division)

Technology Bhavan,
New Delhi-110016
Dated: 13/03/2018

ORDER

Sub:-Financial assistance for the project titled **"Nano-sensor for fluid mass flow rate measurement for biomedical applications"**under the guidance of **Dr. M.Shanmugavalli,** Department of Instrument and Control Engineering, Saranathan College of Engineering, Tiruchirappalli, Tamil Nadu-620 012.

Sanction of the President is hereby accorded to the approval of the above mentioned project at a total cost of **Rs.27,39,968/- (Rupees Twenty Seven Lakh Thirty Nine Thousand Nine Hundred Sixty Eight only)** for a duration of **three** years. The detailed breakup of the grant for General & Capital Components are given below:-

General Component	**Rs.3,39,088/-**
Capital Assets	**Rs.24,00,880/-**
TOTAL	**Rs.27,39,968/-**

S. No.	Proposed Budget Head	1st year	2nd year	3rd year	Total
Capital Assets					
	Equipment's	20,40,880/-	3,60,000/-	--------	24,00,880/-
A	*TOTAL*	20,40,880/-	3,60,000/-	--------	24,00,880/-
Travel					
	Travel	15,000/-	15,000/-	15,000/-	45,000/-
Consumables					
	Chemicals, Glassware and Stationary required for experiment, seed, pesticides, fertilizers, raw materials for fabrication, stationary, etc	15,000/-	15,000/-	15,000/-	45,000/-
Contingency					
	Contingencies @3%	62,126/-	11,700/-	900/-	74,726/-
Overheads (07% of Above Costs)					
	Overheads	1,44,962/-	27,300/-	2,100/-	1,74,362/-
B	*Total*	2,37,088/-	69,000/-	33,000/-	3,39,088/-
	Grand Total (A+B)	22,77,968/-	4,29,000/-	33,000/-	27,39,968/-

2. The sanction of the President is also accorded to the release of **Rs.2,37,088/- (Rupees Two Lakh Thirty Seven Thousand Eighty Eight only)** to **Saranathan College of Engineering, Tiruchirappalli, Tamil Nadu-620 002** being the first installment of grant under "General Component" for implementation of the above mentioned project.

13/03/2018

3. This sanction is subject to the condition that the grantee organization will furnish to the Department of Science & Technology, financial year wise Utilization Certificate (UC) in the proforma prescribed as per GFR 2017 and audited statement of expenditure (SE) along with up to date progress report at the end of each financial year duly reflecting the interest earned/ accrued on the grants received under the project. This is also subject to the condition of submission of the final statement of expenditure, utilization certificate and project completion report within one year from the scheduled date of completion of the project.

4. The grantee organization will have to enter & upload the Utilization Certificate in the PFMS portal besides sending it in physical form to this Division. The subsequent/ final installment will be released only after confirmation of the acceptance of the UC by the Division and entry of previous Utilization Certificate in the PFMS.

5. If the grant has been released under capital head through separate sanction order under the same project for purchase of equipment(s), separate SE&UC has to be furnished for the released Capital head grant.

6. The grant-in-aid being released is subject to the condition that

(a) a transparent procurement procedure in line with the Provision of General Financial Rules 2017 will be followed by the Institute/Organization under the appropriate rules of the grantee organization while procuring capital assets sanctioned for the above mentioned project and a certificate to this effect will be submitted by the Grantee organization immediately on receipt of the grant.

(b) While submitting Utilization Certificate&Statement of Expenditure, the organization has to ensure submission of supporting documentary evidences with regard to purchase of equipment/capital assets as per the provisions of GFR 2017. Subsequent release of grants under the project shall be considered only on receipt of the said documents.

7. **The grantee organization will maintain separate audited account for the project and the entire amount of grant will be kept in an interest bearing bank account. The interest earned / accrued should be reported to DST (financial year wise) while submitting the Statement of Expenditure&Utilization Certificate. The interest thus earned will be treated as a credit to the grantee organization, which will be adjusted towards future release of grant.**

8. DST reserves sole rights on the assets out of grants. Assets acquired wholly or substantially out of government grants (except those declared as obsolete and unserviceable or condemned in accordance with the procedure laid down in GFR 2017), shall not be disposed of without obtaining the prior approval of DST.

9. The account of the grantee organization shall be open to inspection by the sanctioning authority and audit (both by C & AG of India and Internal Audit by the Principal Accounts Office of the DST), whenever the organization is called upon to do so, as laid down under Rule 236(1) of General Financial Rules 2017.

10. Due acknowledgment of technical support / financial assistance resulting from this project grant should mandatorily be highlighted by the grantee organization in bold letters in all publications / media releases as well as in the opening paragraphs of their Annual Reports during and after the completion of the project.

11. Failure to comply with the terms and condition of the Bond will entail full refund with interest in terms of Rule 231 (2) of GFR 2017.

12. The expenditure involved is dubitable to Demand No.84, Department of Science & Technology for the year 2017-18:

3425	:	Other Scientific Research (Major Head)
60	:	Others
60.200	:	Assistance to Other Scientific Bodes (Minor Head)
70	:	Innovation, Technology Development and Deployment
70.00.31	:	Grants-in-aid General for the year 2017-18 (Plan)

*(**Previous**: SSP-SEED-3425.60.200.08.11.31)

13. The amount of **Rs.2,37,088/- (Rupees Two Lakh Thirty Seven Thousand Eighty Eight only)** will be drawn by the Drawing and Disbursing Officer, DST and will be disbursed to **Saranathan College of Engineering, Tiruchirappalli, Tamil Nadu-620 002.** The bank details for electronic transfer of funds through RTGS are given below:-

Institution Account Name	Saranathan College of Engineering, Tiruchirappalli, Tamil Nadu
Saving Bank Account Number	023001000138318
Name of Bank	City Union Bank Ltd.
Branch Name	23, Kaliamman Koil Street, Opp. To Trichy Annadhana Samajam Tiruchirapalli-620 002.
RTGS/IFS Code	CIUB0000023
MICR Code	620054002

14. As per Rule 234 of GFR 2017, this sanction has been entered at S. No. 196 in the register of grants maintained in the Division for the scheme **(Scheme for Young Scientist and Technologists)**

15. This issues with the concurrence of IFD Vide their Concurrence Dy. No. C/5365/IFD 2017-18 Dated: 13/03/2018.

13/3/2018

(Dr. Rashmi Sharma)
Scientist-'E'
011-26590541

To
The Pay and Accounts Officer,
Department of Science & Technology,
New Delhi.

Copy for information and necessary action to:-

1. Cash Section (3 copies) for making the payment to the grantee.
2. Account Section.
3. Director of Audit, (Scientific Deptt), AGCR Building, New Delhi – 110 002.
4. Sanction Folder
5. Head (SEED)
6. Dr. M. Shanmugavalli, Department of Instrument and Control Engineering, Saranathan College of Engineering, Tiruchirappalli, Tamil Nadu-620 012.

13/03/2012

(Dr. Rashmi Sharma)
Scientist-'E'
011-26590541

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9311

SMART SHOPPING USING NI VISION

Buvaneshwari.S[1], Kirthika.V[2], Nisha Francy.S[3], Renuga.S[4], Ezhilarasi.K[5]

Student, Instrumentation and Control Engineering, Saranathan College of Engineering, Trichy, India[1-4]

Assistant Professor, Instrumentation and Control Engineering, Saranathan College of Engineering, Trichy, India[5]

Abstract: In this fast-growing era of technological advancement, people are forced to have a fast-moving lifestyle. We are proposing a solution to reduce the time spent by the customers in a supermarket and to know the availability of products in different sections of a supermarket without entering into it. In every supermarket, a lot of time is wasted by standing at the billing counter for scanning and billing purposes. To reduce this we have used NI Vision to scan the products while placing them inside the cart itself. We have designed a smart display to know about the products in a particular section and the list of products placed inside the cart by the customer and its cost will also be displayed

Keywords: Bar code scan, NI Vision, Smart display, Automatic bill generation, LabVIEW Simulation.

I. INTRODUCTION

Shopping is like the activity of purchasing goods and needs, favourite products, and other essential items. Each and every person in the world loves shopping. Especially women love to shop more and this will bring them happiness and pleasure. Generally, the customers prefer to shop during weekends or at the end of the month. Customers enjoy spending a lot of time shopping for their favourite items but the most annoying part in the entire process of shopping is the billing process. If customers wait for a long time; it makes them impatient and irritated. There is a possibility that sometimes the customer gets irritated while standing in the queue and they might leave the store without even buying the products they need. In the case of festive seasons and discount periods, the billing process becomes even more difficult for the customers because they have to wait for a longer time due to the presence of a huge crowd. We have designed a model which contains a smart display which shows the product availability in different sections of the supermarket without entering into it. We have used NI Vision to scan the products needed by the customer, before adding them to the cart. The products available in all the sections of the supermarket have been uploaded to the server of the supermarket. The list of items that the customer purchased will be added to the cart display along with the details of the product. Since the customers themselves can scan the products and place them inside the cart, the time and labour needed for the billing process can be reduced to a greater extent. This will reduce the manpower in supermarkets and enhance the customer experience. Once a product is picked and scanned by the customers, the product details will be added to the list and it will be updated in the cart display and automatically the bill will be generated. Here the process of scanning and bill generation is simpler so that we can easily pay the bill without waiting near the billing counter of the supermarket and we can reduce the time spent in that place.

II. EXISTING METHOD

Nowadays the necessity of supermarkets has rapidly increased. People prefer to purchase in supermarkets and hypermarkets instead of small grocery shops because it is difficult for them to shop for different products in different places and it is time-consuming also. Customers choose supermarkets and hypermarkets over grocery shops because it will be easier for them to purchase all the products in a single shop, it also gives them a wide variety of choices and it consumes less amount of time. Each and every customer enter into the shop has been given a cart to store the products they have purchased. The cart has taken by the customer at the entrance of the shop itself.

There are more sections in the supermarket that holds a variety of products of different brands. Customers can visit any section and they can purchase the goods and essentials of their need, then they can place the products in their cart. After choosing the products they add them to the cart. Once they have selected all the products needed, they rush towards the billing counter of the supermarket. The products will be scanned by the employee of the supermarket at the counter. The customer has to wait until other customers' billing process gets over. It is very difficult to wait in a queue and it is a time-consuming process also. Some
Supermarkets have split the billing counters and have placed them on different floors of the supermarket. So that it will consume a comparatively less amount of time. But it involves more labour and the requirement of scanning and billing device gets increased.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9311

By using RFID technology and Zigbee Tran receiver, the process of scanning and billing gets automated. The customers need not wait in a queue. But this method is not that easy to implement and execute. This system is not cost-effective. It is a complicated process and not preferable also. In this method, we know the list of products purchased and their total amount, only after the bill provided by the employee. It is difficult to search in the cart for a specific product. So the customer will not be sure of the products they have purchased until they get the bill from the employee.

III. PROPOSED METHOD

The problems faced by the customers in the supermarket are understood and we have proposed a solution to solve those problems. In this solution, we are using NI Vision, the LabVIEW software.

NI VISION SYSTEM: It consists of cameras, which are used to acquire the image and also have controllers useful in image processing methods and I/O operations. It is mainly used to acquire images from various sources and will be modified using image processing techniques according to the applications.

LabVIEW SOFTWARE: Laboratory virtual Instrument Engineering Workbench software is developed by National Instruments Corporation. It is a graphical and visual programming language. It is useful in many applications that require test, measurement, and control. It is a development environment with the front panel, block diagram, and control panel. It can be used to perform various mathematical operations and logical functions. The front panel is the user interface where it contains controls and indicators which are the input and output functions. The block diagram consists of a graphical source code of a particular LabVIEW program. The control panel is used to represent the VI in the block diagrams of another program. The graphical approach will be easier for programmers to connect functions easily by dragging.

IV. SUPERMARKET LOG IN PAGE

We have designed a smart display by using LabVIEW software. The smart display consists of few lists of products available in that specific supermarket. Each list represents the products in the different sections that are located in the supermarket. Customers can see all the products in various sections of the supermarket in the smart display itself. It is not necessary to go to a particular section in search of a specific product. We can see all the products in a single smart display itself so that it reduces the time consumed by the customers to search the products in a supermarket. The smart display has a drop-down menu that consists of all the names of the banks located in India. Initially, we have to select the bank from the drop-down menu where we have an account.

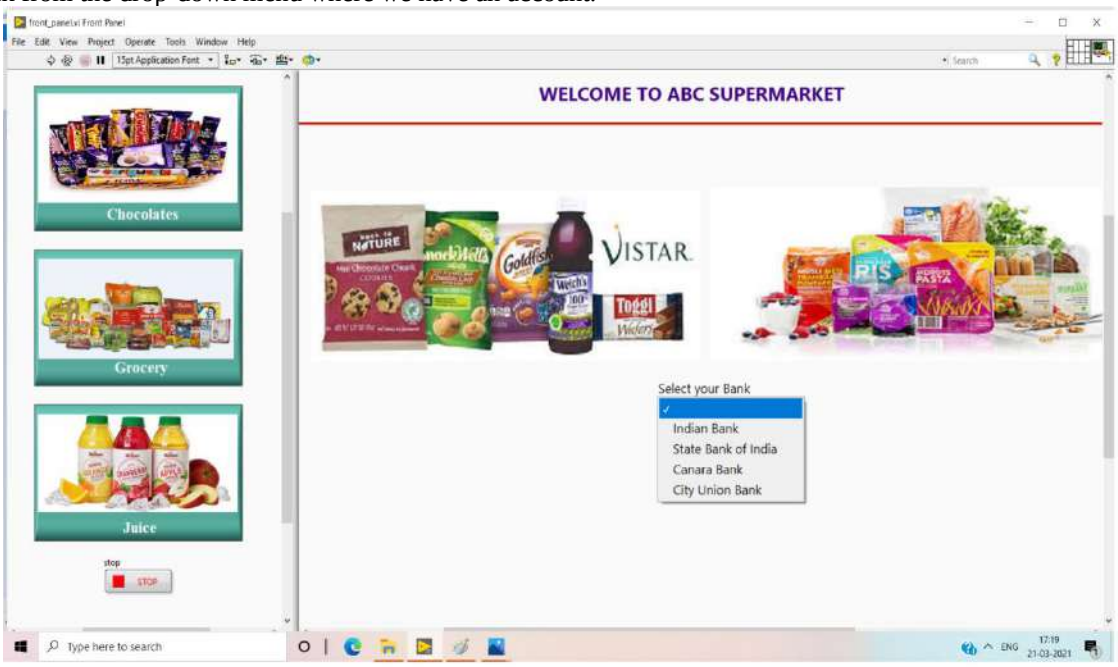

Fig.1. Home page of the smart display

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9311

V. BANK LOG IN PAGE

After the bank name is selected, a screen will pop up on the smart display. The pop-up screen consists of a log-in page. The customer has to log in by using their login credentials. Each and every person has a unique username and passcode. The login credentials should not be shared with unknown people.

Fig.2. Bank server main page

The username used is the customer's mobile number which is registered and linked to their bank account. The passcode is a four-digit unique number set by the customers. The username and passcode entered by the customers while login into the page must be correct. If either username or passcode is wrong then it will show the error "Please enter correct username or passcode". So the customers should enter the correct credentials on the login page. If the customer has entered the correct credentials, then the message will be sent to the registered mobile number as "You are logged into your shopping account" along with the link and OTP.

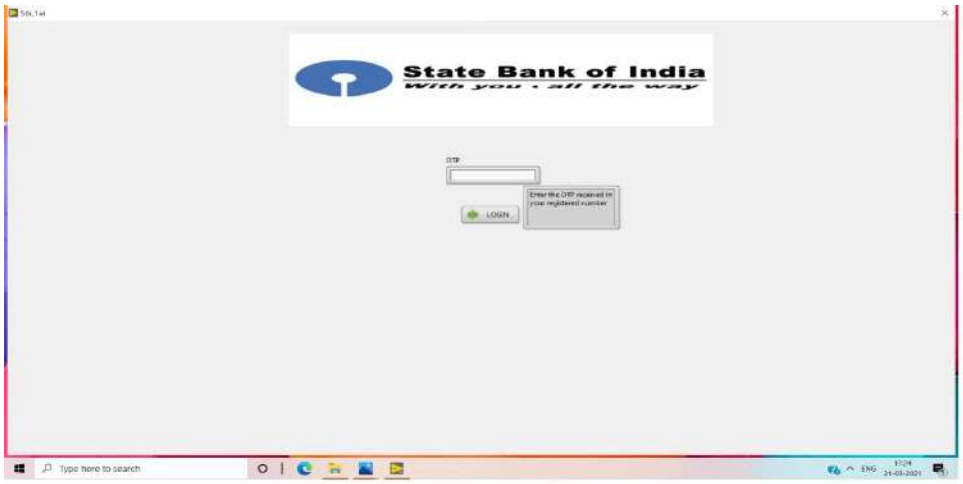

Fig.3. OTP verification tab

The link is used to find the location of the supermarket where the customer is purchasing. If the customer clicks the link then the customer will be redirected to another page that shows the map of the location where our shopping accounts is inactive state. Each and every time we log in to the page it will intimate us by sending a notification to mobile. It will enter into the supermarket server only if we enter the correct OTP or else it shows an error.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

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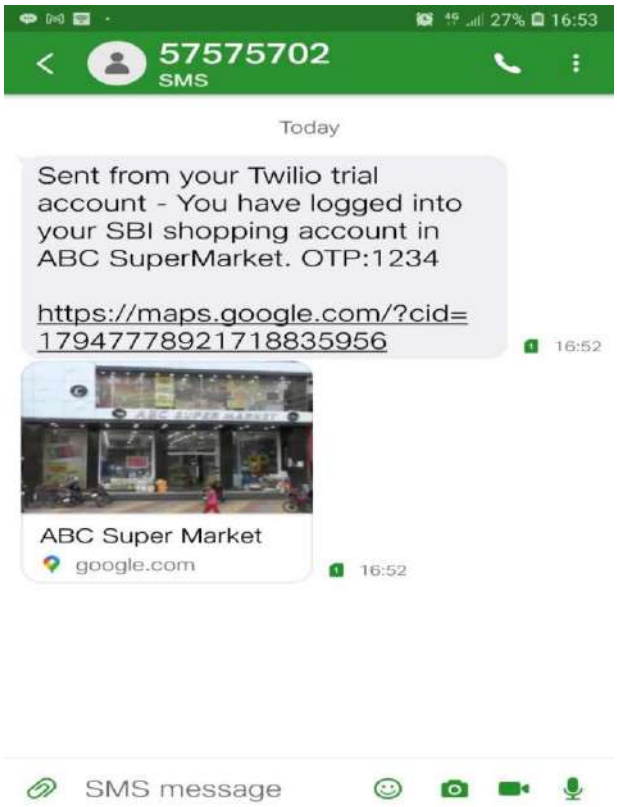

Fig.4.Mobile Notification to the customer's number

VI. SMART SHOPPING USING VISION

Once the customers enter the shopping page of the supermarket there will be a table which will be updated after each product is being scanned, the table contains the name of the product added along with its quantity and price, two buttons 'ADD' and 'REMOVE' are provided which allows the customer to add and remove particular products from the cart, the total amount to be paid and bill generation button is provided to automatically generate the bill for the products that the customers have chosen. The names of the products available in the supermarket from different sections have been stored in the cloud of the supermarket along with its description like brand name, product name, quantity, and price. The customers can pick any product and scan it by using NI Vision, which scans the bar code of the particular item. Every single product has a different bar code. For example, if the customer has taken two salt packets of the same brand but with different quantities, they too have different bar codes. Every product has a bar code that will be printed by the manufacturer itself. It will be easier for the customers to scan the products themselves rather than waiting in a queue in the bill section for a long duration. The main advantage of this process is it doesn't consume more time for the scan and billing process. The process of scanning is very simple and it also makes the customer feel comfortable during the entire process of shopping.

The first step of the process is to pick the products from the rack of the store and show the picked product to the NI Vision camera to scan the product. The scanner is used to scan the bar code of the product. After the scanning is done the bar code will be displayed on the screen. There is an option called ADD which will be used to add the product to the cart. Once the product is added to the cart then it will be displayed in the table along with the price of the particular product. If the customer wants to remove any product from the cart, there is a REMOVE option that will be used to remove the product from the cart. The table shows the price of the individual products and there is a small display on the screen which will show the total price of the products in the cart so that we can know the total amount of bill to be paid. There is a BILL option in the display which is used to generate the bill at the end of the process. If the process of shopping is over, then we can pay the bill by clicking the bill option for the amount to be paid. We need not wait in a queue for a long time for scanning and billing purposes. This system will reduce the time spent by the customers in the bill section and made the process simpler.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9311

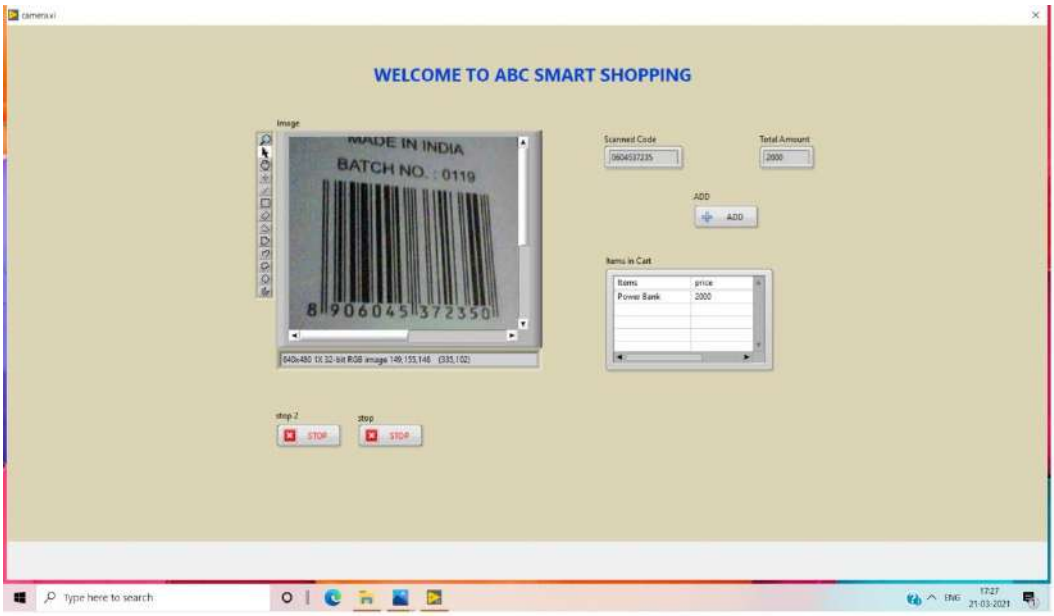

Fig.5.Bar code Scanning using NI Vision

VII. ADVANTAGES AND APPLICATIONS

The advantages of this proposed solution are listed below:

- It saves more time for the customer by avoiding standing in a queue for a long period of time near the billing section.
- It is not necessary for customers to visit every section of the supermarket to know the product availability; instead they can check the smart display which shows every product in different sections of the supermarket.
- This solution is not only applicable for supermarkets alone, but also for hypermarkets, retail shops, and grocery shops and also applicable for malls.
- It reduces the manpower at the billing counter of supermarkets.

VIII. CONCLUSION

Shopping is also an activity which is loved by most of the people to spend their time to purchase the goods, needs and other essentials. Many customers get irritated while standing in a queue for billing purposes. But in the case of the smart shopping process, it will be solved by automated these processes. Our smart display will be very useful for the customers to check the availability of products. In most proposed solutions RFID technology is used which is more complicated to establish and the cost of implementation is also very high. But we have used NI Vision which is simpler to execute and cost-effective process.

IX. FUTURE WORK

In the future, we are going to design a smart trolley that will be more efficient and user-friendly. In this trolley, the NI Vision camera is fixed at one end. Once the customer picks the product he can show the product to the camera which will scan and add the item to the list of products. We have planned to design mobile-based shopping. We can use mobile phones to log in to the supermarket server instead of using the smart display. The purchased product list is viewed by using mobile itself along with its price and quantity. The total amount of bill to be paid is calculated simultaneously. The customer need not go to the billing counter, because we are going to automate the billing process by directly connecting the supermarket server to the bank server and the amount will be deducted from the account automatically without using third-party applications or ATM cards. So the customer can purchase even without carrying money or ATM cards while visiting supermarkets.

IJIREEICE

ISSN (Online) 2321-2004
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Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9311

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| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003001

BAR CODE BASED SMART TROLLEY FOR SUPERMARKETS

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ABSTRACT: With the advancement in science and technology, our world is getting automated in more aspects. No one likes to waste their time, because it is most valuable than anything. But, many customers waste their valuable time while shopping. Every supermarket, hypermarkets, shopping malls, retail shops consists of more number of trolleys for storing the purchased products by the customers. After shopping gets over they should pay their bill in the billing section. In this section customer have to spend more time for scan their products and to pay their bill. So we have proposed a solution for this problem. Our solution is that we have designed a smart trolley which will be helpful for the customers to reduce the time spent in billing sections. We have used bar code scanner in smart trolley to scan the products and the smart display shows the product description which will be useful in automatic bill generation. It will be helpful in improving consumer experience and reduces the time spent in supermarkets.

KEYWORDS: Smart trolley, Barcode scanner, Automatic billing, Smart display.

I.INTRODUCTION

Shopping is also an activity which is loved by almost all people, especially the young ones. Going shopping is also an important and it is necessary for some people. Generally, people prefer shopping malls, supermarket, hypermarkets which is very big and holds many sections. Because, it is easy to purchase all the products they need to buy in a single place. Otherwise, they have to go for many places to buy the needs which are a time consuming process. Although in supermarkets they spent more time in billing section. It is mainly happens because the products that the customer purchased should be scanned by the employee of the supermarket to made a bill for them. The billing counter is located near the exit of the supermarket. In billing section, employee should scan every product in the trolley which is purchased by the customer. Then every customer has to wait in a queue until the previous customer pay and leave the billing section. This took more time for an employee to scan every product from trolley himself/herself. To tackle this problem we have proposed a solution by designing a smart trolley. Every supermarket has trolley at the entrance itself. The smart trolley will be helpful for the customers to store the products they have purchased. We have fixed camera in a trolley which is used as scanner to assist customers to scan the products they have purchased before store into the smart trolley. The supermarket has a server which is used as storage of description of products from different sections of supermarket. Every section of supermarket consists of variety of products from various brands. The products have a unique bar code at its back side. If we scan the bar code then the details of that particular product has been displayed at the display. The details of the product include quantity of the product, brand name and price of the product. After every
Product scanned it will be automatically added to the list of cart along with its description.

It will be very simple and easy process to scan the products they have purchased themselves. The customer should scan the product by using the camera which is fixed at the corner of the trolley before store it to the trolley. If the customer didn't scan the products before store it to the trolley then it will be identified. The load cell which is placed at the bottom of the trolley will be used to measure the weight of the products added to the smart trolley. If customer adds the products to the smart trolley without scanning, then it will be identified by using load cell which will measure the weight of the products then match the weight with the total weight of the list of items in a cart. If mismatch of the weight occurs then it will be known automatically. Then we can easily identify the products in a trolley which is not scanned and it will be added to the cart after scanning.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003001

II.LITERATURE SURVEY

Generally the process of shopping consumes more time. Every supermarket has many floors with lot of sections. The customer should go to respective sections to buy the needed products. They were not familiar about the locations of the section in the supermarket. They should find the correct location to buy the expected products from a particular section of the supermarket. It consumes more time, hence introduced the IoT technology which will guide them to the correct location from where they should go inside the markets. The carts also communicate with neighbour cart which help the co-shopper to enable parallel shopping [1].

The supermarket can use RFID and Zigbee technology to scan the products by using RFID tags which is sticked to every product located inside the supermarket. The scanned products have been added to the list of items in a cart automatically by using Zigbee technology which has trans-receiver. Then the bill will be generated automatically. So that the customer need not to wait in queue instead they can pay their bill using any third party applications or through debit cards or credit cards [2].

The trolley can follow the customer when he moves from one rack to another rack. The trolley uses accelerometer and Omni wheels to make this process of moving from one rack to another automatically. The trolley also keeps track of the products placed inside the trolley and the bill will be generated automatically. Hence there is no need for billing counter in the supermarkets [3].

III. PROPOSED SYSTEM

The main purpose of innovation is to simplifying the works we were doing in our day to day life. According to survey, people spend considerably more time in shopping. The trolley designed initially is used to help the customers to store the products they have purchased. But it was made more efficient by adding special features to it. This will be easier and more convenient for the customers to handle the smart trolley.

CAMERA: The camera is mounted on the smart trolley. It is used to capture the digital images which are then transferred to the personal computer and then it will be forwarded to the server. Finally the images are transferred from server to the hosting page. The main purpose of the camera in smart trolley is to scan the bar code in the products which is unique and used to find their details while adding the product to the cart by the customers. We have to show the products to the camera to scan the same to add them into the list of items in a cart.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003001

Fig.1. Camera

IV. WORKING

The trolley was located near the entrance of the supermarket. The customer can take any trolley to store the products that they have purchased. The smart trolley consists of camera at the corner which is used to scan the products taken from the rack of supermarket. The bar code is printed in every product in the supermarket. The customer should scan the product by showing them in front of the camera at the corner. Then it will scan the bar code in the product and then display the scanned bar code in the smart display.

Fig.2. Smart Trolley

The products in the supermarket has stored in the server of the supermarket. Once the bar code is displayed then the corresponding product along with its quantity, weight, brand, and product name has been displayed in the smart display. We have an option “ADD” and “REMOVE” in the smart display. If customers want to add items to the list of items in a cart then he/she should scan and press that add option or if customers want to remove items from cart then he/she should press remove option and then it will be removed. The load cell was attached in the bottom of the smart trolley which is used to measure the weight of the products placed inside the cart. When the products were placed inside the trolley, the pressure will be developed which will be measured by the load cell and then it output the voltage as output. So we can measure the weight of the products added to the trolley by using the voltage change occurs. The weight will increase or decrease according to the products placed or removed from trolley. If the customers add any products after scanning the product using camera located at the corner of trolley, then the pressure will increase according to the weight added to the trolley. If the customers remove any product from the trolley, then the pressure will decrease according to the weight removed from the trolley. Hence the pressure of the load cell will increase or decrease according to the weight added or removed from the smart trolley.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003001

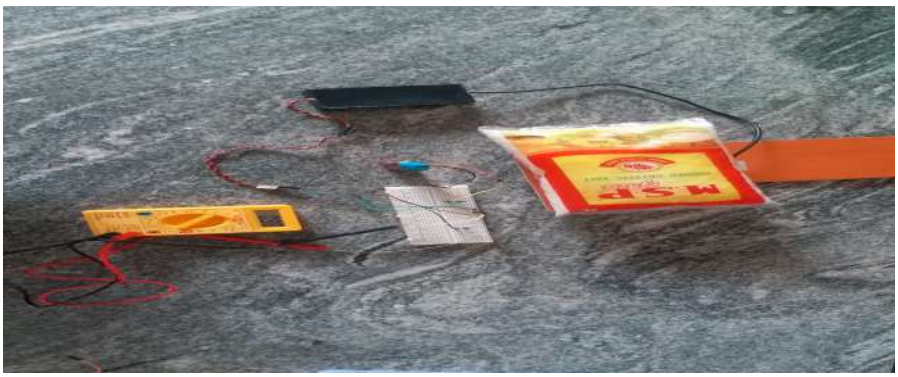

Fig.3. Load Cell Measurement

The smart trolley can scan the products by using camera and after scanning the image will be moved to the personal computer and then forwarded to the server of the supermarket. The server already stores the product details in its server will match the image received from the scanner to the image which is stored in the server of the supermarket. If the image doesn't match with each other, then the process of scanning is not done properly. If the weight of the products in a cart doesn't match with the equivalent voltage then it will be displayed in the screen that any of the products in the trolley was not scanned and it should be scanned by the customer. Finally the bill to be paid is generated automatically and the customers need not to wait in the billing counter.

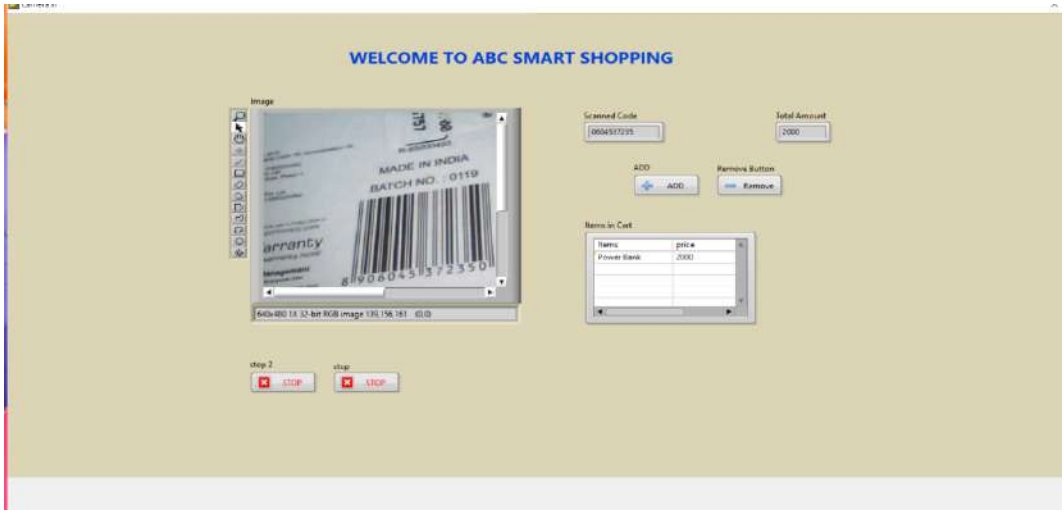

Fig.4. Smart Display

V.CONCLUSION

The main objective of this project is to reduce the time spent in the billing counters of the supermarkets. To make this process easier we have designed a trolley where the camera is mounted on the corner of the trolley while the load cell is placed at the bottom of the trolley. The camera is used for scanning the product purchased by the customer themselves and the load cell is used to measure the weight of the scanned products placed inside the trolley. If the trolley contains the unscanned products then it will be detected by observing the load cell output. Supermarkets have many floors and each floor consists of bill counter at the centre of the floor. If we automated the scanning and billing process, there is no need for bill counters at

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003001

every floors of the supermarket. It will reduce the time spent by the customers in the bill section. It also saves space from every floor so that the seller can use that space to place some other section to showcase more products to the customers. The profit will also get increased for the seller if he place suitable section in the centre of the floor.

VI. ADVANTAGES

- In this proposed solution, Camera is used to scan the products which is easy for every customer to scan the product themselves by showing the products to the camera.
- The level of accuracy is maintained in this process.
- Easy to implement the process in supermarkets, malls, hypermarkets.
- It is cost efficient compared to other proposed solutions which used RFID and IoT technology.
- Smart display will show the product availability.
- Automatic bill generation
- It saves time for the customers.
- It reduces man power.

VII. FUTURE WORK

In future we are going to introduce mobile phone based shopping. The home page of the supermarket can be accessible in the customer mobile phone itself. They can log into the server of the supermarket using their credentials. There is a dashboard in the mobile will show the products which were added by the customer to the smart trolley. It is possible to remove a product from the list by mobile itself. The process of payment will also be automated. The customers need not to bring cash or ATM cards while come to shopping. The amount to be paid will be automatically deducted from the customer bank account after the passcode verification is done. There is no need for any third party application to pay the bill. We also planned to design a smart display, if the amount to be paid to the supermarket by the customer is higher than the bank balance of the customer, and then it will guide the customer to remove the suitable products from the trolley. It is not necessary to remove that suggested products, the customer can remove the product whatever he/she want to remove.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

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| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003001

E-Software for Electric Vehicles Using LabVIEW

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ABSTRACT: This project is based on e vehicles which is named as E-tron, enables the user for more reliable, efficient E vehicle with smarter operations for the Electric Vehicle user. This software helps us to identify the flaws and rectify the issues to predict the Maintenance of our vehicle. It is also embedded with different modules such as Battery Life Analyser, Charge Predictor, Battery Optimization and SOS operations within this software. The software has a rich User Interface which performs smart and efficient operations. It has the capability to communicate directly to the company about the vehicle status. It has a novelistic feature of automatic navigation and re-routing based on the designed algorithm. When there is a viability of increasing the Electric Vehicles, this product would be an added advantage which is packed with features conducive to Electric Vehicles. This would ultimately make for the faster adoption of Electric Vehicles in any country.

KEYWORDS: Battery Usage, Battery life prediction, Charging stations by GPS, Vehicle to vehicle communication.

I.INTRODUCTION

Our E-Tron is indigenously developed software which enables smarter operations for the Electric Vehicle user.
This software helps us to identify the flaws and rectify the issues to predict the Maintenance of our vehicle. It is also embedded with different modules such as Battery Life Analyser, Charge Predictor, Battery Optimization and SOS operations within this software. The software has a rich User Interface which performs smart and efficient operations. It has the capability to communicate directly to the company about the vehicle status. It has a novelistic feature of automatic navigation and re-routing based on the designed algorithm. When the E-Tron software is deployed, it would be ready to use in any vehicle as the software is universal. The reliability, efficiency and smarter operations are getting assessed at low cost. When there is a viability of increasing the Electric Vehicles, this product would be an added advantage which is packed with features conducive to Electric Vehicles. This would ultimately make for the faster adoption of Electric Vehicles in any country
.

II.SYSTEM MODEL AND ASSUMPTIONS

The main objective of the project entitled ”E-TRON” is to increase the reliability, efficiency and to make smarter operations for E-vehicles all integrated into one software. In existing system there is provision only for indicating Battery Charge Level, Speedometer, Odometer only but it lacks the potential to breakthrough into consumers mind to make EV into a formidable force in automotive industry. Our proposed system was designed and developed in LabVIEW platform in a sure way to ensure various functions and operations are automated as a single software for user.

- Predictive Maintenance
- Battery Life Analyser
- Charge Analyser
- Battery Saver
- Emergency Actions

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

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DOI:10.15662/IJAREEIE.2021.1003001

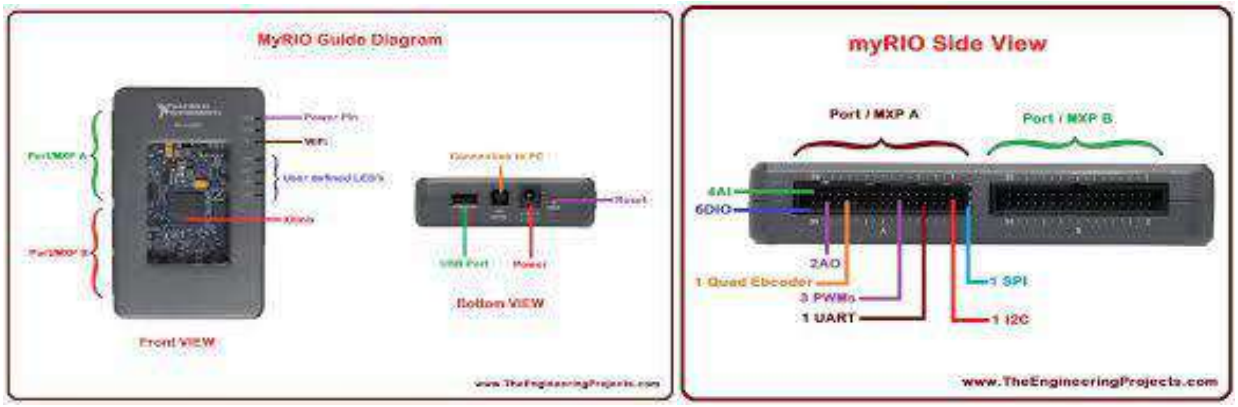
III.HARDWARE AND SOFTWARE DESCRIPTION

Software: LabVIEW-2017. LabVIEW- Laboratory Virtual Instrument Work Bench. We were used LabVIEW-2017 for our simulation. It offers a Graphical programming approach that helps you to visualize every aspect of your application, including Hardware configuration, measurement of Data, and debugging. This visualization makes it simple to integrate measurement hardware from any vendor, represent complex logic on the diagram, develop data analysis algorithms, and design custom engineering user interfaces. In particularly we are using LabVIEW Database Toolkit.

LabVIEW Database toolkit: It is used to communicate and pass data between LabVIEW and either a local or a remote Database management systems (DBMS).

GPS API: It returns a location and accuracy radius based on information about cell towers and WiFi nodes that the mobile client can detect.

Hardware: myRIO. myRio provides educators with an embedded, WiFi-enabled solution to deliver an engaging approach to learning controls, investigating mechatronics, and designing imaginative capstone projects. Device features I/O on both sides of the device in the form of MXP and MSP connectors. It includes analog inputs, analog outputs, digital I/O lines, LEDs, a push button, an onboard accelerometer.



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|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003001

IV.FEATURES

E-TRON is our Indigenously developed software on LabVIEW platform. It enables the user for more reliable, efficient E-vehicle with smarter functions. It enhances the usage and gives clear view about the E-vehicle's Battery charge distribution. The main features are,

PREDICTIVE MAINTENANCE: The main thing we have to consider while using normal vehicle or E-vehicle is maintenance. This is the Key factor which leads to the longevity of the vehicle usage. In particularly for using E-vehicles there is most commonly faced drawback among people is Maintenance. So we are majorly focused to solve this drawback. We used protocols to Real-time monitoring of vehicles and indicate when the maintenance is required. The main protocol that is being used here is I2C communication protocol, I2C combines the best features of SPI and UARTs. With I2C, we can connect multiple slaves to a single master (like SPI) and we can have multiple masters controlling single, or multiple slaves. This is really useful when we want to have more than one sensors logging data to a single memory card. For example, here we have used to monitor the fluid levels of both brake and battery coolant with the use of level sensors which indicates the current level of the fluid and when it decreases, the overall maintenance action of the vehicle changes to compulsory. This also applies to the case of wheel alignment, where an accelerometer is being placed on alloy of the wheels and when any one of the wheel is not properly aligned which is set to certain level, the overall maintenance action indicates as the vehicle compulsorily has to go under maintenance.

BATTERY LIFE ANALYZER: In Battery life predictor battery conditions are all monitored and given to an mathematical algorithm to predict our Battery life condition and its future life. Life of a battery in an e-vehicle plays an important role in electric vehicle market. So we have developed this prediction methodology based on several actions done by the user and the battery itself, it depends mainly on the efficiency and temperature loss whenever the vehicle is in use. For this a temperature sensor with I2C or UART protocol is being connected with the battery for analysing the current temperature status instantly. Secondly, every e-vehicle's battery starts to reduce its efficiency after reaching a particular range so the battery level starts to reduce more quickly this indicates that life of the battery has been reduced, it also depends on how much time the battery has been charged this is called as charging cycle so based on these criteria battery condition are displayed whether it is good, moderate or poor.

REAL TIME CHARGE ANALYZER: Calculates the loads of the battery while E-vehicle is in operation and in the steady state to calculate the load demand and predict. Display the current and predictive charge in the battery (Percentage, Timer). When the e-vehicle is switched ON, the analysis of the current charge capacity is being noted through loads of the battery used, the capacity of the battery depends on the usage of the user whether they use air conditioner or other auxiliary systems like music system, lightings etc. Based on these conditions the system starts to predict the battery and charging range in real time.

BATTERY SAVER: It will be activated after an "X"-level of battery range, it will reduce the battery loads by optimizing battery discharge in vehicle like switching OFF A/C and auxiliary systems. E-TRON also automatically Re-routes the vehicle to the nearest charging station depending on charge level and algorithm.

EMERGENCY: If no charging station is available an SOS signal message with the location tagged will be sent to the nearest E-vehicle or the nearest station for Help. Here we are using the button which is already present in myRIO, when the user presses it, the location and message of the user is being sent to nearest e-vehicle or stations that are present active at that moment.

ACKNOWLEDGEMENT: It will be received when other user accepts, with their location. This is experimentally done through LCD connected in several channels which uses master/slave protocol, this is a model of asymmetric communication or control where one device or process controls one or more other devices or processes and serves as their communication hub. In some systems, a master is selected from a group of eligible devices, with the other devices acting in the role of slaves. Hence the location and message of that e-vehicle user is being received,viewed and acknowledged by anyone who is online and ready to help.

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V. FLOW OF CODE

Fig 1, This flow diagram shows how these features are interpreted using LabVIEW program.

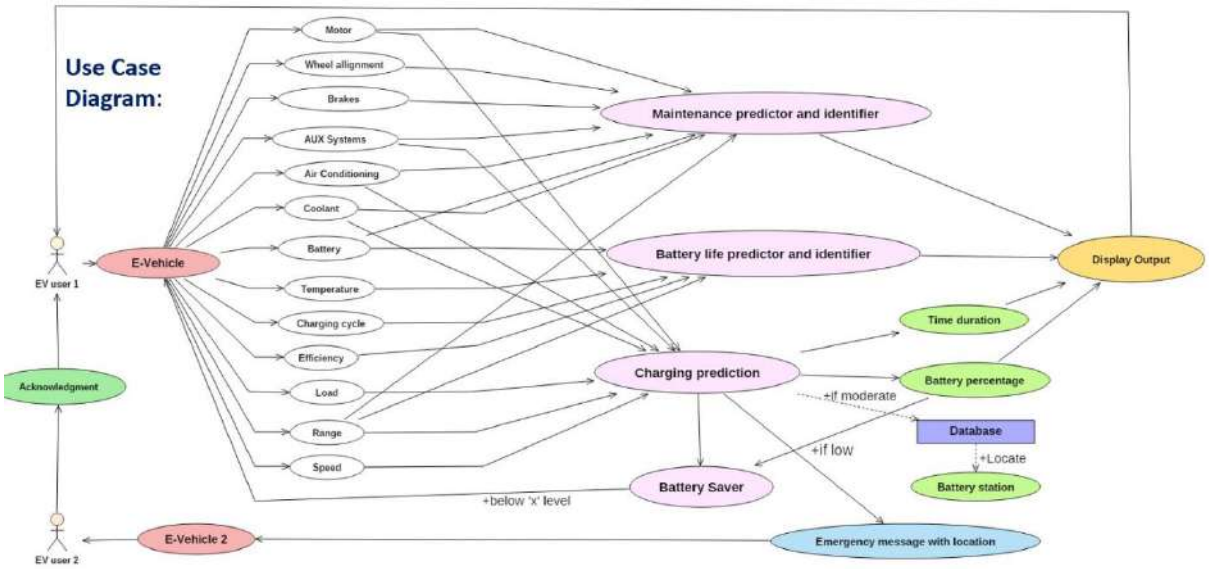

Fig. 1 Flow of code.

VI. RESULT

In the fig 2, it shows various features like charge life prediction, Battery life , Battery action, Maintenance and emergency response. This is our simulated front Panel of our vi.

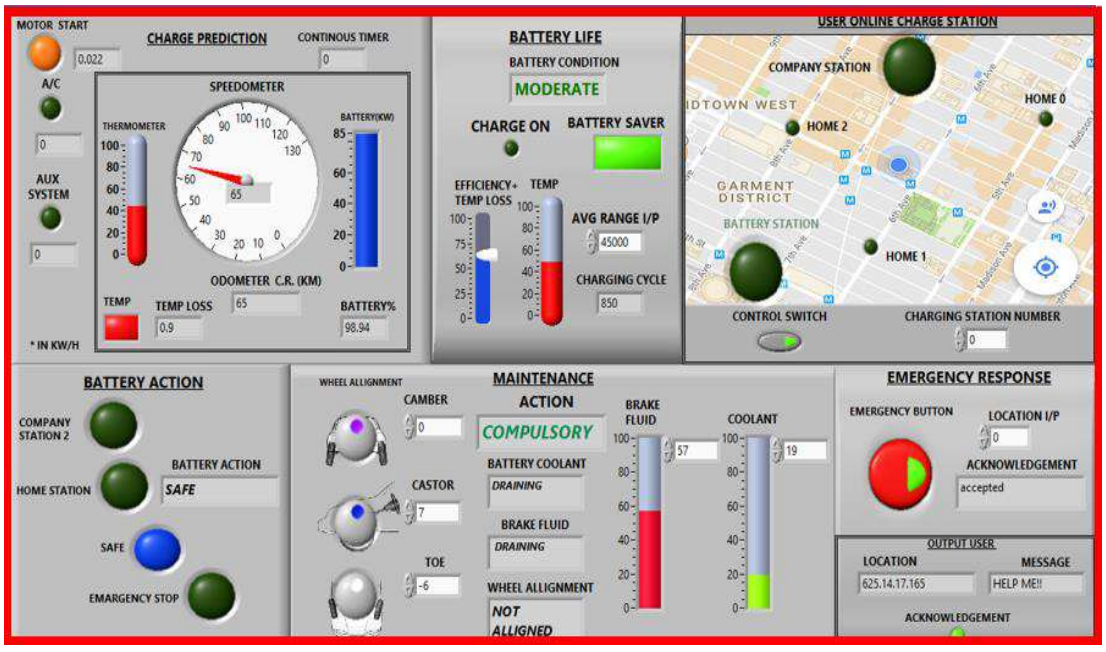

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Fig. 2 Final simulated Features Front Panel.

VII.CONCLUSION

Through our software product we are concluding the usage of battery in E – vehicles is maintained and to make an add on we also provide the details of vehicle maintenance and we provide interface between the users by which they can help each other when the battery runs down. This is an user friendly interface, so any age of user can easily access our product. In future it can be implemented with minor changes according to the developing company's criteria and they can install easily. This provides the interface between user and company, so that the problem can be sorted out.

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ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

IJIREEICE

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, Month 2021

DOI 10.17148/IJIREEICE.2021.9101

Smart Adaptability of E-Vehicle and Smart Forecasting of Agriculture Using LabVIEW

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Abstract: This paper is two in one application which is based on e vehicles and agricultural management. The e-vehicle application which is named as e-tron, enables the user for more reliable, efficient E vehicle with smarter operations for the Electric Vehicle user. This software helps us to identify the flaws and rectify the issues to predict the Maintenance of our vehicle. It is also embedded with different modules such as Battery Life Analyser, Charge Predictor, Battery Optimization and SOS operations within this software. The software has a rich User Interface which performs smart and efficient operations. It has the capability to communicate directly to the company about the vehicle status. It has a novelistic feature of automatic navigation and re-routing based on the designed algorithm. When there is a viability of increasing the Electric Vehicles, this product would be an added advantage which is packed with features conducive to Electric Vehicles. This would ultimately make for the faster adoption of Electric Vehicles in any country. Secondly, The agricultural management application helps farmers to make their business effective comfortable, predictable, confident and more profitable. This application help farmers as well as common people to do an effective and predictable farming. It gives a clear guidance to the user about farming pattern. It helps farmers by suggesting certain methods to keep the crops healthier, prevent and protect from pest attacks. It gives knowledge about different pesticides that can be used when pest attack happens. It also notify farmers about subsidies given by the government when natural calamities occur.

Keywords: E-Tron, Battery Usage, Battery life prediction, Charging stations by GPS, Vehicle to vehicle communication, farming patterns, Pest attack, Pest Contrrol.

I. INTRODUCTION

Our E-Tron is indigenously developed software which enables smarter operations for the Electric Vehicle user.
This software helps us to identify the flaws and rectify the issues to predict the Maintenance of our vehicle. It is also embedded with different modules such as Battery Life Analyser, Charge Predictor, Battery Optimization and SOS operations within this software. The software has a rich User Interface which performs smart and efficient operations. It has the capability to communicate directly to the company about the vehicle status. It has a novelistic feature of automatic navigation and re-routing based on the designed algorithm. When the E-Tron software is deployed, it would be ready to use in any vehicle as the software is universal. The reliability, efficiency and smarter operations are getting assessed at low cost. When there is a viability of increasing the Electric Vehicles, this product would be an added advantage which is packed with features conducive to Electric Vehicles. This would ultimately make for the faster adoption of Electric Vehicles in any country.
And smart forecasting in Agriculture is a software which enables the smarter and forecasting operations for Agriculture. This module particularly helps Farmers to identify the farming patterns like in which month ,what are the crops we have to cultivate, and it gives the best measures to control pest attacks. This module will definitely helps farmers to enhancing their agriculture in smarter way.

II. SYSTEM MODEL AND ASSUMPTIONS

The main objective of the project entitled ”E-TRON” is to increase the reliability, efficiency and to make smarter operations for E-vehicles all integrated into one software. In existing system there is provision only for indicating Battery Charge Level, Speedometer, Odometer only but it lacks the potential to breakthrough into consumers mind to make EV into a formidable force in automotive industry. Our proposed system was designed and developed in LabVIEW platform in a sure way to ensure various functions and operations are automated as a single software for user. Premitive features of E-Tron module are,

IJIREEICE
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- Predictive Maintenance
- Battery life Analyzer
- Charge Analyzer
- Battery saver
- Emergency conditions

The main objective of the Smart Forecasting of Agriculture module are to identifying the farming patterns for varying climate and weather conditions. This module gives the best measure to control the pest attack for crops. And finally it also gives the details about the subsidies which are given by the government due to uncertain things happen to cultivation due to natural calamities. The main features are,

- Farming Patterns
- Pest control
- Subsidy details

III.HARDWARE AND SOFTWARE DESCRIPTION

Software: LabVIEW-2017. LabVIEW- Laboratory Virtual Instrument Work Bench. We were used LabVIEW-2017 for our simulation. It offers a Graphical programming approach that helps you to visualize every aspect of your application, including Hardware configuration, measurement of Data, and debugging. This visualization makes it simple to integrate measurement hardware from any vendor, represent complex logic on the diagram, develop data analysis algorithms, and design custom engineering user interfaces. In particularly we are using LabVIEW Database Toolkit.

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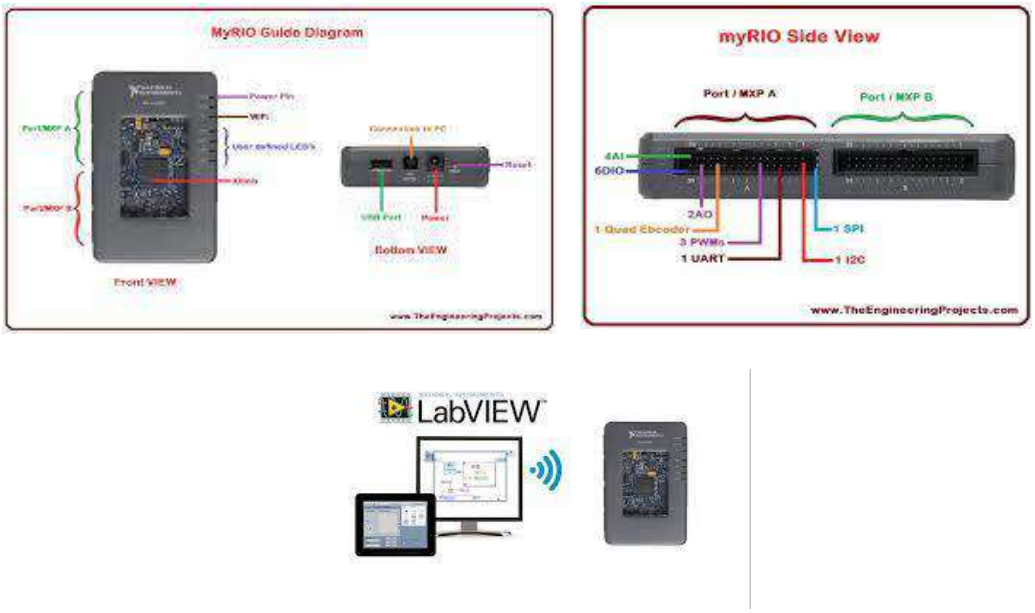

Fig. 1 Pin diagram of myRIO kit.

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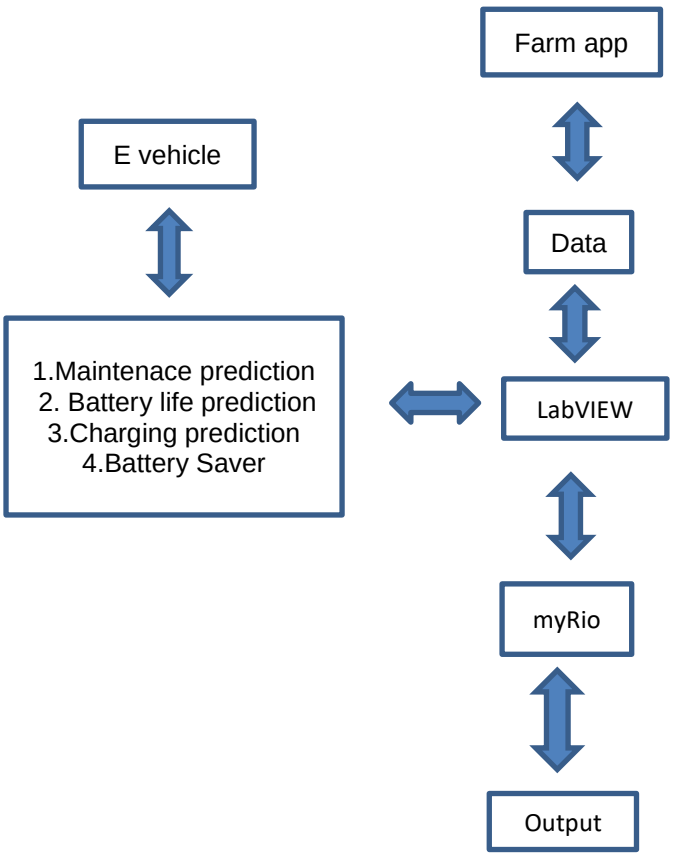
IV.FLOW CHART



V.FEATURES

E-TRON module i**s** our Indigenously developed software on LabVIEW platform. It enables the user for more reliable, efficient
E-vehicle with smarter functions. It enhances the usage and gives clear view about the E-vehicle's Battery charge distribution**.** The main features are,

PREDICTIVE MAINTENANCE: The main thing we have to consider while using normal vehicle or E-vehicle is maintenance. This is the Key factor which leads to the longevity of the vehicle usage. In particularly for using E-vehicles there is most commonly faced drawback among people is Maintenance. So we are majorly focused to solve this drawback. We used protocols to Real-time monitoring of vehicles and indicate when the maintenance is required. The main protocol that is being used here is I2C communication protocol, I2C combines the best features of SPI and UARTs. With I2C, we can connect multiple slaves to a single master (like SPI) and we can have multiple masters controlling single, or multiple slaves. This is really useful when we want to have more than one sensors logging data to a single memory card. For example, here we have used to monitor the fluid levels of both brake and battery coolant with the use of level sensors which indicates the current level of the fluid and when it decreases, the overall maintenance action of the vehicle changes to compulsory. This also applies to the case of wheel alignment, where an accelerometer is being placed on alloy of the wheels and when any one of the wheel is not properly aligned which is set to certain level, the overall maintenance action indicates as the vehicle compulsorily has to go under maintenance.

BATTERY LIFE ANALYZER: In Battery life predictor battery conditions are all monitored and given to an mathematical algorithm to predict our Battery life condition and its future life. Life of a battery in an e-vehicle plays an important role in electric vehicle market. So we have developed this prediction methodology based on several actions done by the user and the battery itself, it depends mainly on the efficiency and temperature loss whenever the vehicle is

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REAL TIME CHARGE ANALYZER: Calculates the loads of the battery while E-vehicle is in operation and in the steady state to calculate the load demand and predict. Display the current and predictive charge in the battery (Percentage, Timer). When the e-vehicle is switched ON, the analysis of the current charge capacity is being noted through loads of the battery used, the capacity of the battery depends on the usage of the user whether they use air conditioner or other auxiliary systems like music system, lightings etc. Based on these conditions the system starts to predict the battery and charging range in real time.

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EMERGENCY: If no charging station is available an SOS signal message with the location tagged will be sent to the nearest E-vehicle or the nearest station for Help. Here we are using the button which is already present in myRIO, when the user presses it, the location and message of the user is being sent to nearest e-vehicle or stations that are present active at that moment.

ACKNOWLEDGEMENT: It will be received when other user accepts, with their location. This is experimentally done through LCD connected in several channels which uses master/slave protocol, this is a model of asymmetric communication or control where one device or process controls one or more other devices or processes and serves as their communication hub. In some systems, a master is selected from a group of eligible devices, with the other devices acting in the role of slaves. Hence the location and message of that e-vehicle user is being received, viewed and acknowledged by anyone who is online and ready to help.

In smart forecasting of Agriculture module, We include most important features which are currently makes the farmer's annual yield in either profitable one or loss. Included features determines the annual profit and helps the farmers by bring them in proactive stage. The main features are,

IDENTIFYING THE FARMING PATTERNS: Mostly some people who are likes to do agriculture but they are facing so many difficulties while cultivating their crops. At initial stage itself they didn't know what are the crops they have to cultivate in which season or month. This module gives them an idea about crops should be cultivated in appropriate season or month. This will improve the total efficiency of crop growth and also the yearly income.

CONTROL MEASURES FOR PEST ATTACKS: The major problem faced by the farmers while cultivating the crops is Pest attack. This will decrease the yield's efficiency and also the income efficiency. Our module gives best solution for this problem. Our solution is, we are collecting the database based on the pest attacks , when we gives the crop name this module will shows the best sprayer, biological pesticide and chemical pesticide for the current climatic conditions. In this module we are using LabVIEW Database toolkit for collecting the datas regarding pest attacks and their respective pesticides.

SUBSIDY BY GOVERNMENT: This section will gives the details regarding what are the subsidy which are given Government for the irregular cultivation due to natural calamities. This will helps the farmer by giving awareness and gives transparency about the government plans towards the irregular cultivation.

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VI.FLOW OF CODE E-TRON

Fig. 2 This flow diagram shows how these features are interpreted in E-Tron using LabVIEW program.

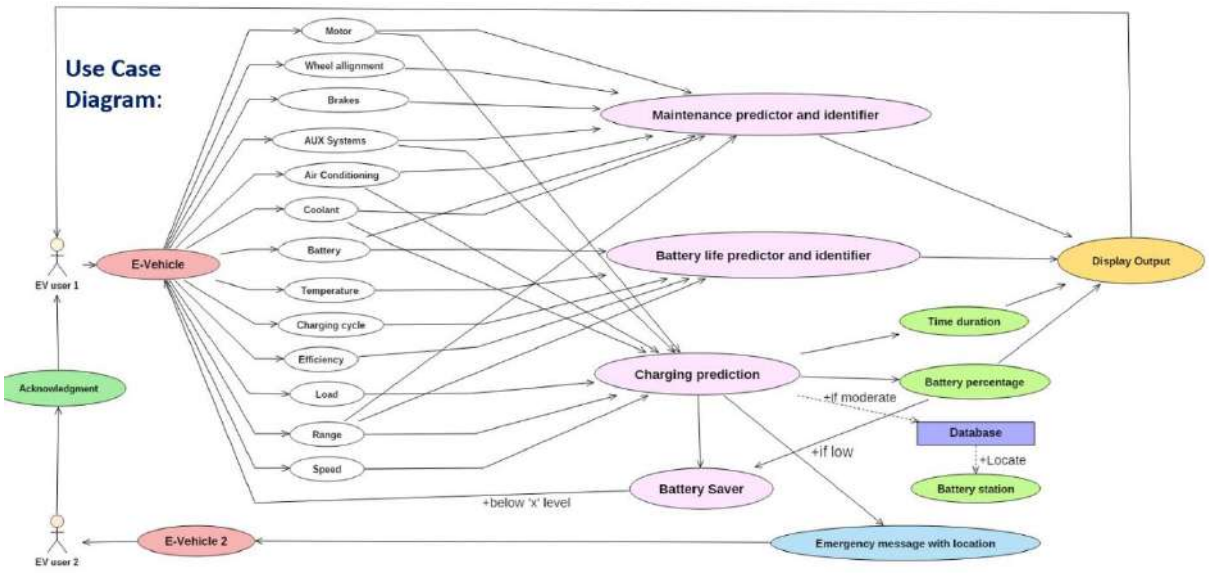

Fig. 2 Flow code of E-Tron

VII.RESULT AND DISCUSSION

In the fig 3, It shows various features like charge life prediction, Battery life , Battery action, Maintenance and emergency response. This is our simulated front Panel of our VI.

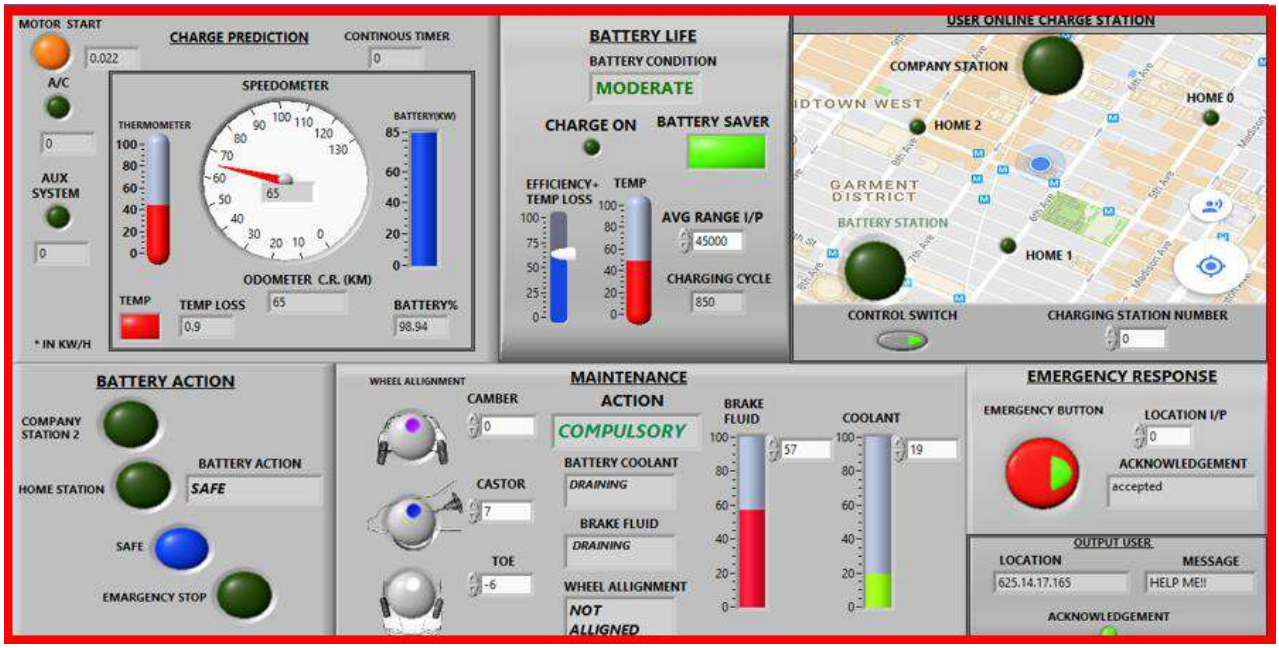

Fig. 3 Front panel of E-Tron module

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In Fig. 4 the Final results of Smart forecasting of Agriculture module is shown.

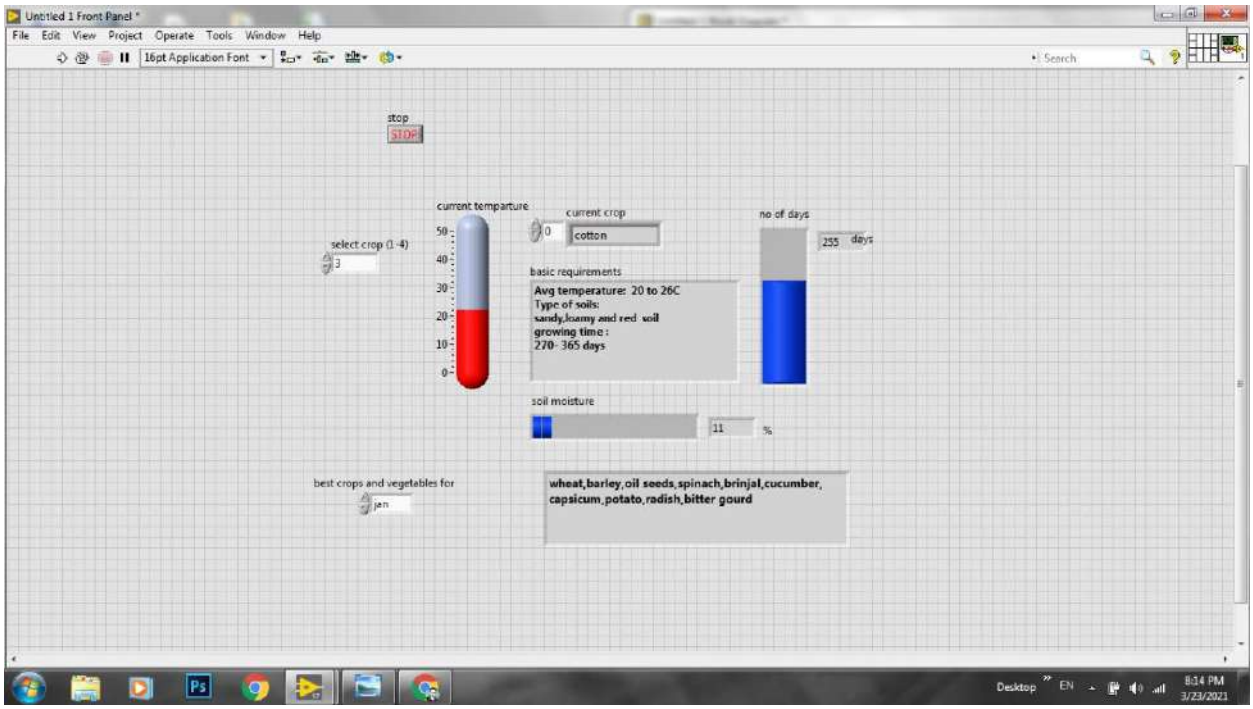

Fig. 4 Front Panel of Smart Forecasting of Agriculture

VIII.CONCLUSION

Through our software product we are concluding the usage of battery in E – vehicles is maintained and to make an add on we also provide the details of vehicle maintenance and we provide interface between the users by which they can help each other when the battery runs down. In according to smart forecasting of agriculture we properly mentioned the major problems faced by the farmers and the best solution are given by our modules. This is an user friendly interface, so any age of user can easily access our product. In future it can be implemented with minor changes according to the developing company's criteria and they can install easily. This provides the interface between user and company, so that the problem can be sorted out.

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Automatic Bottle Filling System Using PLC

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ABSTRACT

In this project Automatic Bottle Filling System is introduced using Programmable Logic Controller (PLC) based controller in automation industry. The main aim of this project is to program a filling system using Delta PLC Software. Filling is controlled by PLC using ladder logic method. By programming the PLC, the entire system is being controlled. The position of the bottle is detected by proximity sensor so that the pump can be functioned at right time and it starts filling the bottle. This work provides with a lot of benefits like low power consumption, low operational cost, less maintenance and accuracy.This automatic bottle filling system is a vast application used in many industries like chemical, milk, food, water and many industrial manufacturers. The PLC used in this system is Delta PLC which makes the system more flexible and easy to operate.

KEYWORDS: Automation ,PLC ,Sensor, Conveyor system

INTRODUCTION

Nowadays in industries the human manual work is replaced by automation.Automation involves remotely controlling processes and creating control loops, so that the operation can be carried out electronically with minimum human intervention. This project aims on designing an automatic filling of bottle along with conveyor system using Delta (PLC) programmable logic controller. Programmable Logic controller is extensive used in industrial automation and it act as a brain in industrial application. This PLCs in industrial field are utilized to control a certain process in order to get better performance and high accuracy to give more production in an efficient manner. Other than PLC, some more hardware parts are also used in this project such as sensors, control valve, motor and some connectors. Filling is the process in which a machine packs the liquid products such as water, cool drinks, etc. This method includes placing bottles upon a conveyor belt and filling one bottle within a given time.

MATERIALS AND METHODS

The materials used in this project are listed as follows,

- PLC
- DC motor
- Conveyor
- Solenoid Valve
- Proximity Sensors

PLC :

A Programmable Logic Controller, PLC is a digital computer used for automation. It is an interface between program and the inputs.. PLC can execute a program by executing at a time single instruction. For instance, when the first input is set ON, then it will turn the first output ON. Further, it knows which input already on/off, so with respect to the previous process, PLC modifies the value of the outputs accordingly. PLC has many programming languages but the most famous and important language is Ladder diagram language which are used to programming the PLC in this paper. The PLC used in this paper is Delta WPL PLC software.

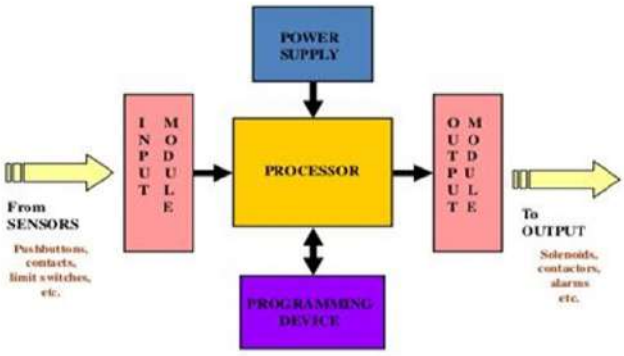


FIGURE 1.PLC

DC motor :

DC motor is type of rotary electrical machines that convert electrical current into mechanical motion. In this paper a DC motor is used to rotate the conveyor belt to move the bottle first under the valve and after it filled move it away from valve

Solenoid Valve :

Solenoid valve is an electromechanical device in which the solenoid uses an electric current to produce a magnetic field and thereby drives a mechanism which controls the opening of fluid flow in a valve. It is operated to control pouring of liquids in a specific time by automatic opening and closing. Several types of applications are accomplished by using this solenoid valve

.

FIGURE 2.SOLENOID VALVE

Conveyor Belt:

It must be strong, long-term and unaffected to an extensive range of temperatures, moisture, chemical, etc. There are some materials that are used to make conveyor belts such as: thermoplastics, leather, rubber, metal and fabric. The material used in this paper is a rubber composite, as it is stretchy, resistant, unbroken and smooth. Plastics consist of polyester, polyethylene, polyvinyl chloride and silicone. In case of bulk material manufacturing and production, steel made conveyor belts are preferred because of their high strength

FIGURE 3.CONVEYOR SYSTEM

Proximity Sensor:

A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact. A proximity sensor often emits an electromagnetic field or a beam of electromagnetic radiation (infrared, for instance), and looks for

changes in the field or return signal. In this the presence of bottle is sensed by this sensor and then the motor and conveyor switched on.

FIGURE 4.PROXIMITY SENSOR

LITERATURE REVIEW

[1] IEEE International Conference on Power Electronics. Intelligent Control and Energy Systems (CPEICES) PLC based automatic liquid mixing and bottle filling.This paper gives an detailed view in the automatic bottle filling using PLC.

[2] International Journal of Power Electronics Controllers and Converters Design and Implementation of Bottle Filling Automation System for Food Processing Industries using PLC. In this project the designing and implementation of filling system is clearly explained and the programming of PLC is done using the ladder logic Instruction .

METHODOLOGY

Water filling in the bottles is the key job of this project via automatic system. This operation starts with keeping bottles on the top of a conveyor belt, also pouring liquid at the same time in one bottle. Filling is controlled and managed by PLC by means of ladder logic programming method. Initially, the whole conveyor system will be in off state,it turns on when the proximity sensor detects the bottle in conveyor system. And when the sensor under the solenoid valve senses the bottle, the solenoid opens and starts to fill the bottle for given time.

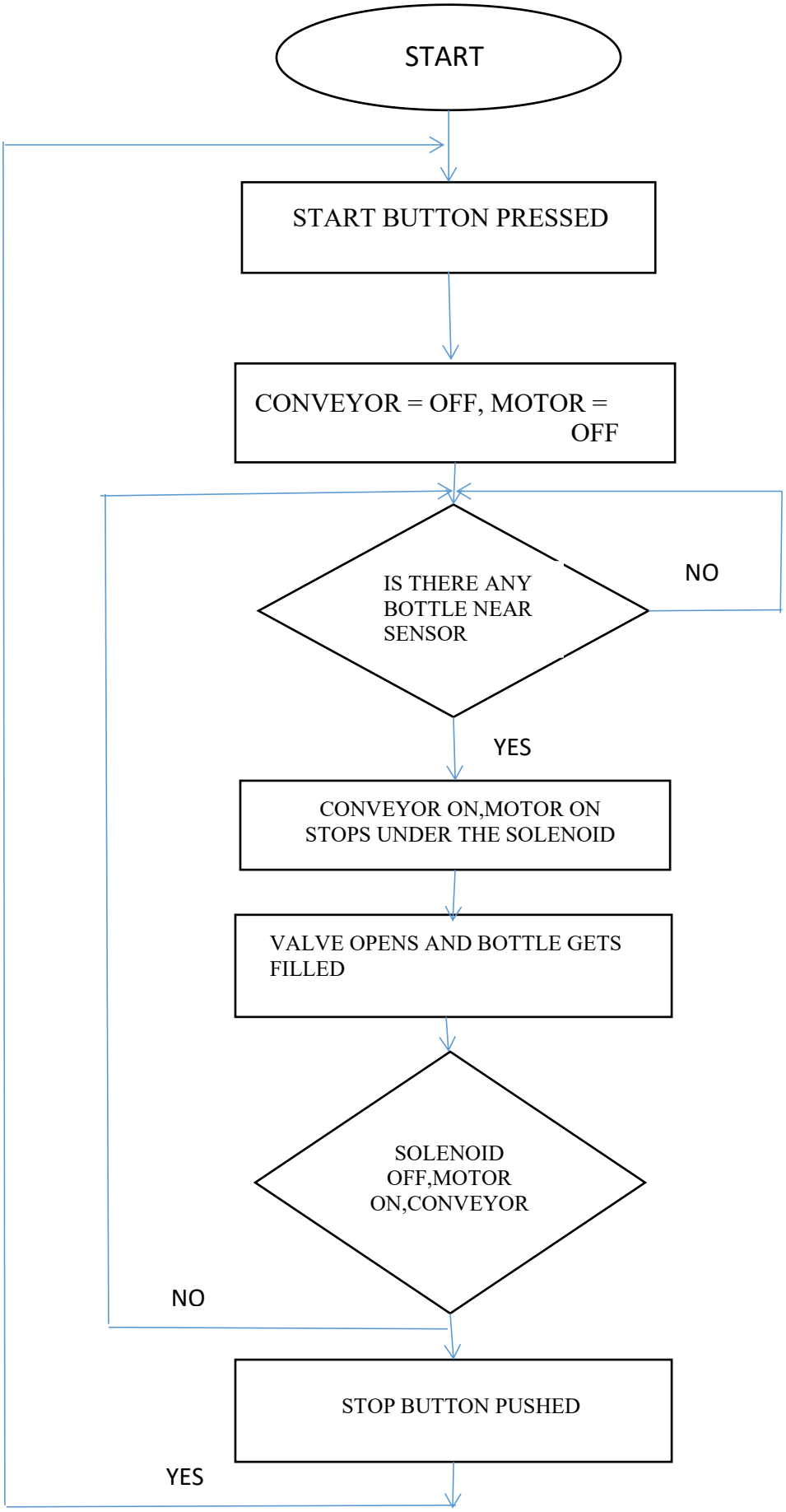
i. Supply Tank Level Control: The Supply tank is connected to continuous water supply line and controlled by solenoid valve. It is fitted with high and low level float switches which directly controls the inflow to the tank using a solenoid valve.

ii. Overhead Tank Filling: This is a timer-based operation. The pump on the Supply tank will be running for every 10secs in an interval of 20 secs. These timings can be user defined.

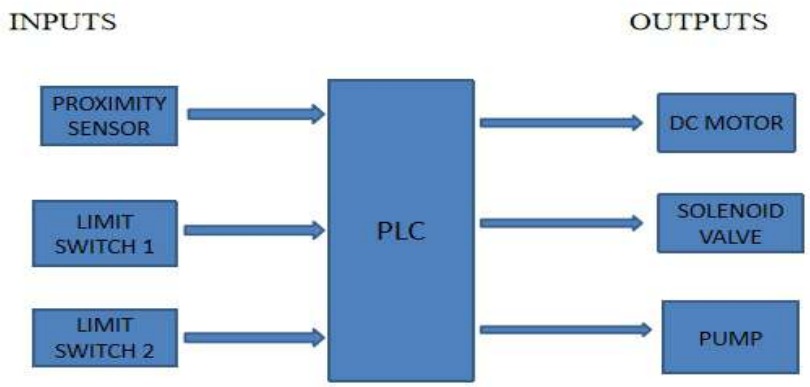
iii. Conveyor Control: Bottle sensor 1 senses the presence of the bottle and moves the conveyor. There will be an internal counter that counts the number of bottles. This value will be compared with bottle sensor 2 value and the conveyor will be in working until the difference is zero.

iv. Filling Unit operation: Conveyor will be stopped once bottle sensor 2 (BS2) is high. After a delay of 2 secs the filling solenoid valve will operate for 5 secs. After one second of delay, the conveyor will move further.

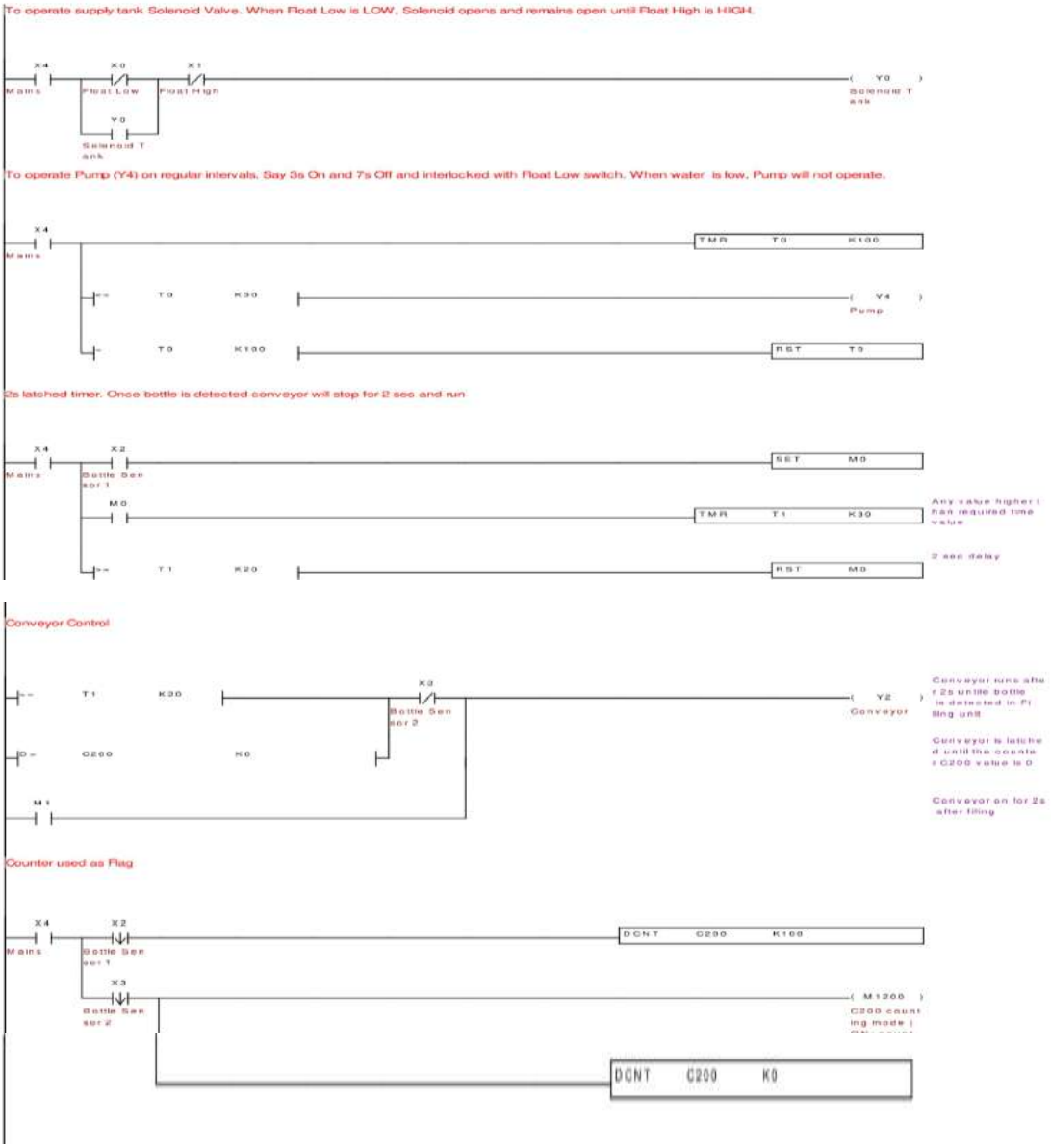
FLOWCHART OF THE PROPOSED SYSTEM:

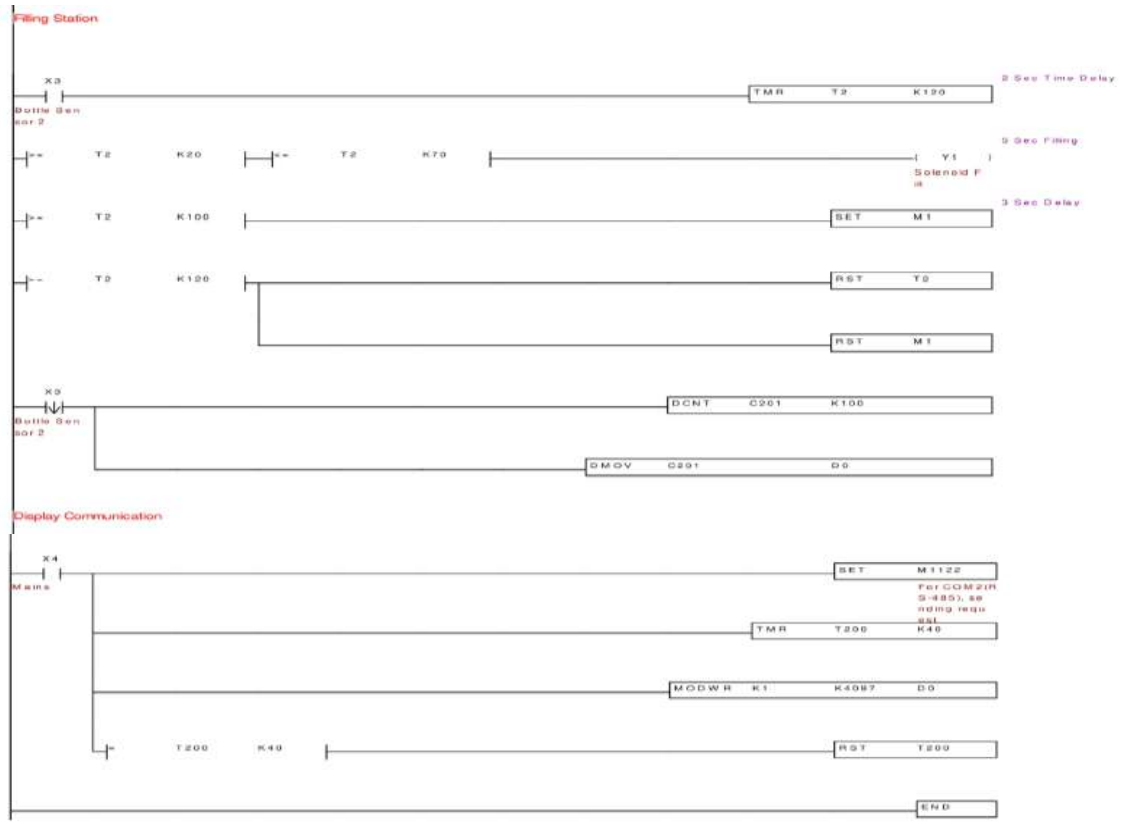

START
START BUTTON PRESSED
CONVEYOR = OFF, MOTOR = OFF
IS THERE ANY BOTTLE NEAR SENSOR
NO
YES
CONVEYOR ON,MOTOR ON STOPS UNDER THE SOLENOID
VALVE OPENS AND BOTTLE GETS FILLED
SOLENOID OFF,MOTOR ON,CONVEYOR
NO
STOP BUTTON PUSHED
YES

BLOCK DIAGRAM



IMPLEMENTATION OF SOFTWARE:





APPLICATIONS OF PROPOSED SYSTEM :

- Ink filling Industry.
- Soft-drink and water filling Industries.
- Oil Industries.
- Milk and Food processing Industries.
- Chemical Industries.
- Beverage Industries.
- Pharmaceutical Industries.

RESULT AND CONCLUSION:

This bottle filling automation system is used to increase productivity, better quality and quantity in a given time. The main purpose of this system is to control the industries with lesser manual work and also cost is minimized . Thus, requirement of full automation is to be attained by using Delta PLC . The aim of this is also to make this system more flexible than other, more reliable, time saving so that productivity will be improved.
Solenoid

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IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9308

Determination of Suitable Controller for Flow Process Between PID and PLC

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Abstract: Liquid flow rate is a measure of velocity of a liquid which is flowing through a pipe or a closed cross-section. This paper aims to compare, analyze and determine the suitable control method for liquid flow process. There are several ways to control and stabilize flow process, in that we compare two control methods (PID controller and PLC) which has vital role in industrial applications. A Proportional–Integral–Derivative controller is a control loop mechanism employing feedback that is widely used in industrial control systems. Programmable Logic Controller (or PLC) is a ruggedized computer used for industrial automation. This controller can automate a specific process, machine function, or even an entire production line. This paper aims to conclude best controller for a real-time liquid flow process.

Keywords: PID, Cohen-Coon, Ziegler-Nichols, PLC, Flow Control, Process Control, DeltaPLC, MATLAB

I. INTRODUCTION

Liquid flow rate is a measure of velocity of a liquid which is flowing through a pipe or a closed cross-section. Generally, there are 2 types of flow rates volumetric flow rate and mass flow rate. Volumetric flow rate is a measure of the 3-dimensional space that the liquid occupies as it flows through the instrument under the measured pressure and temperature conditions. Volumetric flow rate can also be called actual flow rate. On the other hand, Mass flow rate is a measure of the mass of a liquid passes per unit time. Flow control is essential in many industrial applications such as chemical reactors, heat exchangers and distillation columns. This paper aims to design a liquid volumetric flow monitoring and control of liquids (petrol, diesel, kerosene etc.) pipeline system to offer accurate flow through the channel. There are several controllers available in industries out of which we employed two control methods.

- PID controller
- PLC controller

A Proportional–Integral–Derivative controller is a control loop mechanism employing feedback that is widely used in industrial control systems and a variety of other applications requiring continuously modulated control. A PID controller continuously calculates an error value e(t) as the difference between a desired set-point (SP) and a measured process variable (PV) and applies a correction based on proportional, integral, and derivative terms (denoted P, I, and D respectively). In practical terms it automatically applies an accurate and responsive correction to a control function.

A Programmable Logic Controller (or PLC) is a ruggedized computer used for industrial automation. This controller can automate a specific process, machine function, or even an entire production line. The PLC receives information from connected sensors or input devices, processes the data, and triggers outputs based on pre-programmed parameters. Depending on the inputs and outputs, a PLC can monitor and record run-time data such as input pressure for pneumatic control valve, flow rate, level etc. It automatically starts and stop processes. Programmable Logic Controllers are a flexible and robust control solution, adaptable to almost any application. The experimental system consists of pneumatic valve actuator (final control element), orifice flow meter (sensor), differential pressure transmitter (to measure the flow rate using pressure head), PLC, rotameter (regulation) and human machine interface (PC as HMI). The mathematical model for the designed system is derived based on open loop response of the system. Orifice flow meter and DP transmitter measures the flow rate then controller compares the sensed value with the set-point and produces corresponding control signal then actuator acts with respect to the control signal. Thus the stability and steady state with desired flow rate is reached.

II. LITERATURE REVIEW

[1] The flow is maintained constantly by implementing control valves depends on the different flow rate of the transmitting pipe and these parameters are monitored and controlled using HMI screen. In order to fulfil the above requirement, there is a continuing need for research on improved forms of control. Hence plc (programmable logical controller) is used to automatically regulate the flow of the petroleum product by controlling the percentage of opening of the control valves.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9308

[2] The theoretical concepts are validated utilizing numerical simulations and analysis, which proves the effectiveness of the PID controller in the control of flow rates in pipelines. [3] The ordinary orifice transducer widely used in process industries for flow rate measurement produces a differential pressure which is generally measured by a DP cell and thus may suffer from various problems like leakage of process fluid, corrosion of diaphragm materials, etc. [4] Expert PID control algorithm to form a closed loop control system, so as to realize the control of the flow rate. The debugging results show that the control system is stable and can achieve the control of the flow quickly and accurately. [5] The PID controller constants will automatically self-tuning using fuzzy logic and the generated control signal will be limited using anti-windup. Self-tuning of PID constants is designed using the fuzzy logic Mamdani method with the inputs are error value and its change. [6] PI and PID control schemes are accepted in various types of control applications. Pc based position control schemes have wide applications in process plant. In recent years, it is more common to integrate control actions into PLC systems. The analog I/O of a PLC can be used to achieve PID control. [7] A comparative study of performance of PID controller and the state feedback gain controller is done by implementing both the controller on the flow loop. It is observed that the state feedback controller has less rise time and no peak overshoot as compared to PID controller.

III. EXPERIMENTAL SETUP

PLC based flow process is designed to understand the elements of a flow process and its control. It consists of a pipeline fitted with orifice as flow device and a differential pressure transmitter calibrated to measure flow. One end of the pipeline is connected with a pump and rotameter. The flow of the pipeline is controlled by a control valve which operates on a 3 to 15 psi pressure signal. A current to pressure (I/P) converter is used to convert the output of the controller (4-20mA) to the signal pressure. The process parameter is controlled by a digital indicating controller. These units along with necessary piping are fitted on the support frame. The setup is designed for tabletop placement and access. The setup is designed for tabletop placement and access. The setup can be controlled using ladder logic program using WPLSoft. The controller is connected to computer through USB for monitoring and controlling the process. User friendly software will be supplied along with the hardware to perform different set of experiments.

Fig 1: Experimental setup for flow monitoring and control system

IV. P&I DIAGRAM FOR THE EXPERIMENTAL SETUP

As shown in fig 2, the experimental setup was visualised using P&I Diagram using their own standard blocks corresponding to the components used in the setup. Each of the three parts of the lab scale setup contains a pressure transmitter (PT), a pressure gauge (PG), and a gate valve (GV). At the conclusion of the two sections, an equal percentage opening of the control valve (CV) is implemented. The flow transmitter (FT) has been installed along the pipeline after control valve. The pressure indicator, flow indicating controller (FIC), and flow controlling controller (FCC) are all part of the controller section. The level of control valve opening is determined by a PLC-mounted Flow controlling controller (FCC), and this FCC is not available to the operator for system operation.

IJIREEICE

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DOI 10.17148/IJIREEICE.2021.9308

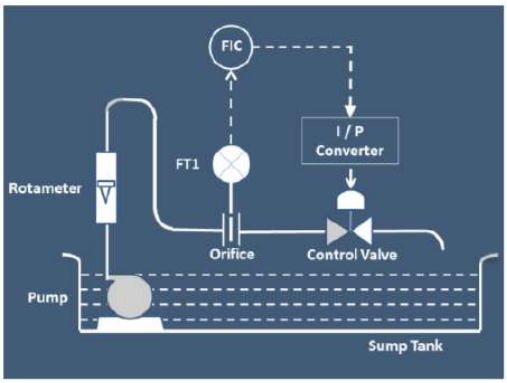

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Fig 2: P & I diagram of the flow system

V. INTERFACING THE REAL TIME SYSTEM WITH HMI

Using LabVIEW, a Human Machine Interface (HMI) screen was created to view the performance of PLC-based controllers. Fig. 3 depicts the HMI screen used to maintain the pressure and flow rate of liquid through transmission lines. The screen depicts the patterns obtained by the pressure and flow signals, as well as their parameter values. The flow range is set here, the pressure for the same flow result is then controlled, and the control valve is actuated accordingly. The introduced PLC-based controller regulates and controls the level of control valve opening based on the pressure and flow signal data to maintain a constant flow rate at the destination. The numerical display of the pressure readings read by the pressure transmitter can be found on the control panel of the HMI screen. It also shows the flow rate measured by the flow sensor, the percentage of valve opening, the parameters to control the process and set point scale.

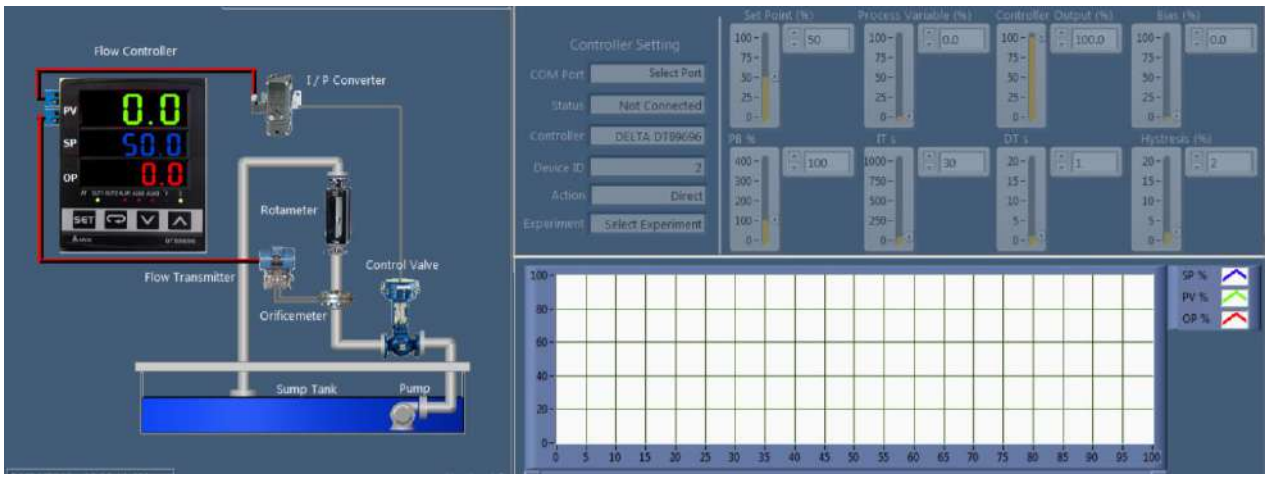

Fig 3: HMI for monitoring and control of flow process.

VI. EXPERIMENTAL ANALYSIS

Fig. 4 shows a flow diagram for a controller design for a system that transports liquid through a pipeline, in which a PLC-based controller regulates the level of opening control valves based on pressure signal monitoring to achieve the desired constant flow rate. To make the decision, the optimised pressure signal is fed to the PLC controller from the pressure signal received for the control valve opening levels.

IJIREEICE

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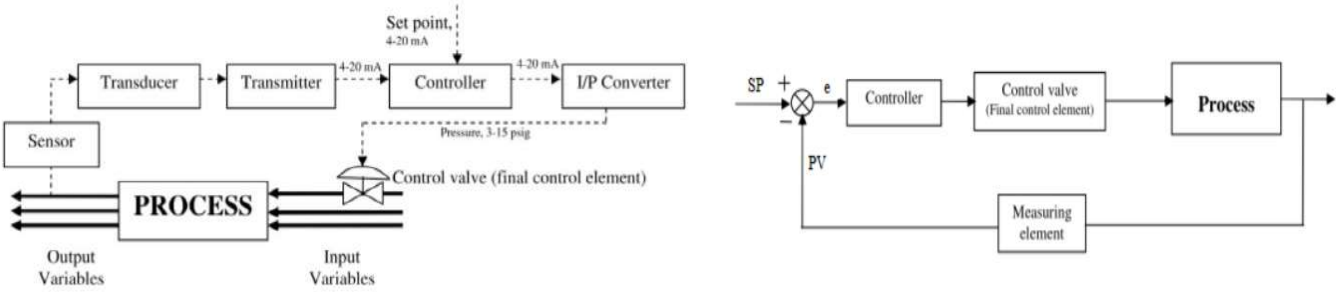

Fig. 4 Block diagram of controller design for the experimental setup

VII. OPEN LOOP RESPONSE

Open-loop system, also referred to as non-feedback system, is a type of continuous control system in which the output has no influence or effect on the control action of the input signal. In other words, in an open-loop control system the output is neither measured nor "fed back" for comparison with the input. Therefore, an open-loop system is expected to faithfully follow its input command or set point regardless of the final result. Also, an open-loop system has no knowledge of the output condition so cannot self-correct any errors it could make when the pre-set value drifts, even if this results in large deviations from the pre-set value.

From the lab scale experimental system, the experiment is conducted to find the influence of the pressure on the flow rate of liquid through transmission lines. For the model development, in the open loop scheme, a transient response curve is recorded by regulating the pressure in order to obtain the corresponding flow of the liquid. The curve describes the influence of pressure on the flow rate and level of complexity in terms of nonlinearity. The flow is varied by using the control valve opening based on the obtained three pressure signals from the pressure sensor.

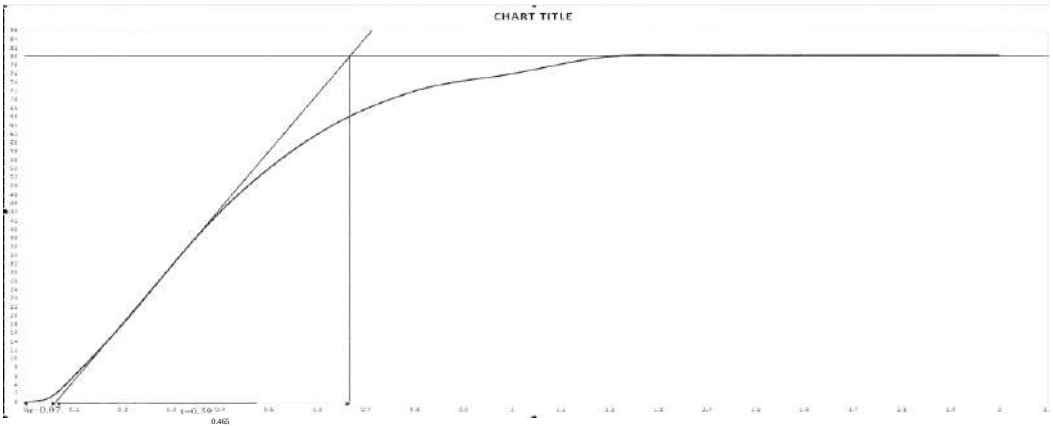

Fig. 5 Process Reaction Curve obtained from the flow process (Open Loop)

Transfer Function:

$$G(s) = \frac{K\, e^{-t_d s}}{\tau s + 1}$$

$$G(s) = \frac{80\, e^{-0.05s}}{0.465s + 1}$$

K= 80 is the final value of the system (at steady state)

τ **=0.465** sec, which is time taken to reach 63.2% of the final value(**K**)

t_d **= 0.05** sec, which is a dead time

IJIREEICE

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International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

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VIII. TUNING OF THE PID CONTROLLER

The three-mode controller (PID) is the most common feedback controller used in industrial control. The method of determination of the optimum mode gains, depending on the nature and complexity of the process is known as loop tuning. The three parameters should be selected to meet a set of defined goals. These goals typically require a plant response with minimum steady state error, insensitivity to load disturbances and an acceptable transient response to set point changes and disturbances. In practice the choice of proportional band, integral time and derivative time is a compromise between the set point tracking and disturbances. If a mathematical model of the process is known, selecting the controller parameters is relatively simple. A widely used set of rules for tuning a PID controller are proposed by Cohen-Coon and Ziegler-Nichols

A. *Cohen-Coon Tuning:*

The Cohen-Coon method is classified as an 'offline' method for tuning, meaning that a step change can be introduced to the input once it is at steady-state. Then the output can be measured based on the time constant and the time delay and this response can be used to evaluate the initial control parameters. For the Cohen-Coon method, there are a set of pre-determined settings to get minimum offset and standard decay ratio of 1/4(QDR). A 1/4(QDR) decay ratio refers to a response that has decreasing oscillations in such a manner that the second oscillation will have 1/4 the amplitude of the first oscillation.

PID Parameters	Formula	For, k=80, α=0.07, τ=0.465
K_p Proportional gain	$\frac{1}{K}\frac{\tau}{\alpha}\left[\frac{4}{3}+\frac{1}{4}\left(\frac{\alpha}{\tau}\right)\right]$	0.118364
τ_i Integral Time	$\alpha\left[\frac{32+6\left(\frac{\alpha}{\tau}\right)}{13+8\left(\frac{\alpha}{\tau}\right)}\right]$	0.162150
τ_d Derivative Time	$\alpha\left[\frac{4}{11+2\left(\frac{\alpha}{\tau}\right)}\right]$	0.024776
K_i Integral Gain	$\frac{K_p}{\tau_i}$	0.729966
K_d Derivative Gain	$K_p\tau_d$	0.002933

Table 1 PID Parameters obtained from Cohen-coon tuning

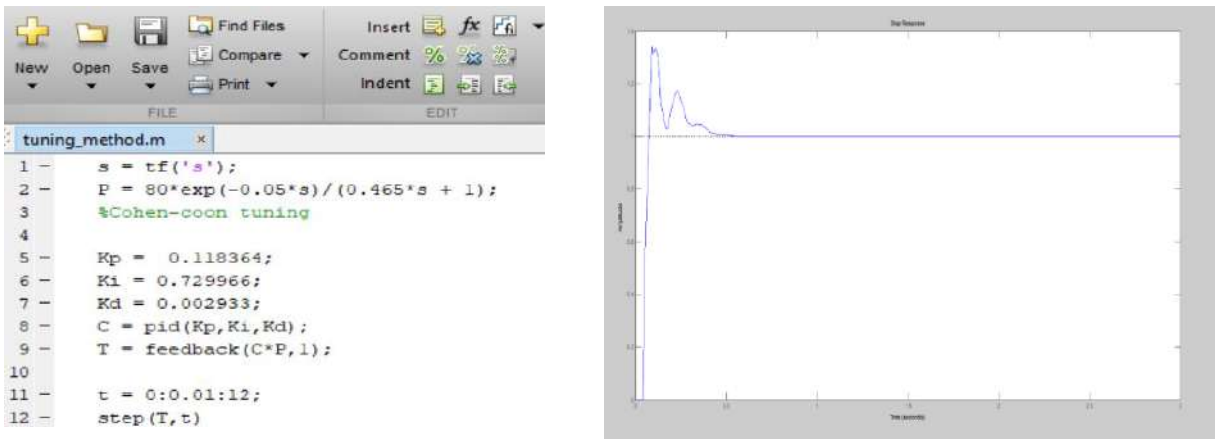

Fig. 6 Implementation of PID gain values and corresponding response graph obtained

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9308

B. ***Ziegler-Nichols First Method:***

This approach is still widely used to fine-tune controllers with proportional, integral, and derivative actions. Because it tests the open-loop response of the process to a change in the control variable output, the Ziegler-Nichols open-loop method is also known as a process reaction method. This fundamental test necessitates the recording of the system's response, preferably using a plotter or computer. Once certain process response values have been identified, they can be plugged into the Ziegler-Nichols equation for the gains of a controller with P, PI, or PID actions, using specific multiplier constants.

PID Parameters	**Formula**	**For $K = 80; \alpha = 0.07; \tau = 0.465$**
K_p Proportional Gain	$\frac{1.2}{K}\frac{\tau}{\alpha}$	0.099643
τ_i Integral Time	2α	0.14
τ_d Derivative Time	0.5α	0.035
K_i Integral Gain	$\frac{K_p}{\tau_i}$	0.711736
K_d Derivative Gain	$K_p\tau_d$	0.003488

Table 2 PID Parameters obtained from Ziegler-Nichols First Method

Fig. 7 Implementation of the PID gain values and corresponding graphs response obtained

C. ***Auto-Tuning PID controller using MATLAB:***

"Autotuning" or "self-tuning" PID controllers are designed to simplify matters by choosing their own tuning parameters based on some sort of automated analysis of the controlled process's behaviour. For this experiment the autotuned values are determined from the MATLAB software with an inbuilt function “pidTuner()” which gives tuned PID gain values which when implemented makes the system to stabilize on its own.

Proportional Gain(K_p) = 0.080064	Integral Gain(K_i) = 0.11122	Derivative Gain(K_d) =0.00060031

Table 3 PID Parameters obtained from MATLAB Auto-Tuning

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

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Electrical, Electronics, Instrumentation and Control Engineering

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DOI 10.17148/IJIREEICE.2021.9308

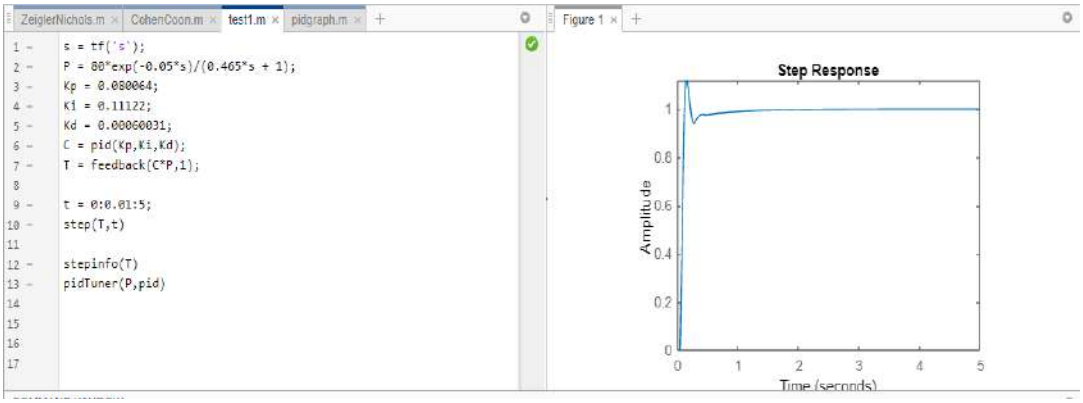


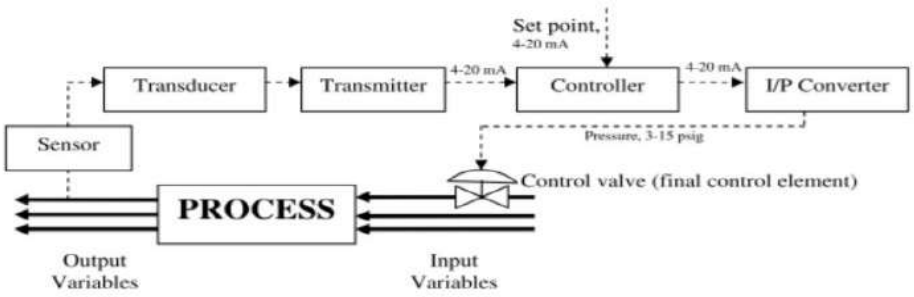
Fig. 8 Response obtained from implementing the Autotuned PID gain values

IX. IMPLEMENTATION

The Tuned PID values are implemented in two modes of operation for the same flow process, The PID values are implemented in two different modes of operation, one is implemented in a system only with a PID controller and the other in PLC (PID) controller

A. ***PID controller implementation:***

The flow control system is first designed with a PID controller and the autotuned values obtained are entered as K_p, K_i



and K_d respectively thus the PID controller responds to the error signal and produces a control signal which makes the system to stabilize, this stability is achieved only when the control parameters are accurate. Thus, resulting is low rise time, Low peak overshoot, High stability and quick response time. Thus the system response obtained is given in Fig. 10

Fig. 9 Flow system implemented with PID controller

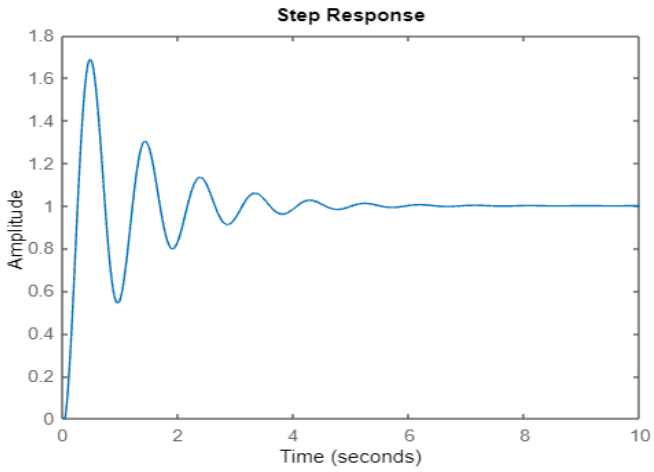


Fig. 10 Response of system using PID controller

IJIREEICE
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ISSN (Print) 2321-5526
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Electrical, Electronics, Instrumentation and Control Engineering
Vol. 9, Issue 3, March 2021
DOI 10.17148/IJIREEICE.2021.9308

B. ***PLC (PID) controller implementation:***

A PLC logic is created for the flow control process using ladder logic programming in the WPLSoft software, The PLC logic consists of input block, output block and a PID block where the input sensed signals are manipulated and the flow is controlled, The flow control process involves following procedures, The sensor first senses the current flow rate through the pipe, Then the obtained value is scaled from 0 to 100%, Then the scaled value is implemented to the PID controller and according to the tuned PID gain values a control signal is produced, The output of the PID control is unscaled from 0 to 100% to 0 to 4000 unit value, then the value is written as output. The PLC (PID) gives the best response because the system responds spontaneous due to fast switching actions which results in greater accuracy in the system response

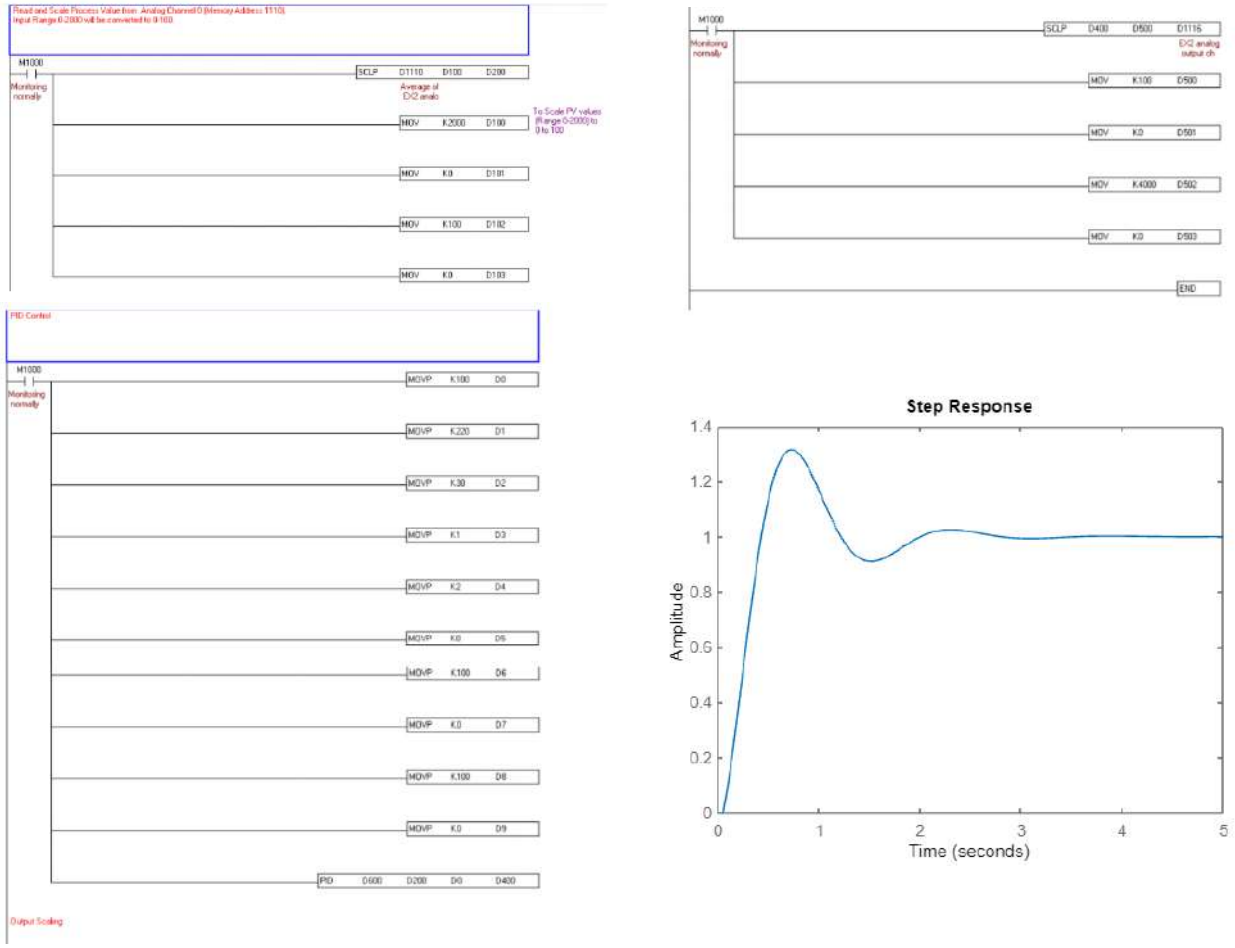

Fig. 11 Flow system interfaced with Delta PLC and the Response graph

X. RESULTS AND COMPARISION

There are so many methods available to tune PID controller that results suitable gain values. Among them Cohen-Coon method and Ziegler-Nichols First method are popular ones. Here, we have tuned the PID controller using Cohen-Coon and Ziegler-Nichols methods and also, we have used MATLAB to simulate the most exact PID gain values. Here is the comparison of responses of all the 3 set PID gain values.

Methods-- Time Domain Parameters	Cohen-Coon method	Ziegler-Nichols First method	Auto-tuned PID values
Rise Time	0.0197 sec	0.0180 sec	0.0663 sec
Settling Time	0.4051 sec	0.4567 sec	0.8186 sec
Minimum Settling Time	0.9258 sec	0.7849 sec	0.9356 sec

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9308

Maximum Settling Time	1.5700 sec	1.4992 sec	1.0511 sec
Overshoot	56.99 %	49.9249 %	5.1132 %
Undershoot	0 %	0 %	0 %
Peak	1.5700	1.4992	1.0511
Peak Time	0.1000 sec	0.1000 sec	0.1620 sec

Table 4 Comparison of Time Domain Parameters of different tuning methods

From the comparison table we can know that MATLAB auto-tuned gain values results best response less rise time, settling time and overshoot which results in stable system. Between manual methods of tuning (between Cohen-Coon and Ziegler-Nichols) Ziegler-Nichols First methods gives best response as it has less rise time, settling time and overshoot which results in stable system.

The best PID gain values obtained from MATLAB simulation is implemented in the real-time system with 2 different controllers namely conventional PID controller and Programmable Logic Controller (with PID block). The time domain specifications of its responses are compared in the below table.

Methods— Time Domain Parameters	With Typical PID Controller	With PLC-PID Controller
Rise Time	0.1617 sec	0.2882 sec
Settling Time	4.3931 sec	2.4711 sec
Minimum Settling Time	0.5434 sec	0.9106 sec
Maximum Settling Time	1.6859 sec	1.3150 sec
Overshoot	68.5923 %	31.5016 %
Undershoot	0 %	0 %
Peak	1.6859	1.3150
Peak Time	0.4967 sec	0.7270 sec

Table 5 Comparison of Time Domain Parameters of different controller responses

From the comparison table we can infer that process with PLC response has the better time domain specifications compared to PID controller response.

XI. CONCLUSION

Flow process is normally a quick process hence choosing a proper control strategy is quite tough job. Here we have proposed advanced control strategy that is Programmable Logic Controller and compared it with conventional PID controller which proves PLC is the best controller as it has improved time domain parameters. As far as the future scope for developments with this paper are concerned, very advanced control strategies like fuzzy and adaptive fuzzy control schemes can be implemented along with or without existing control methods, the performance of the system can be improved more.

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IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
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Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9308

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BIOGRAPHY

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IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Volume 10, Issue 3, March 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.122

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003021

Design, Simulation and Performance Analysis of Manual Tuning Versus Fuzzy Logic Tuning of PID Controller for Flow Control Process

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ABSTRACT:The OPC (Open Process Control)-based fuzzy adaptive PID control algorithm is designed for flow process stations to boost control efficiency over traditional PID controllers. Only if the mathematical model of the device can be computed does the PID controller function well. As a consequence, PID control for variable and complicated systems is difficult to implement. However, fuzzy logic control does not require a precise mathematical model and is suitable for both simple and complex applications, a flow input of range 0 to 100 is given as input and corresponding control signal is produced in the PID controller. This paper aims at analysing the performance of both the control techniques at ideal conditions.

KEYWORDS:PID, Flow Control, Process Control, MATLAB, Fuzzy Logic Controller, Fuzzy-PID.

I. INTRODUCTION

Many industrial applications, such as chemical reactors, heat exchangers, and distillation columns, require flow control. Nonlinearities and dead time are inherent in most industrial processes, restricting the efficiency of typical PID controllers. The design and implementation of a Fuzzy Logic Controller (FLC) for flow control applications is the focus of this project. The goal is to solve problems associated with traditional PID control schemes, such as dealing with unpredictable disturbances and non-measurable noise, as well as to enhance transient state and steady state response efficiency. Nonlinear, inertial lag, time delay, and time varying are only a few of the characteristics of industrial process control systems. As a result, accurate mathematical modelling is difficult. the customary. For such systems, the PID algorithm does not work well. There are disruptions A new algorithm that can deal with these problems has been created. Limitations must be taken into account. There are more benefits of fuzzy PIDin addition to PID It has a quick response time, minimal overshoot, andAnti-interference capacity is fine. The fuzzy controller is a nonlinear control system. The fuzzy control algorithm is based on the controllerintuition and familiarity with the regulated plant.Many industrial applications, such as chemical reactors, heat exchangers, and distillation columns, require flow control. Nonlinearities and dead time are inherent in most industrial processes, restricting the efficiency of typical PID controllers. The design and implementation of a Fuzzy Logic Controller (FLC) for flow control applications is the focus of this project.Simulation and implementation results showed that the developed controller has less overshoot, good control performance, better disturbance handling ability, great robustness and is more flexible and intuitive to tune. It is expected that this advanced controller improves efficiency and productivity of industrial processes through proper handling of any disturbance or noise and increase the robustness of controller actions.

II. LITERATURE REVIEW

[1] System with feedback control contains drawback which is related to the instability of the system. In order to resolve this problem an appropriate controller should be chosen and also it must be ideal for the monitoring system. [2] The major problem faced by the worker is maintaining the required pressure and flow till the extreme ends. In this paper, the parameters such as pressure and flow are maintained constantly by implementing control valves depends on the different pressure and flow rate of the transmitting pipe and these parameters are monitored. [3] The mathematical model of the controlled object is established by the step response curve method. With the development of modern industry, the accuracy of the pump flow control system is more and more high. [4] Fuzzy Logic is a mathematical system that can deal with uncertain and ambiguous information which is complex to calculate by means of conventional mathematics. Fuzzy Logic uses Fuzzy sets in continuous interval [0, 1] rather than two-valued logic (0, 1) or crisp set. [5] The System variables can be divided into two categories. The first one is the input variables which are measured from the system

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003021

and second one is the output variables which are used by fuzzy logic controller for the system control. The fuzzification unit converts data from measured values to appropriate linguistic data. Decision making unit is the most important part of a fuzzy logic controller and is capable of achieving the desired control strategy. [6] Fuzzy Logic Controller (FLC) enhances the closed loop performance of a PID controller in terms of handling change in an operating point for nonlinear processes by online updating the controller parameters. FLC works with a set of control rules, derived from expert's knowledge. Various fuzzy logic controller structures which are analogous to the conventional PID controllers are analysed using single or multiple input conditions (viz. error, change of error and rate of change of error). The fuzzy tuning parameters may be the choice of inputs, scaling factors, membership functions (number or type or both), rule base, fuzzification–defuzzification and inferencing techniques.

III. EXPERIMENTAL SETUP

The PLC-based flow method is intended to help you understand the components of a flow process and how to manage them. It consists of a pipeline with an orifice as a flow system and a flow-calibrated differential pressure transmitter. A pump and rotameter are attached to one end of the pipeline. The flow of the pipeline is controlled by a control valve that responds to a pressure signal of 3 to 15 psi. The signal pressure is converted from the controller's output (4-20mA) using a current to pressure (I/P) converter. A digital indicating controller controls the process parameter. The support frame houses these units, as well as the requisite piping. The set-up is intended for use on a tabletop. The set-up is intended for use on a tabletop. WPLSoft ladder logic software can be used to monitor the set-up. For monitoring and controlling the operation, the controller is connected to a computer through USB. To conduct various tests, user-friendly applications will be provided in conjunction with the hardware.

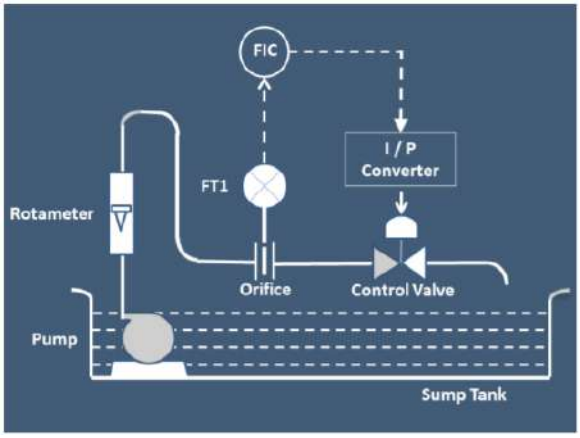

Fig 1: Experimental setup for flow monitoring and control system

IV. EXPERIMENTAL ANALYSIS

A PLC-based PID controller controls the level of opening control valves based on pressure signal monitoring to achieve the optimal constant flow rate. The optimised pressure signal is fed to the PLC controller from the pressure signal obtained for the control valve opening levels in order to make the decision.A Fuzzy controller is employed for this flow process along with a PID controller to determine the parameters required for the PID controller to produce a best response for the flow system, Thusthis paper aim in comparing and analysing the response obtained from the system with a PID controller where the gain values are tuned with different tuning methods and a system with a PID controller where the gain values for the PID controller are obtained using Fuzzy logic.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003021

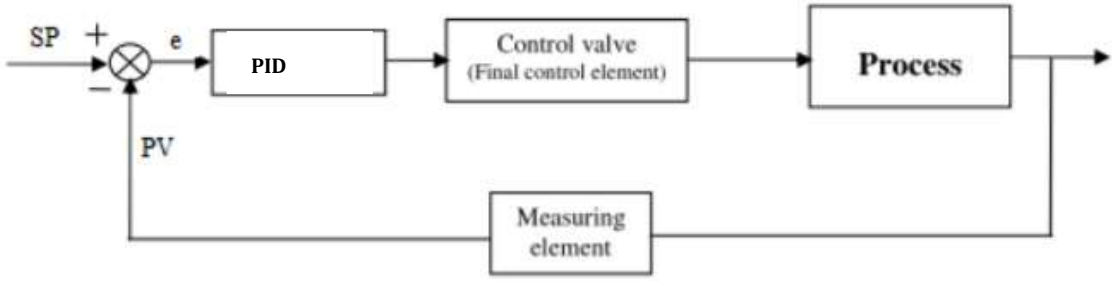

Fig 2: Experimental setup with PID controller for manual tuning

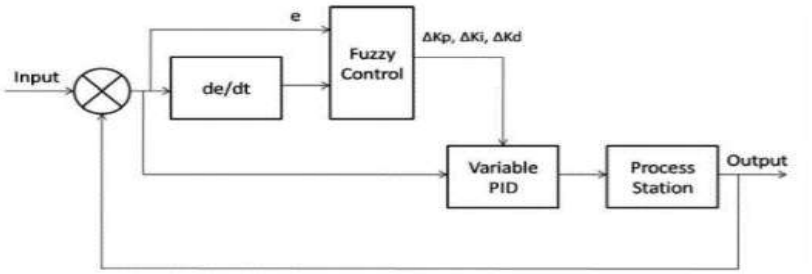

Fig 3: Experimental setup with Fuzzy logic controller for tuning with fuzzy

V. MANUAL TUNING OF PID CONTROLLER

A Proportional–Integral–Derivative controller is a control loop mechanism employing feedback that is widely used in industrial control systems and a variety of other applications requiring continuously modulated control. A PID controller continuously calculates an error value e(t) as the difference between a desired set-point (SP) and a measured process variable (PV) and applies a correction based on proportional, integral, and derivative terms (denoted P, I, and D respectively). In practical terms it automatically applies an accurate and responsive correction to a control function

A. *OPEN LOOP:*

An open-loop system, also known as a non-feedback system, is a continuous control system in which the output signal has no influence or effect on the input signal's control operation. In other words, the performance of an open-loop control device isn't evaluated or "fed back" for comparison with the input. As a result, regardless of the final result, an open-loop device is required to faithfully execute its input order or set point. Furthermore, since an open-loop system has no knowledge of the output state, it is unable to self-correct any errors it can create when the pre-set value drifts, even though major deviations from the pre-set value occur.

The experiment is carried out on a lab scale experimental device to determine the effect of pressure on the flow rate of liquid across transmission lines. In the open loop scheme, a transient response curve is recorded for model creation by controlling the pressure to obtain the corresponding liquid flow. In terms of nonlinearity, the curve depicts the effect of pressure on the flow rate and degree of complexity. The flow is regulated by opening the control valve based on the pressure sensor's three pressure signals.

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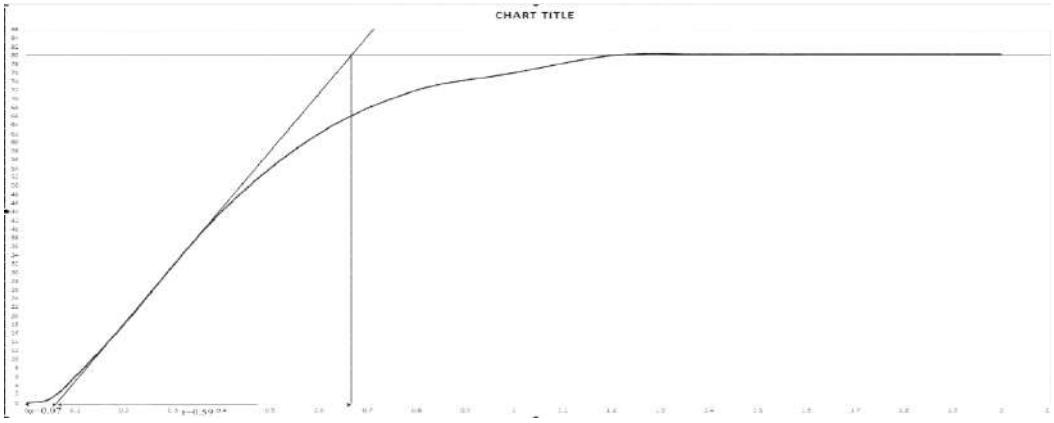

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Fig. 4 Process Reaction Curve obtained from the flow process (Open Loop)

$$G(s) = \frac{K\, e^{-t_d s}}{\tau s + 1}$$

$$G(s) = \frac{80\, e^{-0.05s}}{0.465s + 1}$$

K=80 is the final value of the system (at steady state)

τ**=0.465** sec, which is time taken to reach 63.2% of the final value(**K**)

t_d**= 0.05** sec, which is a dead time

The most common feedback controller used in industrial control is the three-mode controller (PID). Loop tuning is a tool for determining the best mode gains depending on the design and complexity of the operation. The three parameters should be chosen to achieve a set of predetermined objectives. These objectives usually call for a plant response with minimal steady-state error, load insensitivity, and a transient response to set point changes and disturbances.

B. *COHEN-COON*:

The Cohen-Coon method is known as a 'offline' tuning method, which means that once the input has reached steady-state, a phase change can be introduced. The performance can then be calculated using the time constant and time delay, and the response used to determine the initial control parameters. There are a number of pre-determined settings for the Cohen-Coon method to get a minimum offset and a normal decay ratio of 1/4(QDR). An answer with a 1/4(QDR) decay ratio has decreasing oscillations, with the second oscillation having 1/4 the amplitude of the first.

PID Parameters	Formula	For, k=80, α=0.07, τ=0.465
K_p Proportional gain	$\frac{1}{K}\frac{\tau}{\alpha}\left[\frac{4}{3}+\frac{1}{4}\left(\frac{\alpha}{\tau}\right)\right]$	0.118364
τ_i Integral Time	$\alpha\left[\frac{32+6\left(\frac{\alpha}{\tau}\right)}{13+8\left(\frac{\alpha}{\tau}\right)}\right]$	0.162150
τ_d Derivative Time	$\alpha\left[\frac{4}{11+2\left(\frac{\alpha}{\tau}\right)}\right]$	0.024776
K_i Integral Gain	$\frac{K_p}{\tau_i}$	0.729966
K_d Derivative Gain	$K_p\tau_d$	0.002933

Table1 PIDParameters obtained from Cohen-Coon tuning

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003021

C.*ZIEGLER-NICHOLS*:

This method is still commonly used to fine-tune proportional, integral, and derivative behaviour in controllers. The Ziegler-Nichols open-loop method is also known as a process reaction method because it measures the process's open-loop response to a shift in the control variable output. This basic test necessitates the recording of the system's response, which is best done with a plotter or device. Using various multiplier constants, those process response values can be plugged into the Ziegler-Nichols equation for the gains of a controller with P, PI, or PID behaviour.

PID Parameters	Formula	For $K = 80; \alpha = 0.07; \tau = 0.465$
K_p ProportionalGain	$\frac{1.2}{K}\frac{\tau}{\alpha}$	0.099643
τ_i Integral Time	2α	0.14
τ_d Derivative Time	0.5α	0.035
K_i IntegralGain	$\frac{K_p}{\tau_i}$	0.711736
K_d DerivativeGain	$K_p\tau_d$	0.003488

Table2PID Parameters obtained from Ziegler-Nichols First Method

VI. TUNING OF PID FUZZY LOGIC

Fuzzy Logic is a mathematical system that can deal with vague and unclear data that is difficult to measure using standard mathematics. Instead of two-valued logic (0, 1) or crisp sets, Fuzzy Logic uses Fuzzy sets in the continuous interval [0, 1]. The general configuration of the Fuzzy Logic system is shown in Figure 2. The Fuzzification interface uses membership functions to translate crisp input into a linguistic variable, while the Defuzzification interface uses membership functions to convert fuzzy output into crisp numbers. Centroid of Area, Mean of Maximum, and Largest of Maximum are common defuzzification methods. The rule base is a compilation of IF-THEN statements that reflect an expert's linguistic expertise, while the decision-making unit uses the Rule Base to translate Fuzzy inputs to Fuzzy outputs and decides how rules are enabled and combined using operators like AND, OR, and NOT. The most popular Fuzzy Inference Systems (FIS) are Mamdani and Takagi and Sugenofuzzy inference systems, which combine rule base and decision-making unit.Figure 2 portrays a general FLC block diagram. The error (e) and change of error (ce) are the most common FLC inputs; the outputs are scaled before being fed to the final element (e.g. Control Valve).

dkp dki dkd	**dERROR**				
	NB	**NS**	**ZE**	**PS**	**PB**
NB	S B B	B S ZE	B S ZE	B S ZE	B ZE B
NS	S B ZE	B S ZE	B S ZE	B ZE B	B S B
ZE	S S ZE	B B ZE	ZE ZE ZE	B B ZE	B S ZE
PS	S S B	B ZE ZE	ZE S ZE	B S B	B B ZE
PB	S ZE B	B S ZE	ZE S B	B S ZE	B B ZE

LEGENDS:

NB-Negative Big

NS-Negative Small

ZE-Zero Error

PS-Positive Small

PB-Positive Big

S- Small

B- Big

Table 3 Membership function for the fuzzy logic to tune the PID

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003021

A. ***IMPLEMENTATION OF THE MEMBERSHIP FUNCTION IN FUZZY LOGIC USING MATLAB:***

The membership function created for thetuning of PID controller is mentioned in table 3 This function is implemented into the fuzzy logic controller via MATLAB and a corresponding rule base is created with two input variable error and derivative of the error and 3 output variable which gives output of dKp, dKi, dKd corresponding to the input error and change in error value

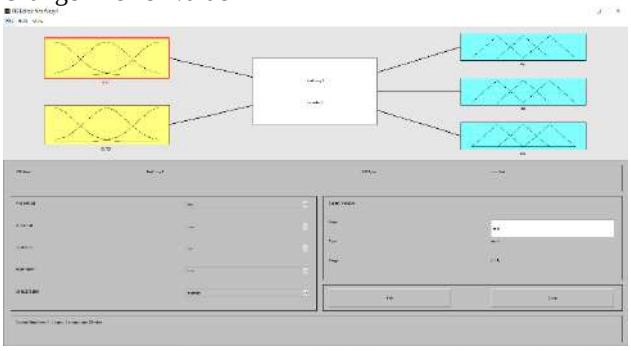


Fig 5. Fuzzy logic with 2 inputs and 3 outputs with a rule base

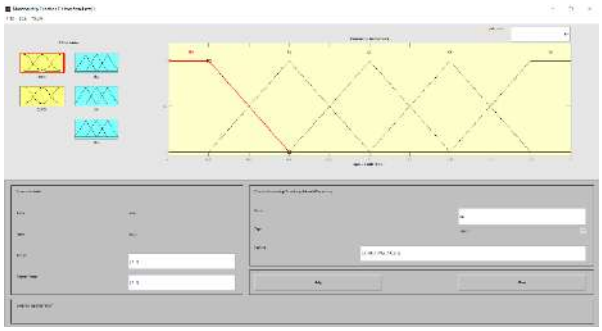
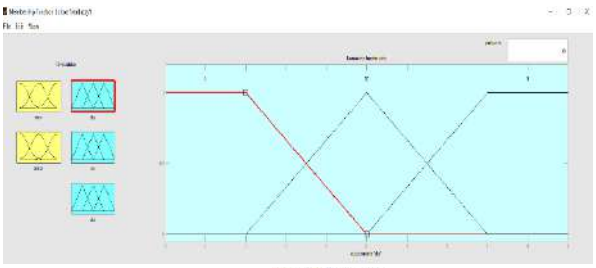
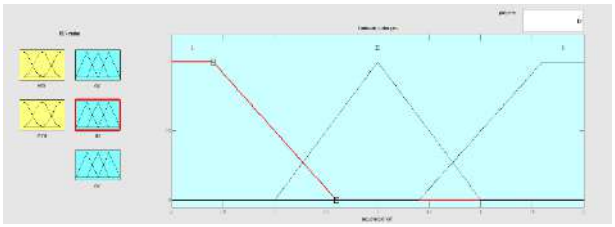


Fig 6. Membership function for error and change in error





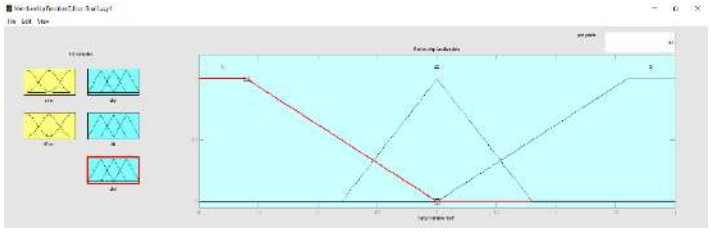


Fig 7. Membership function of the outputs dKp, dKi, dKd

Fig 8. Rules framed in fuzzy controller for PID tuning

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003021

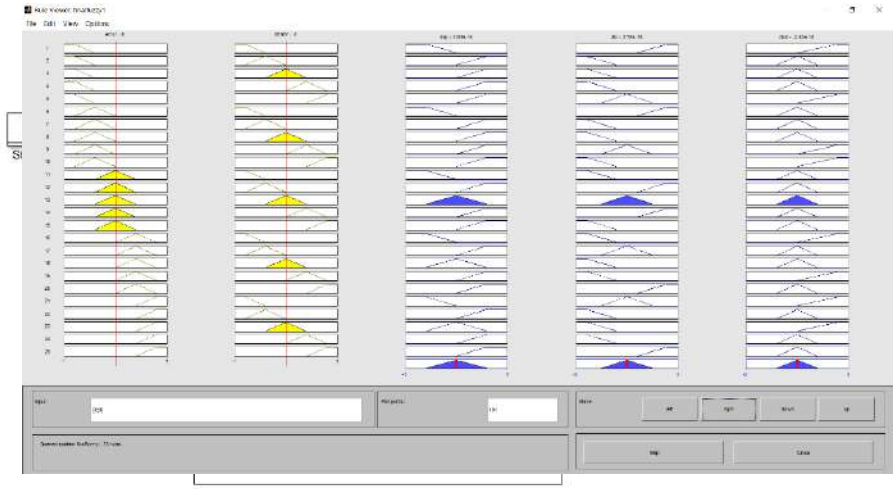


Fig 9. Implementation of Fuzzy-PID and conventional PID in flow process (Simulink model)

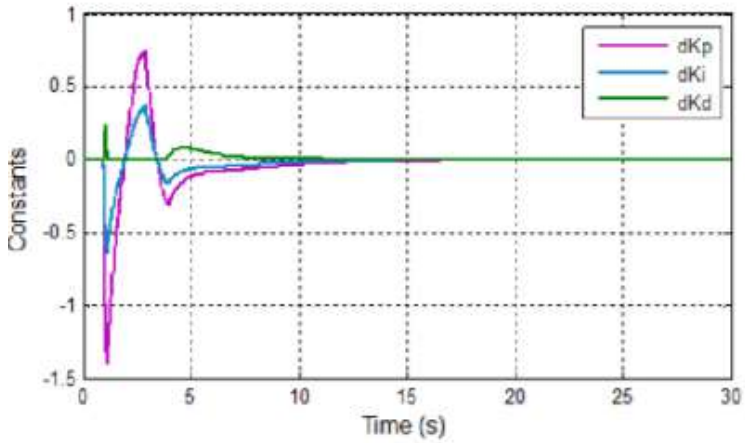


Fig 10. Response obtained from fuzzy logic controller

VII. RESULTS

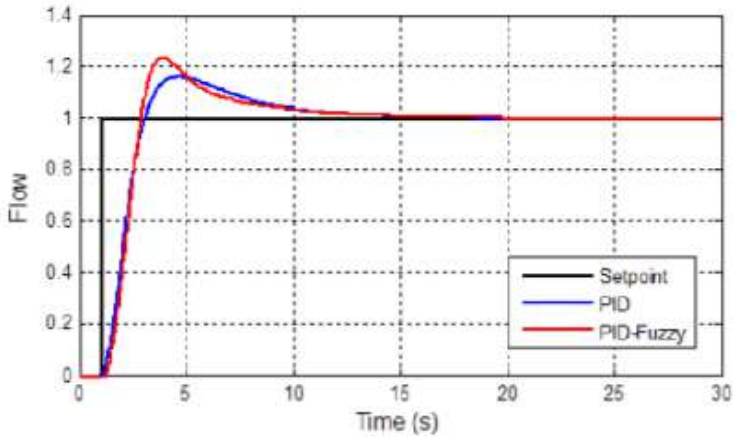


Fig 11. Response obtained from Conventional PID and PID-Fuzzy logic controller

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

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DOI:10.15662/IJAREEIE.2021.1003021

Fig 11 shows the control characteristics that were obtained based on the simulation performance. The simulation results show that the PID-Fuzzy controller generates a better response in the linear condition than the PID controller, despite having more overshoot. For these two types of controllers, the control signal produced exceeds the maximum limit. With a value of about 0.6, the largest addition to the PID constant occurred at Kp.When comparing the results, it can be seen that the fuzzy logic controller takes a little longer to boost than the PID controller, but the system reaches its steady-state condition faster. When the system attempts to achieve its target location, the fluid flow fluctuates less, according to these experimental findings, if the fuzzy logic control algorithm is used as the system's controller. Fig 9 shows the output responses of Fuzzy logic controller that is dKp, dKi and dKd which are further fed to the PID controller block for controlling the system as gains (Kp, Ki, Kd)

VIII. CONCLUSION

The design of a self-tuning PID-Fuzzy controller for liquid flow control in a tank system has been completed successfully. When compared to the conventional PID controller, the simulation results show that the PID-Fuzzy controller can provide the best control response. The answer is generated by the fuzzy controller with a rise time of less than 1 second, a settling time of less than 6 seconds, and overshoots of less than 14%. The developed control signal does not exceed the maximum limit.More research is required to develop a more robust optimization process, especially to reduce the still-high overshoot. As a future development of this paper we can further add an anti-windup block after PID controller that eliminates the integral windup which will eventually yields better system response (faster than the proposed system)

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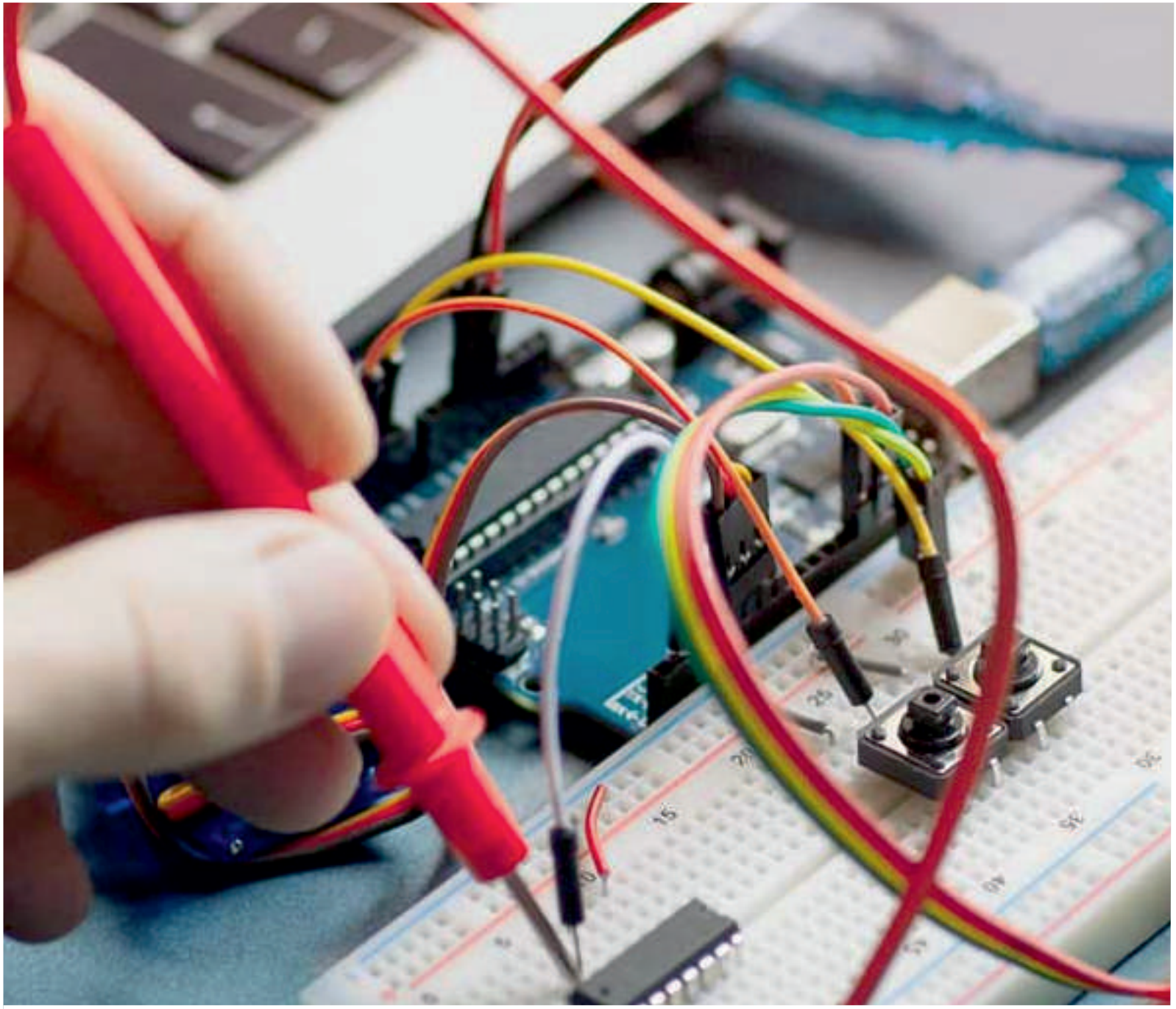

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International Journal of Advanced Research

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Volume 10, Issue 3, March 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.122

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003008

An Efficient IoT based HR Management System using Node MCU

Mr.S. Prasanna Perumal[1], K. Gowri[2] , Lavanya.B[3], Mahalakshmi.S.P[4], Sindhuja.C[5]

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ABSTRACT: The worldwide imprisonment of companies and industries that were enforced and mandated to curb the unfold of the Covid 19 virus generated a distinctive and significant challenges for both workers and employers across the world. The employees around the world were over night turned into many categories like “Remote Employees”, “Essential Employees”, “Health Workers”, “Emergency Workers” etc. But the safety of these workforce which comes physically to work in the workspace are not clearly defined. Hence adding up to the risk of the spread of Infectious Diseases.

This project automates the entry/exit of the workers in any trade or geographic point, by detecting their body temperature mechanically when the worker checks in, maintain and analyse the information for future reference.
It provides an affordable hardware integrated solution for worker management system particularly throughout Pandemic state of affairs. This automatic solution permits the Employer to establish of a secure operating setting for his or her workers, sporadically check his workers health knowledge, their vaccination details etc.

KEYWORDS: Automation, Body Temperature Sensing, LM35, Health Security, NodeMCU, IoT.

I. INTRODUCTION

Certain Businessesare required to run even in the pandemic, struggle to pay attentionto the health history of their staff. There are many systems for maintaining the worker database, but current pandemic situation has created a need for maintaining the health history of the employee and continuously monitor the same to keep check on probable danger of any contagion spread.

In 2019, not even 10% of business leaders from developed republics considered the spread of any viruses as a universal risk. Nor were companies anticipating that an epidemic might test their public repute as a responsible employer. Yet in early 2020 all administrations started facing a big catastrophe and the need to address the urgent apprehensions of various categories of workers like those who can and continue to work remotely, non-remote workers who can work remotely with proper support, those that cannot work for a spread of reasons and people who still work in person. Moreover, many companies, across many sectors, had not implemented flexible or distant working arrangements. Even many companies struggle in establishing and maintaining a safe working atmosphere for their non-remote working population. In the current situation, most businesses are in necessity to put in place new measures for their workforces rapidly – often with no previous comparable experiences.

During a pandemic, wellbeing assumes a new urgency. An employer’s actions in supporting wellbeing are critical to putting together and sustaining workforce resiliency and sending the message that employees ’ matter.
Companies got to support employees through clear communication during all phases of an organization ’s response to COVID-19. They need to maintain a very safer workspace for their resources to come and work efficiently. And companies must seek to maximise the coverage of all employees, including those in roles where remote work is feasible also as non-mobile employees (e.g., customer-facing retail and repair workers). Henceforth, an integrated system to check and maintain the employee health history is all that is the need of the hour and world indeed.

II.SYSTEM MODEL AND ASSUMPTIONS

It is a temperature sensing system integrated with computer that measures and maintains the vital sign of the worker primarily Temperature. The worker will sign in with a QR code provided in his ID card, which can be scanned by the QR Scanner of the System. It validates the identity of the worker and checks his body temperature. By processing the temperature with internal algorithms, the system permits the Entry of the worker if: - His Temperature is normal AND

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||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003008

His health check-up is up to date. If any of thecondition isn't met, then the person is denied entry and therefore the notification is sent to the unit Manager.

Temperature sensing is done with Non-contact Temperature sensing device to take care of hygiene. this method maintains the health history of the worker in conjunction with the attendance details. It's assumed that in the Pandemic state of affairs, associate worker is predicted to take up regular health check-ups which knowledge conjointly ought to be maintained within the official records.

This project consists of a system with temperature as the control parameter, that keeps check on the entry and exit of the worker.

Fig1. Pinouts of LM35 and NodeMCU

Fig2. Model of the ID card with QR Code

III.WORKING AND METHODOLOGY

The entire set up is divided into two parts – Sensing System and Analytics System

1.CYE Sensing System:

This set up consists of QR Scanner andTemperature sensor. The QR scanner mounted at the sensing area where the employee scans his ID card to Check IN. Once the code is scanned, the employee's name and his ID number is displayed in the UI, then the temperature sensor senses the temperature of the Employee. The temperature data is analysed in the Analytics system, to validate the entry of that Employee. The Employee data scanned from the QR code and the temperature data is collected and stored in the data base.

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||Volume 10, Issue 3, March 2021||

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2.CYE Analytics System:

This set up is the back-end algorithm of the proposed software. The temperature data collected from the sensor is analysed and determined if the employee's temperature is acceptable for entry. If any abnormal body temperature is sensed, the employee is alerted and denied entry. The HR is notified about the same, so that the required precautions can be taken to contain the infection and potential threat. The Process is entirely automatic and mobile notification is sent to the concerned official through cloud technology.

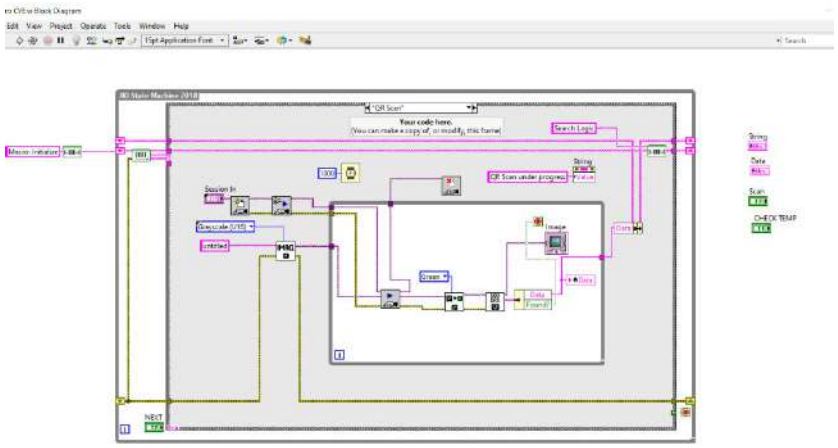

Fig3. Block Diagram of the LabVIEW code

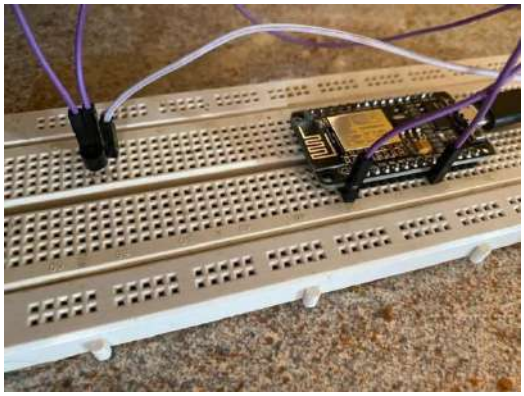

Fig 4. Hardware – Sensor Interfacing with Arduino.

IV. SIGNIFICANCE OF THE SOLUTION

Amidst this Pandemic situation, any employee working physically in a workspace tend to face the risk of infection. He might be a victim of the infection or a potential carrier who can infect to his fellow mates. To check this potential risk, minimum precaution which can be taken is to monitor the body temperature of the employee during his entry/exit to the workplace. Manually checking the temperature of the employees results in following shortcomings:

- No Data Logging
- Possibility of Manual Error
- Tedious and Repetitive Process
- Time consuming
- Difficulty in Data Maintenance

This project automates the entry/exit of the employees in any industry or workplace, by detecting their body temperature automatically as the employee checks in, maintain and analyse the data for future reference. It provides a

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low-cost hardware integrated solution for employee management system especially during Pandemic Situation. Our solution proposes following features: -

1. Validates the employee check in/Check out at the entry and exit.
2. Automates the temperature checking of the employees during entry.
3. Identifies potential risky employees and alerts them.
4. Maintains the health data of the employees, thereby tracking their infection probability/possibility.

This automated solution enables the Employer to maintain a safe working environment for their employees, periodically check his Employees health data, their vaccination details, swab test reports etc.

V. RESULT AND DISCUSSION

Fig 5 shows the Front Panel of the application. The User Interface is designed using LabVIEW and the inputs include- Temperature Sensing and QR code scanning.

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Fig 5. Front Panel of the Application designed using LabVIEW

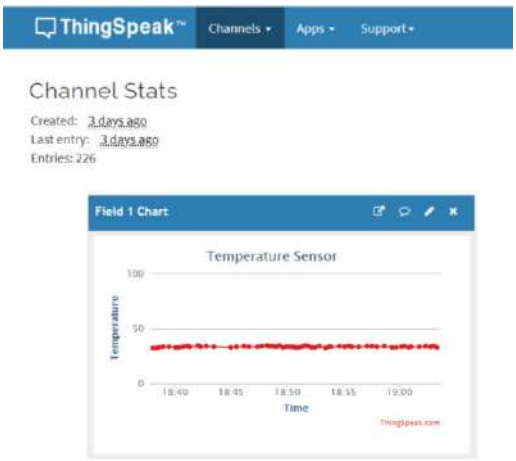

Fig 6. The temperature data of the Employee collected in the cloud.

For this Project, we have used the cloud resource from "Thingspeak" and interfaced it with LabVIEW to process the temperature data.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

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VI. CONCLUSION

Thus, this cohesive solution permits the Employer to automate the worker check in/Check out method throughout Pandemic in any Industry/Workspace. Also, Maintain the information of Temperature of the worker throughout entry/exit, along with the health Check-up details. Therefore, to spot the workers in risk and take necessary precautions to prevent infection spread.

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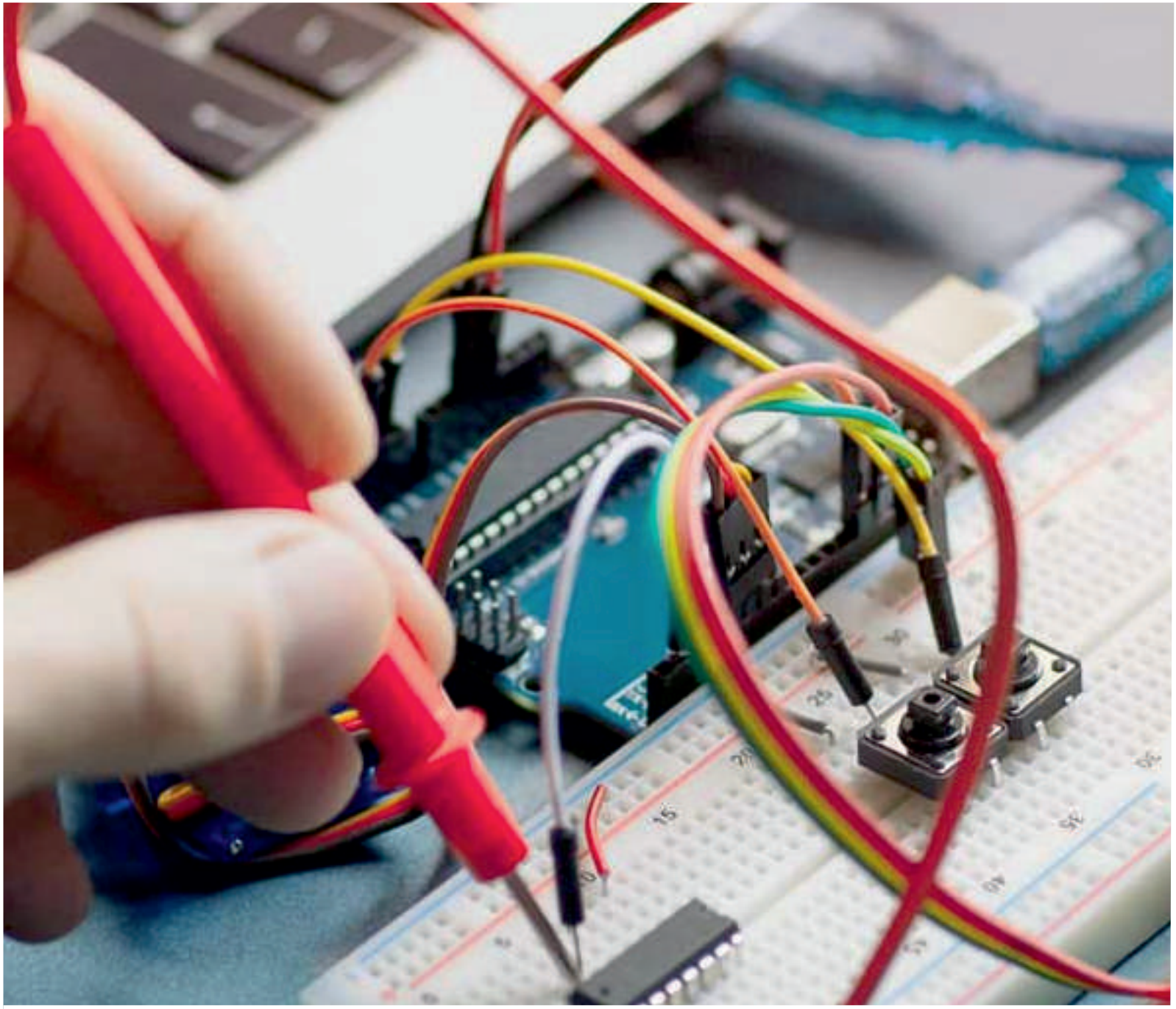

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ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9307

CYE-Check Your Employee Automated HR Maintenance system for Pandemic

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Abstract: COVID-19 is both a global health crisis and international economic threat. The worldwide lockdown of companies and industries that were implemented and mandated to curb the spread of the virus generated a good array of unique and fundamental challenges for both employees and employers across the globe.
At the individual level, populations of shutdown affected employees were turned overnight into

- "Work from home" employees,
- "Essential" or "Life-sustaining" workers (e.g., emergency room medical personnel and supermarket staff)
- Furloughed or laid-off employees seeking the nation-specific equivalent of unemployment benefits.

This project automates the entry/exit of the employees in any industry or workplace, by detecting their body temperature automatically as the employee checks in, maintain and analyse the data for future reference.
It provides a low-cost hardware integrated solution for employee management system especially during Pandemic Situation. This automated solution enables the Employer to maintain a safe working environment for their employees, periodically check his Employees health data, their vaccination details, swab test reports etc.

Keywords: Automation, Body Temperature Sensing, Pandemic Management, Health Security.

I. INTRODUCTION

Certain Industries that need to run even in the pandemic situations struggle to maintain the health history of their employees. There are many systems for maintaining the employee database, but current pandemic situation has created a need for maintaining the health history of the employee and continuously monitor the same to keep check on potential risk of any infection spread.
In 2019, not even 10% of business leaders from developed countries considered the spread of any diseases as a global risk. Nor were companies anticipating that an epidemic might test their public reputation as a responsible employer. Yet in early 2020 all organizations started facing a big crisis and the need to address the urgent concerns of various categories of workers like those who can and continue to work remotely, non-remote workers who can work remotely with proper support, those that cannot work for a spread of reasons and people who still work in person. Moreover, many companies, across many sectors, had not implemented flexible or remote working arrangements. Even many companies struggle in establishing and maintaining a safe working environment for their non-remote working population. In the current situation, most businesses are in necessity to put in place new measures for their workforces rapidly – often with no previous comparable experiences.
The four magnitudes of employee welfare are – physical, emotional, financial and social – are the vital elements of the employee experience and crucial to an engaged and productive workforce in regular times. During a pandemic, wellbeing assumes a new urgency. An employer's actions in supporting wellbeing are critical to putting together and sustaining workforce resiliency and sending the message that employees' matter.
Companies got to support employees through clear communication during all phases of an organization's response to COVID-19. They need to maintain a very safer workspace for their resources to come and work efficiently. And companies must seek to maximise the coverage of all employees, including those in roles where remote work is feasible also as non-mobile employees (e.g., customer-facing retail and repair workers). Henceforth, an integrated system to check and maintain the employee health history is all that is the need of the hour and world indeed.

II.SYSTEM MODEL AND ASSUMPTIONS

It is a temperature sensing system integrated with PC that measures and maintains the body temperature of the Employee. The Employee can check in with a QR code provided in his ID card, which can be read by the QR Scanner of the System. It validates the identity of the Employee and checks his body temperature. By processing the temperature with internal algorithms, the system allows the Entry of the Employee if: - His Temperature is normal AND His health check-up is up

IJIREEICE
ISSN (Online) 2321-2004
ISSN (Print) 2321-5526
International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering
Vol. 9, Issue 3, March 2021
DOI 10.17148/IJIREEICE.2021.9307

to date. If any of the above condition is not satisfied, then the person is denied entry and the notification is sent to the HR Manager.

Temperature sensing is done with Non-contact type Temperature sensor to maintain hygiene. This system maintains the health history of the employee along with the attendance data. It is assumed that during the Pandemic situation, an employee is expected to take regular health check-ups and that data also should be maintained in the official records.

This project is a control system with temperature as the regulating parameter, that keeps check on the entry and exit of the Employee.

Fig 1. MLX90614 Temperature Sensor

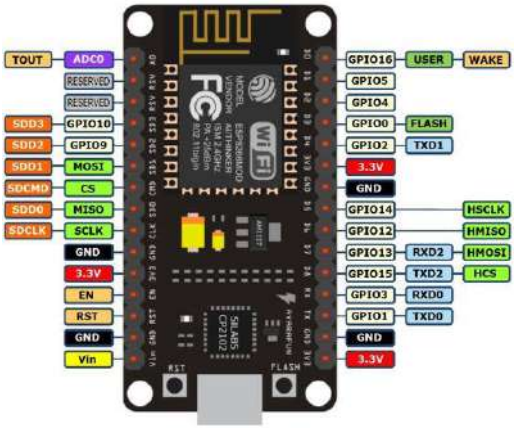

Fig 2. NodeMCU Pinouts

III.WORKING AND METHODOLOGY

The entire set up is divided into two parts – Sensing System and Analytics System

1.CYE Sensing System:

This set up consists of QR Scanner and Non-Contact Temperature sensor. The QR scanner mounted at the sensing area where the employee scans his ID card to Check IN. Once the code is scanned, the employee's name and his ID number is displayed in the UI, then the temperature sensor senses the temperature of the Employee. The temperature data is analysed in the Analytics system, to validate the entry of that Employee. The Employee data scanned from the QR code and the temperature data is collected and stored in the data base.

2.CYE Analytics System:

This set up is the back-end algorithm of the proposed software. The temperature data collected from the sensor is analysed and determined if the employee's temperature is acceptable for entry. If any abnormal body temperature is sensed, the employee is alerted and denied entry. The HR is notified about the same, so that the required precautions can be taken to contain the infection and potential threat. The Process is entirely automatic and mobile notification is sent to the concerned official through cloud technology.

IJIREEICE

ISSN (Online) 2321-2004
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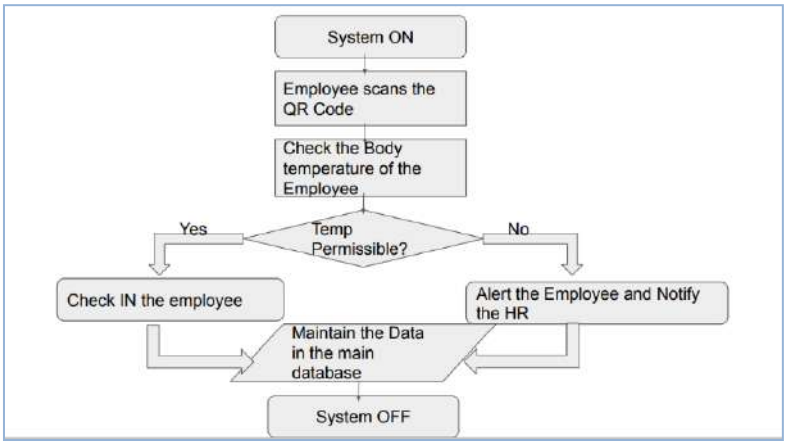

Fig. 3 Methodology

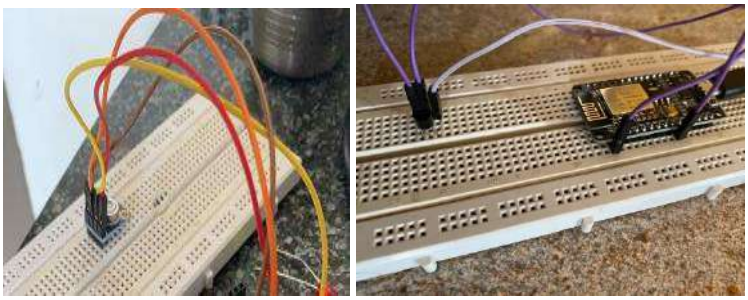

Fig .4 Hardware- Temperature Sensor Interface with NodeMCU Micro-controller

Fig 4 shows the interfacing of temperature sensor with NodeMCU. The sensor MLX90614 reads the temperature in both Celsius and Fahrenheit, which is uploaded to the cloud named “Thingspeak” from where it is retrieved and logics are applied in the LabVIEW.

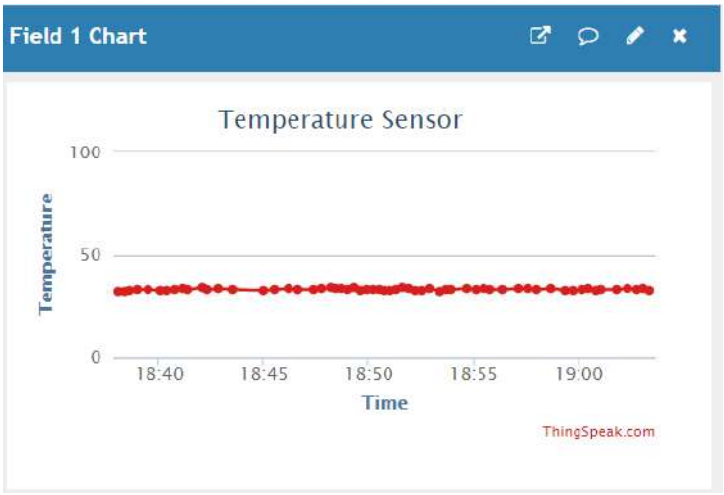

Fig 5. Temperature Sensor output from Cloud

IV. SIGNIFICANCE OF THE SOLUTION

Amidst this Pandemic situation, any employee working physically in a workspace tend to face the risk of infection. He might be a victim of the infection or a potential carrier who can infect to his fellow mates. To check this potential risk, minimum precaution which can be taken is to monitor the body temperature of the employee during his entry/exit to the workplace. Manually checking the temperature of the employees results in following shortcomings:

- No Data Logging

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- Possibility of Manual Error
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1. Validates the employee check in/Check out at the entry and exit.
2. Automates the temperature checking of the employees during entry.
3. Identifies potential risky employees and alerts them.
4. Maintains the health data of the employees, thereby tracking their infection probability/possibility.

This automated solution enables the Employer to maintain a safe working environment for their employees, periodically check his Employees health data, their vaccination details, swab test reports etc.

V. RESULT AND DISCUSSION

In the Fig 6, it shows the Front Panel of the application. The User Interface is designed using LabVIEW and the inputs include- Temperature Sensing and QR code scanning.

Fig. 6 Front Panel of the Application

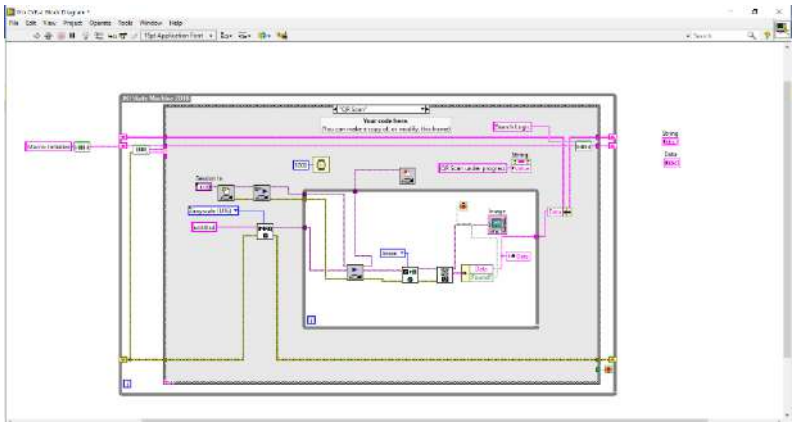

Fig. 7 Block Diagram and Software Architecture

Fig 7 shows the Block diagram i.e., the back-end code of the Application. The prime packages used for coding is JKI statemachine and Actor Framework installed from VI Package Manager.

IJIREEICE

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VI.CONCLUSION

Thus, this solution enables the Employer to automate the Employee check in/Check out process during Pandemic in any Industry/Workspace. Also, Maintain the data of Temperature of the Employee during entry/exit, along with health Check-up details. Therefore, to Identify the Employees at Risk and take necessary precautions to prevent spread at workspace.

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IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Volume 10, Issue 3, March 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.122

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003020

Traffic Control for an Ambulance using LabVIEW with Emergency Sound Alarm

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ABSTRACT:Vehicular traffic is endlessly increasing everywhere in the world and can cause terrible traffic congestion at intersections. Most of the traffic lights today feature a fixed green light sequence, therefore the green light sequence is determined without taking the presence of the emergency vehicles into account. Therefore, emergency vehicles such as ambulances, police cars, fire engines, etc. stuck in a traffic jam and delayed in reaching their destination can lead to loss of property and valuable lives. This paper presents an approach to schedule emergency vehicles in traffic. The main objective of this system is that to control the traffic, allowing an ambulance to arrive at a particular location without it having to stop anywhere until the destination is reached. This system includes RF technology and LabVIEW software.

KEYWORDS: Four way Traffic Control Arduino, RF433 MHz Module, myRIO, LabVIEW.

I.INTRODUCTION

According to the project, when the ambulance is at emergency comes to in any junction the traffic signals stops the signals and give a green signal for the ambulance. The road accidents in modern urban areas are increased to an uncertain level. The loss of human life due to the accident is to be avoided. Traffic congestion and tidal flows are major facts that causing delay to the ambulance. To bar loss of human life due to Accidents to we introduce a scheme called Adaptive Traffic clearance for the ambulance using an RF technology. The main theme behind this scheme is to supply a smooth flow for the emergency vehicles like the ambulance to succeed in the hospitals accurately and thus minimizing the delay caused by the traffic congestion. The idea behind this scheme is to implement Traffic clearance for the ambulance using an RF technology which could control mechanically the traffic lights within the trail of the ambulance.

II.LITERATURE SURVEY

[1] The traffic give way to such emergencyvehicles, on hearing the vehicle's siren. However, this is not sufficient in situations where the traffic cannot give path to emergency vehicles at the traffic signals, which is the major reason for delay. Almost all the traffic signals today are automated, when an emergency vehicle passes by an intersection without green signal is a danger to traffic which is approaching the signal from other roads for which the signal is green. Thus to avoid major accidents the emergency vehicle has to wait until the entire traffic signal cycle to complete and gets an official green signal. This is an important reason for the delay in response time of emergency vehicle.[2] A third methodology is to detect vehicles using the recognition of in-use Bluetooth devices and to derive an average travel time between two Bluetooth detectors. For the first two approaches, several traffic state reconstruction methods exist. the traffic situation can be reconstructed out of travel time measurements. To this end, Bluetooth detectors are placed along a road. A vehicle with in-use Bluetooth device(s) passes a first sensor and afterwards a second sensor downstream.[3] The proposed system creates a android app that connects both the ambulance and the traffic signal station using cloud network. This system makes uses RFID(radio frequency identification) technology to implement the Intelligent traffic signal control. The basic idea behind the proposed system is, if the Ambulance halts on the way due to a traffic signal, RFID installed at the traffic signal tracks the RFID tagged ambulance and sends the data to the cloud. [4] Traffic control is the most common operation strategy deployed in major cities and influences the performance of network most directly to tackle gridlock. Traffic signal control systems and algorithms have a long history. With the deployment of detectors (including traditional infrastructure based detectors and GPS, mobile devices or on-board units equipped on probe vehicles) on arterial roads, more and more traffic signal.[5]The adaptive control system combines these desired

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states and the current prevailing traffic conditions collected by the sensing system to produce real time traffic control schemes. These traffic control schemes are implemented in the field to guide the real world traffic flow to evolve towards the desired states..[6] This RFID technique deals with a multi-vehicle, multi-lane, multi road junction area. It provides an efficient time management scheme, in which a dynamic time schedule is worked out in real time for the passage of each traffic column. the present intelligent traffic lights are sensor based with a certain algorithm that controls the switching operation of the system.[7] A new traffic control scheme can be generated to construct the urban roads traffic control closed-loop self-tuning system. So the system control strategy can be adjusted real-timely according to the system output, and the open-loop control will be upgraded to the closed-loop control in the traffic control

IIISOFTWARE

LabVIEW

LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is a system-design platform and development environment for a visual programming language from National Instruments. LabVIEW ties the creation of user interfaces (called front panels) into development cycle. LabVIEW programs subroutines are Virtual Instruments (VIS). Each VI has two components: a block diagrams and a connector panel. The last is used to represent the VI in the block diagrams of other, called VIS. The front panel is built using controls and indicators. Controls are inputs —they allow a user to supply information to the VI. Indicators are outputs –they indicate, or display, the results based on the inputs given to the VI. The back panel, which is a block diagram, contains the graphical source code. All of the objects placed on the front panel will appear on the back panel as terminals. The back panel also contains structures and functions which perform operations on controls and supply data to indicators. The structures and functions are found on the Function palette and can be placed on the back panel. Collectively controls, indicators, structures and functions will be referred to as nodes. Nodes are connected to one another using wires –e.g. two controls and indicators can be wired to the addition function so that the indicator displays the sum of the two controls. Thus, a virtual instrument can either be run as a programme, with the front panel serving as user interface, or, when dropped as a node onto the block diagram, the front panel defines the inputs and outputs for the node to the connector pane. This implies each VI can be easily tested before being embedded as a subroutine into a larger program. The LabVIEW programming environment, with the included examples and documentation, makes it simple to create a small application. For complex algorithms or large-scale code, it is important that the programmer possess an extensive knowledge of the special LabVIEW syntax and the topology of its memory management. The most advanced LabVIEW development system offer the possibility of building stand-alone applications.

IV. HARDWARE

A. myRIO

myRIO Student Embedded Device—The myRIO1900 is a tool you can use to teach and implement multiple design concepts with one reconfigurable I/O (RIO) device. Featuring I/O on both sides of the device in the form of MXP and MSP connectors, it includes 10 analog inputs, six analog outputs, 40 digital I/O lines, Wi-Fi, LEDs, a push button, an onboard accelerometer, a Xilinx FPGA, and a dual-core ARM Cortex A9 processor.

Fig. 1: myRIO

Fig.1 shows the myRIO, the word "RIO" stands for Reconfigurable Input Output. NI-myRIO is one of the best products of National Instruments which can able to do the process of Image Processing programs, Hardware interfacing

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programs such as motors, gears and levers etc. NI-myRIO has Xilinx which is thereby a combination of Dual CoreARM Cortex A-9 Processor and FPGA embedded on it. It has Integrated WIFI, Analog I/O ports and Digital I/O ports
and many others as described in the following figure.

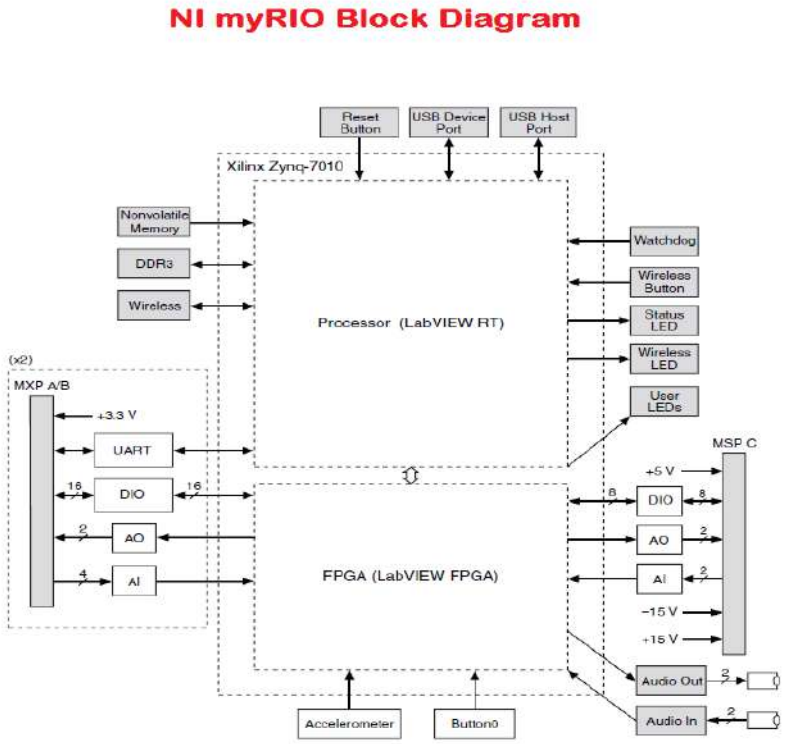

Fig 2:myRIO Block Diagram

myRIO Features

The unique features can make a device more and more popular.
myRIO major features are listed in the table given in the figure shown below.

myRIO FEATURES	
Si.No	Softwares
1	10 analog input, 6 analog output, 40 digital input/output lines
2	Wireless, LEDs, push button, accelerometer on-board
3	Xilinx FPGA and dual core ARM cortex A9 zynq processor
4	Programmable with labVIEW or C language

B. Arduino

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. The Arduino Uno can be powered via the USB connection or

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with an external power supply. The power source is selected automatically.External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Ground and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

Fig. 3: Arduino

C. RF Transmitter & Receiver

This RF module comprises of an RF Transmitter and an RF Receiver. The transmitter/receiver (Tx/Rx) pair operates at a frequency of 433 MHz. An RF transmitter receives serial data and transmits it wirelessly through RF through itsantenna. The transmission occurs at the rate of 1Kbps – 10Kbps.The transmitted data is received by an RF receiveroperating at the same frequency as that of the transmitter. The RF module is often used along with a pair ofencoder/decoder. The encoder is used for encoding parallel data for transmission feed while reception is decoded by a decoder.

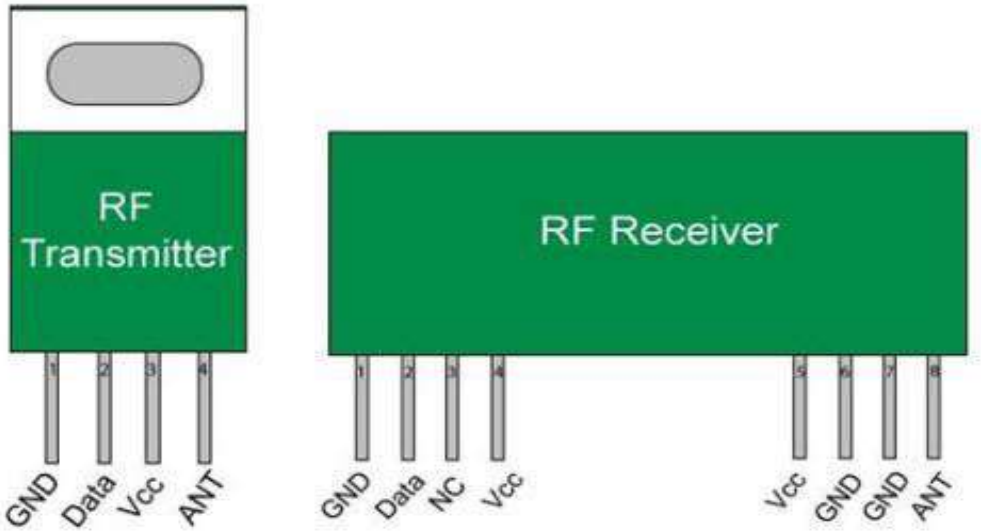

Fig. 4: RF Transmitter & Receiver

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V. BLOCK DIAGRAM

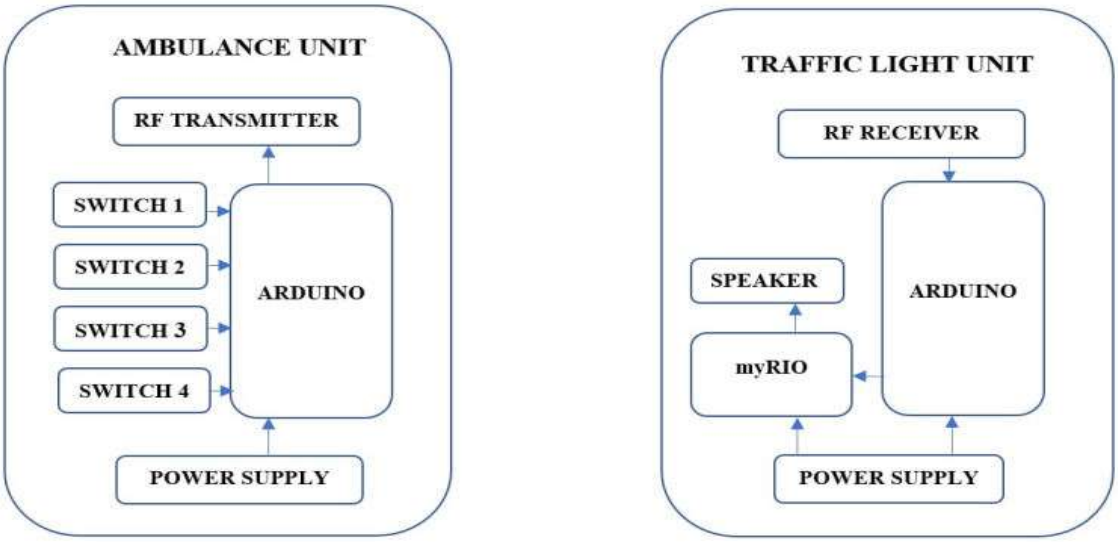

Fig. 5: Block Diagram

A. Transmitter Block

This block is used to transmit the signals given at the input terminals, a microcontroller(Arduino Uno) is used to interface and manipulate the input signals, the input controls used in the Transmitter block are Switch 1, Switch 2,Switch 3, and Switch 4 which performs various logic operations when executed. The Arduino is given a power supply
of +5 Volts DC Supply.

B. Receiver Block

This block is used to receive the datas transmitted from the transmitter and Receiver module uses the transmitted signal and decrypts the sent signal, based on the received signal the microcontroller (Arduino Uno) executes the logic proportional to it. The other parts of the receiver block are Arduino, myRIO, Loudspeaker and a Traffic Light Indicator. The Arduino and myRIO are supplied with +5 Volts of DC Supply.`

AMBULANCE UNIT

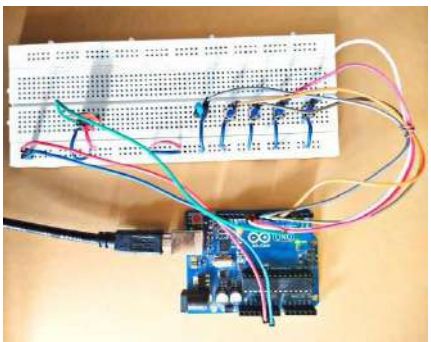

Fig 6: Ambulance Unit

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VI. EXPERIMENTAL SETUP

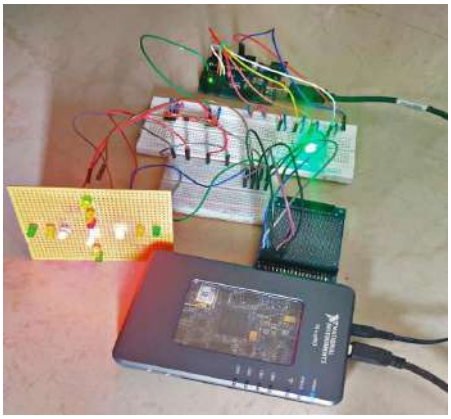

Fig 7: Traffic Light Unit

VII. WORKING

As the Block Diagram shows the system has two separate blocks the first one is input block which is fixed in every ambulance and it has four distinct switches interfaced with Arduino and RF Transmitter for the transmission of emergency signal. The second block is output block which is placed at every traffic signal junction. It has RF Receiver which receives the transmitted signal from the input block and the receiver signal is fed to the another Arduino which in turn interfaced with myRIO Hardware which controls the traffic lights. Four switches in the input block corresponds to each directions, that is Switch 1 is North, Switch 2 is East, Switch 3 is West and Switch 4 is South.

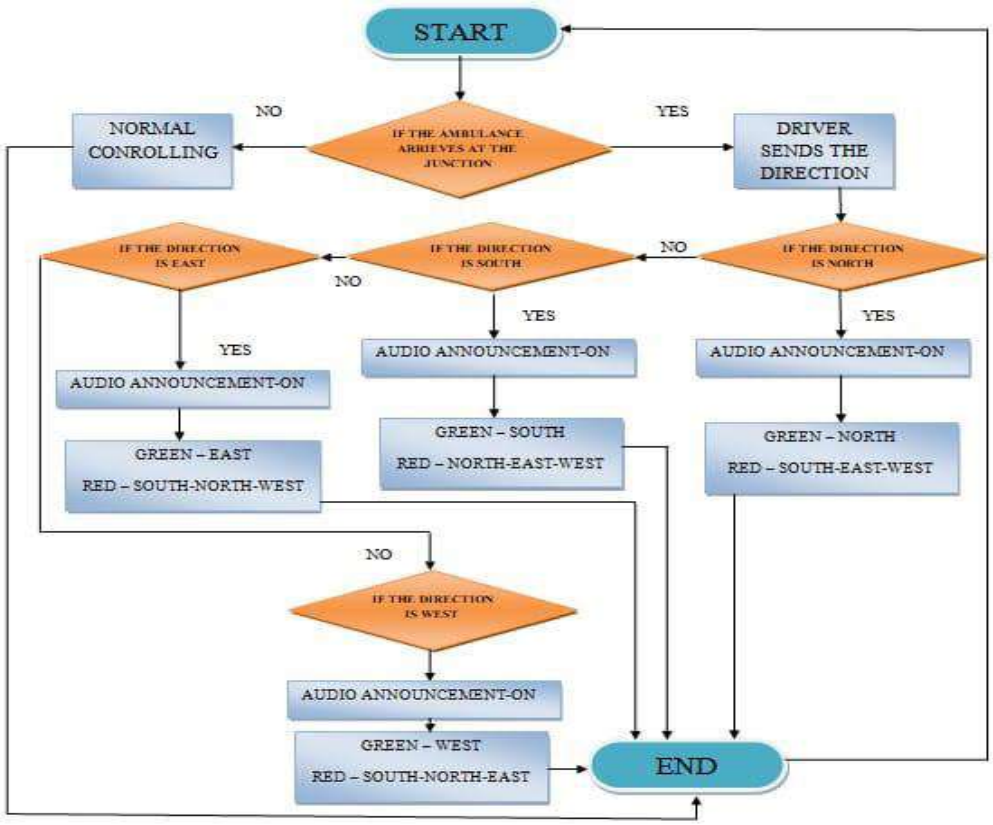

Fig. 8: Working Flow Chart

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A. Case:1- If no switch is pressed at the input block

Normal Traffic Signal Cycle continues until signal is received from the input block.

B.Case:2- If switch 1 is pressed at the input block

Then the direction is North and following changes are automatically made through LabVIEW Programming.
First Audio announcement is given aloud, Second the Green Signal at the North Direction is turned ON and all the other three directions are set to RED until the Ambulance goes away from the Signal Zone.

C.Case:3- If switch 2 is pressed at the input block

Then the direction is East and following changes are automatically made through LabVIEW Programming.
First Audio announcement is given aloud, Second the Green Signal at the East Direction is turned ON and all the other three directions are set to RED until the Ambulance goes away from the Signal Zone.

D.Case:4- If switch 3 is pressed at the input block

Then the direction is West and following changes are automatically made through LabVIEW Programming.
First Audio announcement is given aloud, Second the Green Signal at the West Direction is turned ON and all the other three directions are set to RED until the Ambulance goes away from the Signal Zone.

E.Case:5- If switch 4 is pressed at the input block

Then the direction is South and following changes are automatically made through LabVIEW Programming.
First Audio announcement is given aloud, Second the Green Signal at the South Direction is turned ON and all the other three directions are set to RED until the Ambulance goes away from the Signal Zone.

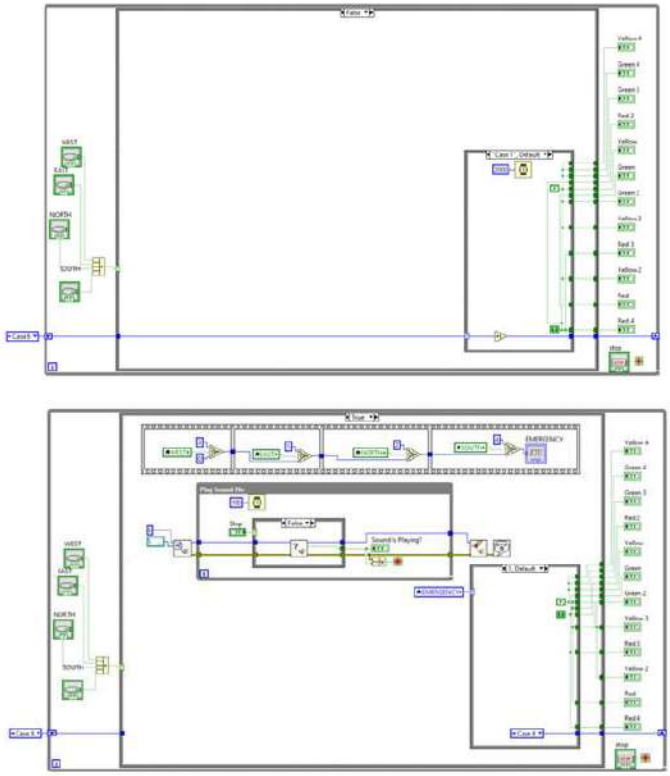

Fig. 9:Block Diagram of LabVIEW Program

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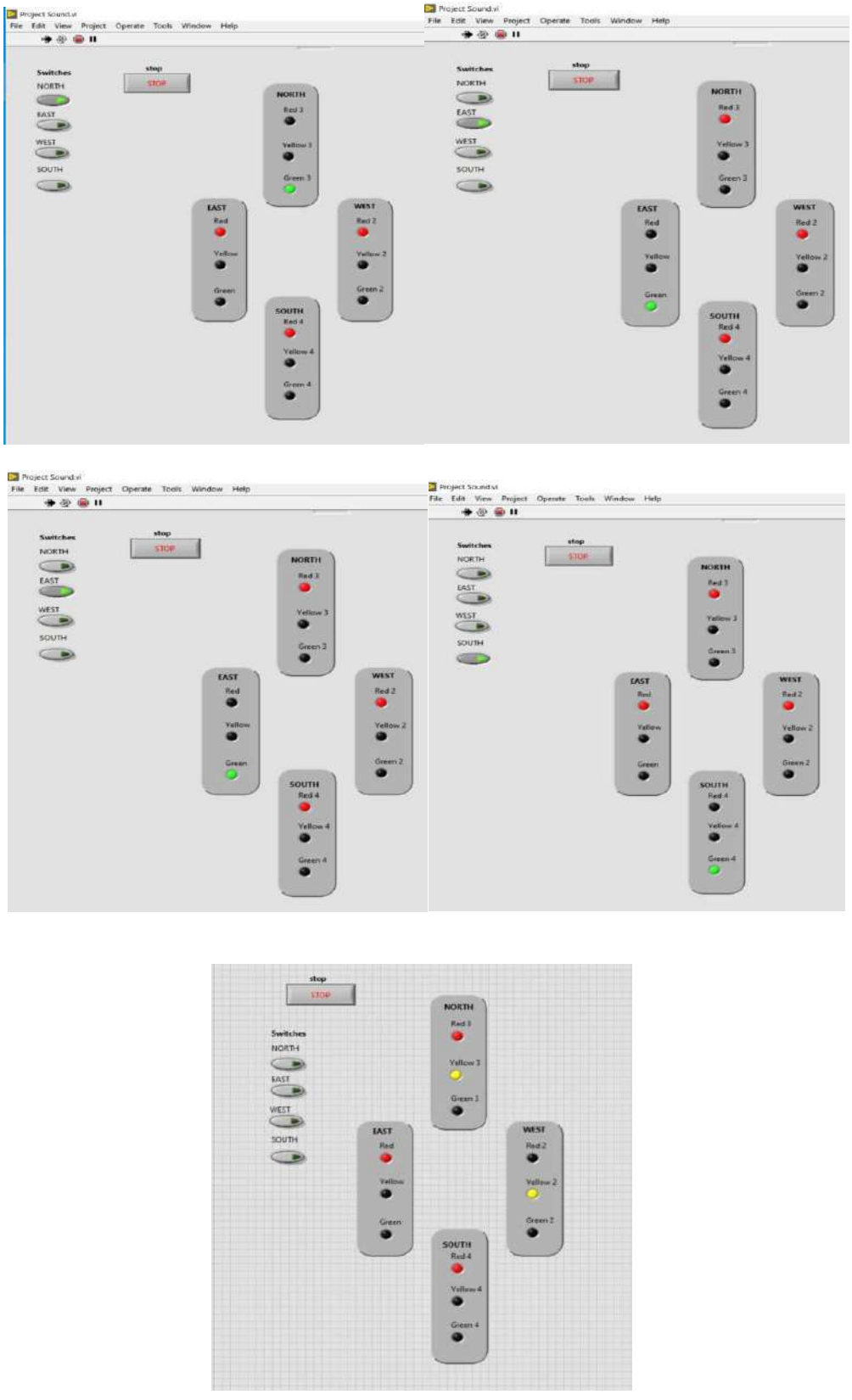

Fig. 10:Front Panel of LabVIEW Program for Different Cases at run time

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VIII. CONCLUSION

All developed nations have well-developed transportation system with efficient traffic controlled on road, rail, air, and transportation of goods industrial products, man power and machinery are the key factors which influencing theneconomic development of any country. Mismanagement and traffic jam lead to long waiting times, loss of fuel and money. It is therefore, utmost necessary to possess a quick, economical and efficient control system for National development. The monitoring and control of city traffic is becoming a serious problem in many countries. With the ever-increasing number of vehicles in the road, the traffic monitoring authority on find new methods of overcoming.
This system will certainly help to traffic police to offer the way to the ambulance when there's heavy traffic on the road. The design and implementation of this technique is directly targeted for traffic management so that emergency vehicles get clear way to reach their destination in less time, and without any human interruption.

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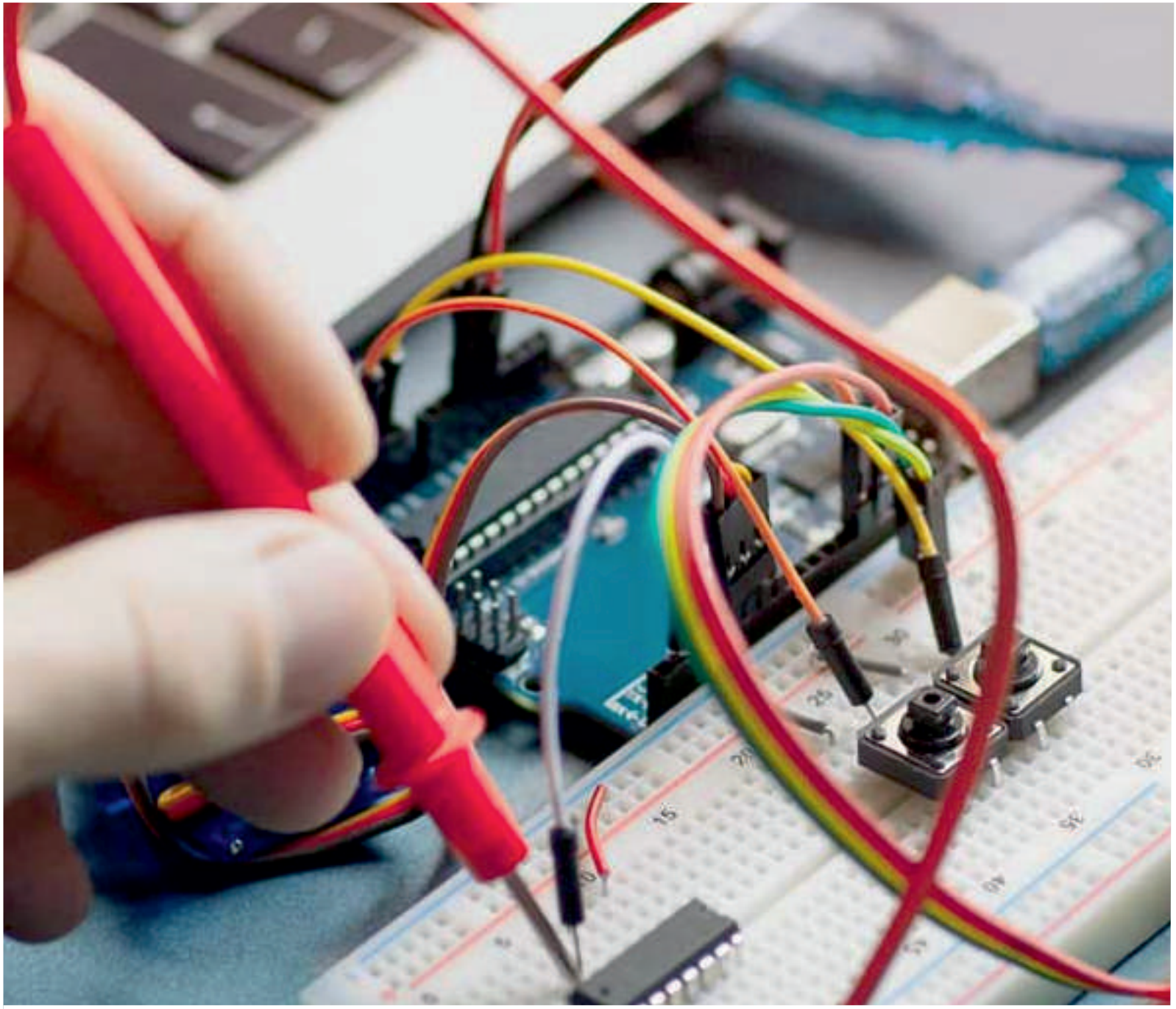

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ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

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International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

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IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue x, Month 2021

DOI 10.17148/IJIREEICE.2021.9101

Adaptive Traffic Control For Ambulance

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Abstract: Vehicular traffic is endlessly increasing everywhere in the world and can cause terrible traffic congestion at intersections. Most of the traffic lights today feature a fixed green light sequence, therefore the green light sequence is determined without taking the presence of the emergency vehicles into account. Therefore, emergency vehicles such as ambulances, police cars, fire engines, etc. stuck in a traffic jam and delayed in reaching their destination can lead to loss of property and valuable lives. This paper presents an approach to schedule emergency vehicles in traffic. The main objective of this system is that to control the traffic, allowing an ambulance to arrive at a particular location without it having to stop anywhere until the destination is reached. This system includes RF technology and LabVIEW software.

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II. LITERATURE SURVEY

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IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

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III. SOFTWARE

LabVIEW

LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is a system-design platform and development environment for a visual programming language from National Instruments. The graphical language is named "G (not to be confused with G-code). Originally released Apple Macintosh in 1986, LabVIEW is commonly used for data acquisition, instrument control and industrial automation on a variety of platforms including Microsoft Windows, various versions of UNIX, Linux and OS X. The latest versions of LabVIEW are LabVIEW 2019. For this work LabVIEW 2019 version is used as it has found to be most stable version of all.

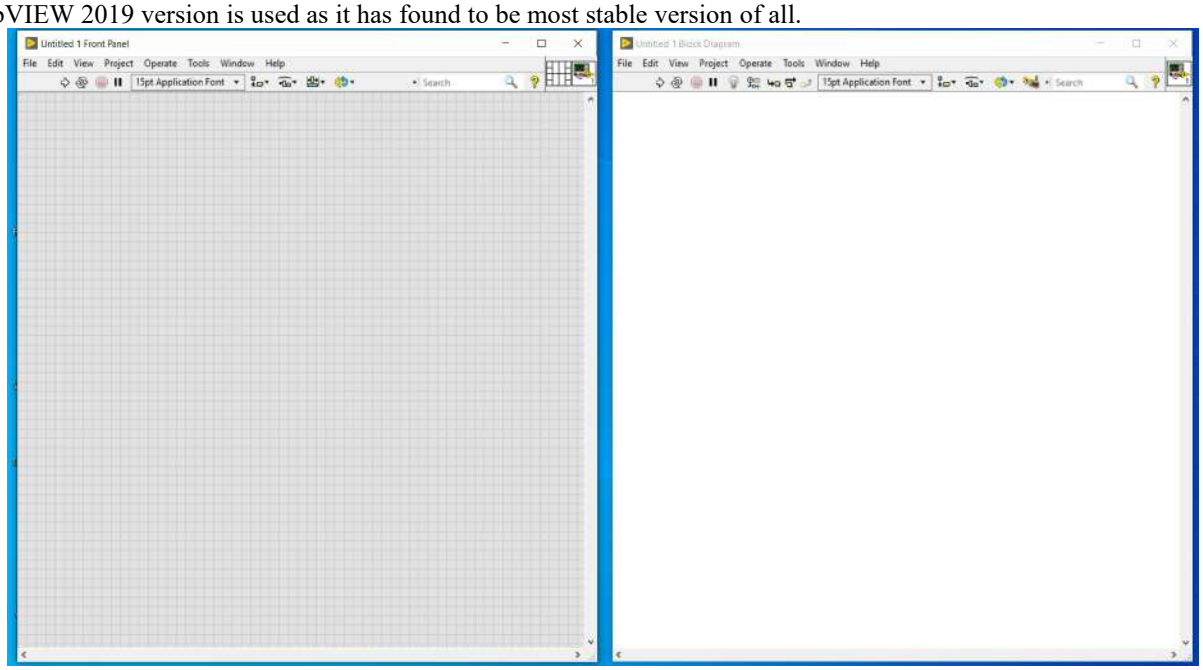

Fig. 1:Home Screen of LabVIEW Front panel(Left) Block Diagram(Right)

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system offer the possibility of building stand-alone applications. Furthermore, it is possible to create distributed applications, which communicate by a client/server are therefore easier to implement due to the inherently parallel nature of G.

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A. myRIO

myRIO Student Embedded Device—The myRIO1900 is a tool you can use to teach and implement multiple design concepts with one reconfigurable I/O (RIO) device. Featuring I/O on both sides of the device in the form of MXP and MSP connectors, it includes 10 analog inputs, six analog outputs, 40 digital I/O lines, Wi-Fi, LEDs, a push button, an onboard accelerometer, a Xilinx FPGA, and a dual-core ARM Cortex A9 processor.

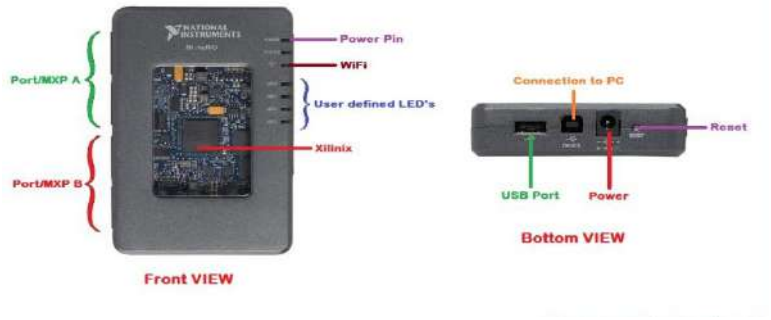

Fig. 2: myRIO

Fig.2 shows the myRIO, the word "RIO" stands for Reconfigurable Input Output. NI-myRIO is one of the best products of National Instruments which can able to do the process of Image Processing programs, Hardware interfacing programs such as motors, gears and levers etc. NI-myRIO has Xilinx which is thereby a combination of Dual Core ARM Cortex A-9 Processor and FPGA embedded on it. It has Integrated WIFI, Analog I/O ports and Digital I/O ports and many others as described in the following figure.

B. Arduino

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.

Fig. 3: Arduino

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Ground and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

IJIREEICE
ISSN (Online) 2321-2004
ISSN (Print) 2321-5526
International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering
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DOI 10.17148/IJIREEICE.2021.9101

C. RF Transmitter & Receiver

This RF module comprises of an RF Transmitter and an RF Receiver. The transmitter/receiver (Tx/Rx) pair operates at a frequency of 433 MHz. An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna. The transmission occurs at the rate of 1Kbps – 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter. The RF module is often used along with a pair of encoder/decoder. The encoder is used for encoding parallel data for transmission feed while reception is decoded by a decoder.

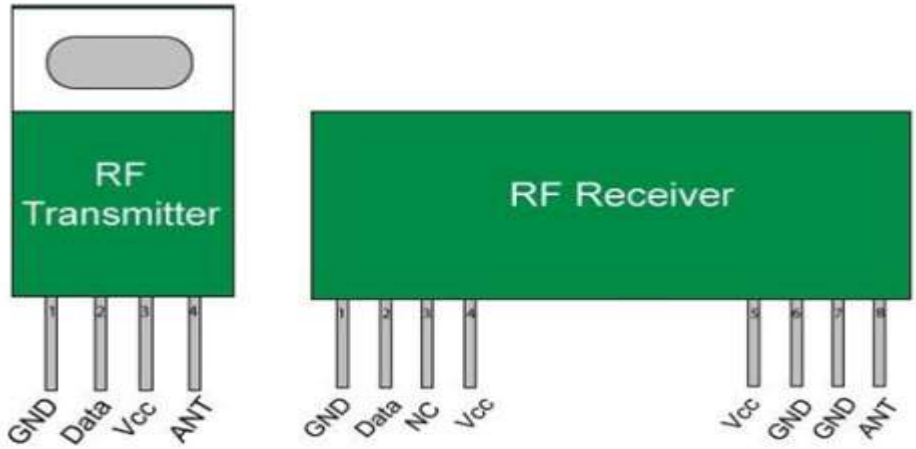

Fig. 4: RF Transmitter & Receiver

V. BLOCK DIAGRAM

The traffic light control system consists of two main blocks they are the Transmitter Block and the Receiver Block.

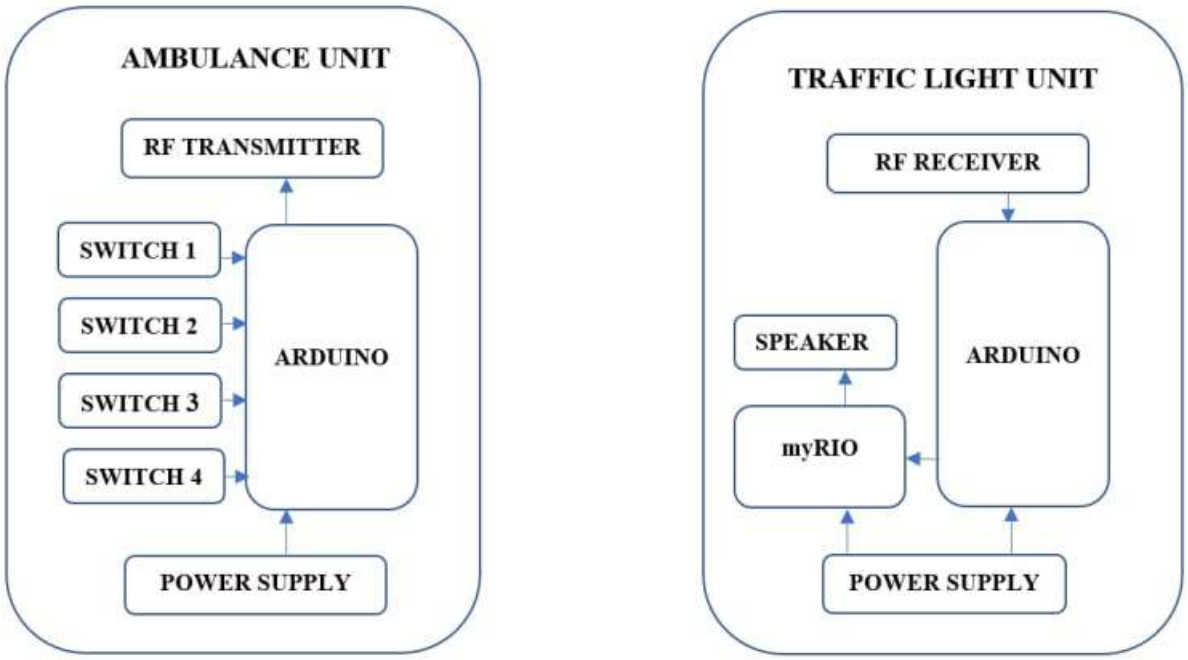

Fig. 5: Block Diagram

A.***Transmitter Block:***

This block is used to transmit the signals given at the input terminals, a microcontroller(Arduino Uno) is used to interface and manipulate the input signals, the input controls used in the Transmitter block are Switch 1, Switch 2,

IJIREEICE
ISSN (Online) 2321-2004
ISSN (Print) 2321-5526
International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering
Vol. 9, Issue x, Month 2021
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Switch 3, and Switch 4 which performs various logic operations when executed. The Arduino is given a power supply of +5 Volts DC Supply.

B.***Receiver Block:***
This block is used to receive the datas transmitted from the transmitter and Receiver module uses the transmitted signal and decrypts the sent signal, based on the received signal the microcontroller(Arduino Uno) executes the logic proportional to it. The other parts of the receiver block are Arduino, myRIO, Loudspeaker and a Traffic Light Indicator. The Arduino and myRIO are supplied with +5 Volts of DC Supply.

VI. WORKING

As the Block Diagram shows the system has two separate blocks the first one is input block which is fixed in every ambulance and it has four distinct switches interfaced with Arduino and RF Transmitter for the transmission of emergency signal. The second block is output block which is placed at every traffic signal junction. It has RF Receiver which receives the transmitted signal from the input block and the receiver signal is fed to the another Arduino which in turn interfaced with myRIO Hardware which controls the traffic lights. Four switches in the input block corresponds to each directions, that is Switch 1 is North, Switch 2 is East, Switch 3 is West and Switch 4 is South.

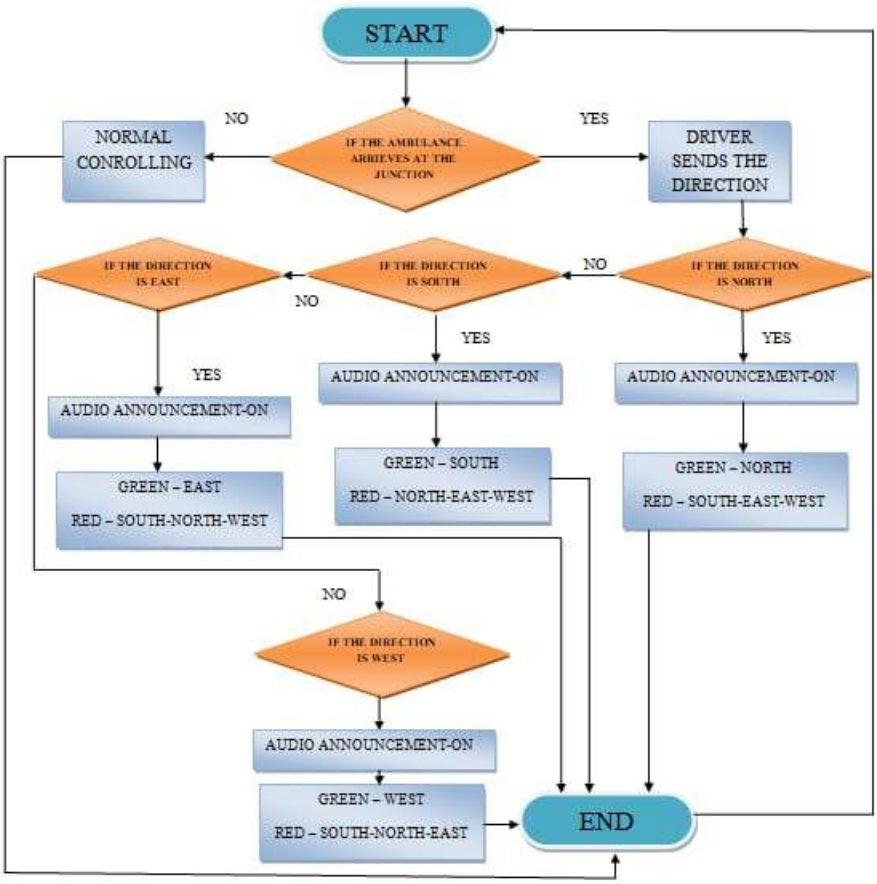

Fig. 6: Working Flow Chart

A.Case:1- If no switch is pressed at the input block
Normal Traffic Signal Cycle continues until signal is received from the input block.
B.Case:2- If switch 1 is pressed at the input block
Then the direction is North and following changes are automatically made through LabVIEW Programming.
First Audio announcement is given aloud, Second the Green Signal at the North Direction is turned ON and all the other three directions are set to RED until the Ambulance goes away from the Signal Zone.
C.Case:3- If switch 2 is pressed at the input block
Then the direction is East and following changes are automatically made through LabVIEW Programming
First Audio announcement is given aloud, Second the Green Signal at the East Direction is turned ON and all the other three directions are set to RED until the Ambulance goes away from the Signal Zone.

IJIREEICE
ISSN (Online) 2321-2004
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International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering
Vol. 9, Issue x, Month 2021
DOI 10.17148/IJIREEICE.2021.9101

D.Case:4- If switch 3 is pressed at the input block

Then the direction is West and following changes are automatically made through LabVIEW Programming
First Audio announcement is given aloud, Second the Green Signal at the West Direction is turned ON and all the other three directions are set to RED until the Ambulance goes away from the Signal Zone.

E.Case:5- If switch 4 is pressed at the input block

Then the direction is South and following changes are automatically made through LabVIEW Programming
First Audio announcement is given aloud, Second the Green Signal at the South Direction is turned ON and all the other three directions are set to RED until the Ambulance goes away from the Signal Zone.

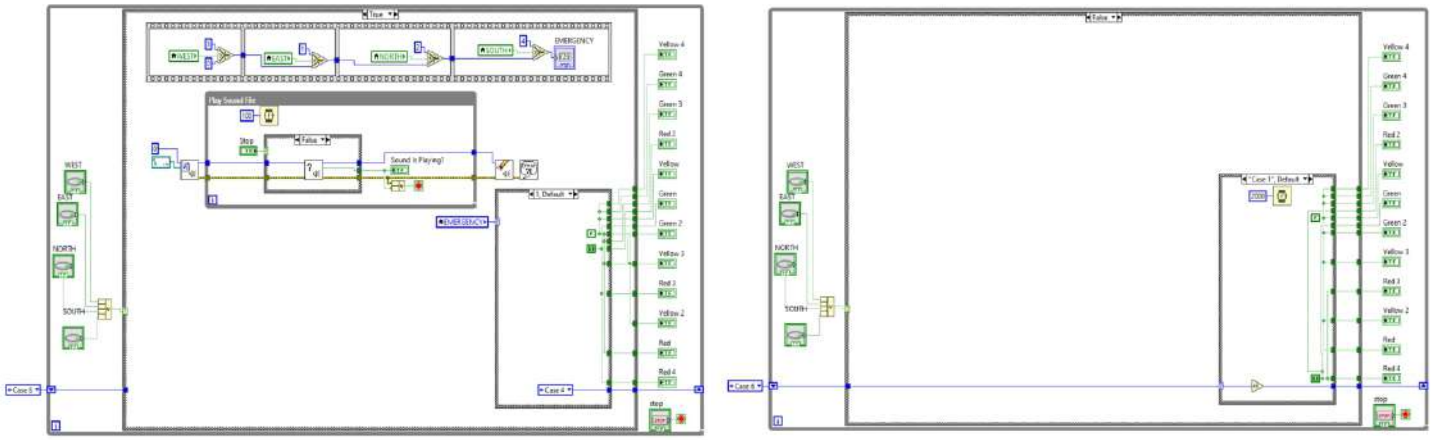

Fig. 7:Block Diagram of LabVIEW Program

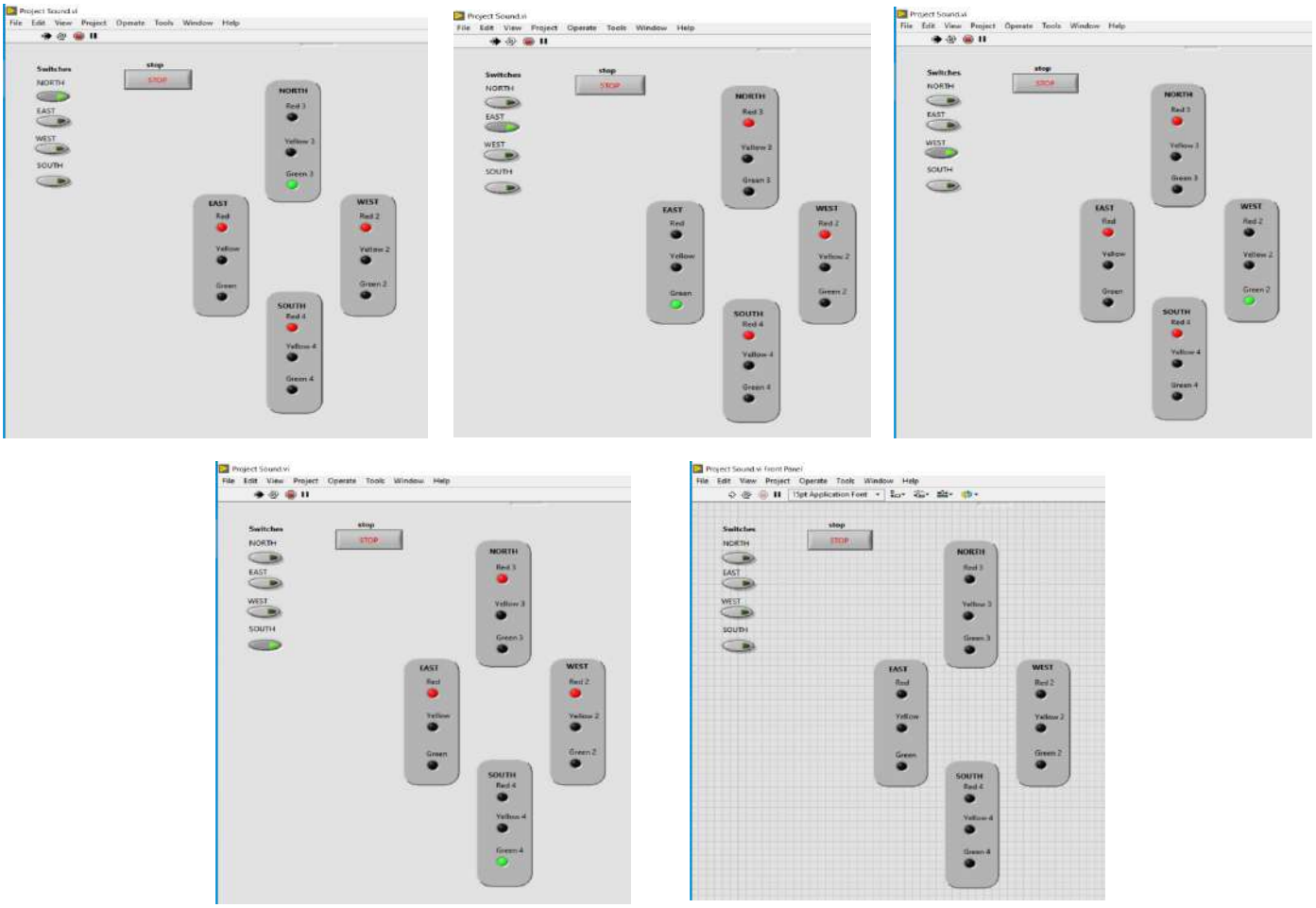

Fig. 8:Front Panel of LabVIEW Program for Different Cases at run time

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue x, Month 2021

DOI 10.17148/IJIREEICE.2021.9101

VII. CONCLUSION

All developed nations have well-developed transportation system with efficient traffic controlled on road, rail, air, and transportation of goods industrial products, man power and machinery are the key factors which influencing the economic development of any country. Mismanagement and traffic jam lead to long waiting times, loss of fuel and money. It is therefore, utmost necessary to possess a quick, economical and efficient control system for National development. The monitoring and control of city traffic is becoming a serious problem in many countries. With the ever-increasing number of vehicles in the road, the traffic monitoring authority on find new methods of overcoming. This system will certainly help to traffic police to offer the way to the ambulance when there's heavy traffic on the road. The design and implementation of this technique is directly targeted for traffic management so that emergency vehicles get clear way to reach their destination in less time, and without any human interruption.

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IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9314

Neonatal Incubation Controlling and Monitoring system using myRIO and LabVIEW

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Abstract: The medical industry has developed and reached new heights in the modern world as a result of technological advancements. Premature new-born child mortality rates have been brought under control. Incubators for babies play a crucial role in this. The patient's welfare is of the utmost importance. Unlike normal babies, who can regulate their body temperatures on their own, premature newborns lack the ability to monitor their temperature. As a result, they are placed in infant incubators that can regulate their body temperature. Unfortunately, it has been noticed in recent times that there is often a fault in the temperature controlling unit, which has resulted in deadly accidents resulting in the death of infants. Taking this into account, it appears to be perfectly reasonable to include a separate temperature monitoring unit that will measure the temperature of the incubation system. To address this problem, we suggest a design that will reduce issues with baby incubation. The incubator plays an important role in the medical industry; it is one of the most important things for new born premature babies to regulate their body temperature. We propose a project for infants incubator temperature sensing and controlling system, as well as nearby gas leakage sensing and live monitoring through camera. If an imbalance happens, it will transmit an alarm to the closest nursing station as well as messages to the parents**.**

Keywords: Premature infant, LabVIEW,Temperature Sensor,Gas Sensor**.**

I. INTRODUCTION

The incubator is thought of as an air-conditioned room with precise specifications that we can control based on the baby's condition in the incubator. Incubators are specially designed to provide the best possible environment for newborn babies with growth issues (premature babies) or illnesses. The incubator is a dust-free, bacteria-free environment with the ability to regulate temperature, humidity, and oxygen to keep them at safe levels, such as (36°C-38°C) for temperature. The patient's welfare is of the utmost importance. Premature newborn babies, unlike normal babies, do not have the ability to regulate their body temperatures on their own. As a result, they are placed in infant incubators that can regulate their body temperature. Unfortunately, it has been noted in recent years that there is always a fault in the temperature controlling unit, which has resulted in deadly accidents resulting in the death of infants.

Taking this into consideration, it seems reasonable to include a separate temperature monitoring unit that will measure the temperature of the incubator. In the current research, we suggest adding a gas sensor unit to the incubator, which will detect nearby gas leakage. We integrated a camera to constantly monitor the baby and to know the baby's status. This may help prevent fatal accidents caused by the incubation system's temperature control unit malfunctioning.

A camera installed in the incubator constantly captures pictures of the infant, ensuring that the environment is not disrupted by regular visits. Neonate actions in the incubator and incubator parameters were controlled using Camera and Vision Assistant software with the assistance of LabVIEW 2017's.

II. IMPLEMENTATION

A.*Temperature Sensor*:

The temperature of the incubation chamber is totally measured using an LM35 temperature sensor.(Fig a) It is a reasonable option because it does not require external calibration and the coating prevents self-heating. It has more precision. Its operating voltage ranges from 4 to 30 volts.V.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

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Fig a. LM35 Temperature Sensor

B. *Gas Sensor*:

The MQ135 Gas Sensor(Fig b) is used to detect or measure gas leakage near the incubation. It is used because it has a high sensitivity to ammonia, sulphide, and benzene series steam, as well as the ability to monitor smoke and other poisonous gases. It detects the gas and sends an alert to a nearby nursing station. The gas level within the incubation is also continually tracked using a LabVIEW waveform graph.

Fig b. MQ 135 Gas Sensor

C. *Camera Module:*

The camera module is used to entirely capture the baby in real time. If there are any imbalances in the newborn, the nursing station will be notified.

D. *myRIO Hardware:*

The myRIO hardware is used to accept both digital and analogue sensor signals.(Fig c) It is used in our project to connect temperature sensors, gas sensors, and camera modules to the PC's LabVIEW programming software. It supports data acquisition and signal conditioning equipment from National Instruments. Ethernet, GPIB, serial, USB, and other kinds of instruments are all supported. NI GPIB controllers and NI embedded controllers with GPIB ports are supported.

Fig c. myRIO Hardware

E. *LabVIEW Programming*:

The process inside the incubator is controlled using LabVIEW, a graphical programming tool. Compact Field Point is used to collect data from temperature, gas, and camera modules. The Temperature Acquistion Module (TC-120) receives signals from temperature sensors, while the Analog Input/Output (AIO-610) receives signals from gas sensors. Sensor values are consistently obtained and compared to see if they are within defined limits, according to the control algorithm. The bulb is switched off if the temperature limit is exceeded. The 5v relay is used to turn the light on and off.

The gas sensor output is calibrated to show the gas level of the baby's incubation system. The camera is attached to the incubator and is programmed to consistently capture pictures of the baby using LabVIEW and Vision Assistant. All of these settings, as well as the photograph, can be watched and monitored from afar.

IJIREEICE

ISSN (Online) 2321-2004
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International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

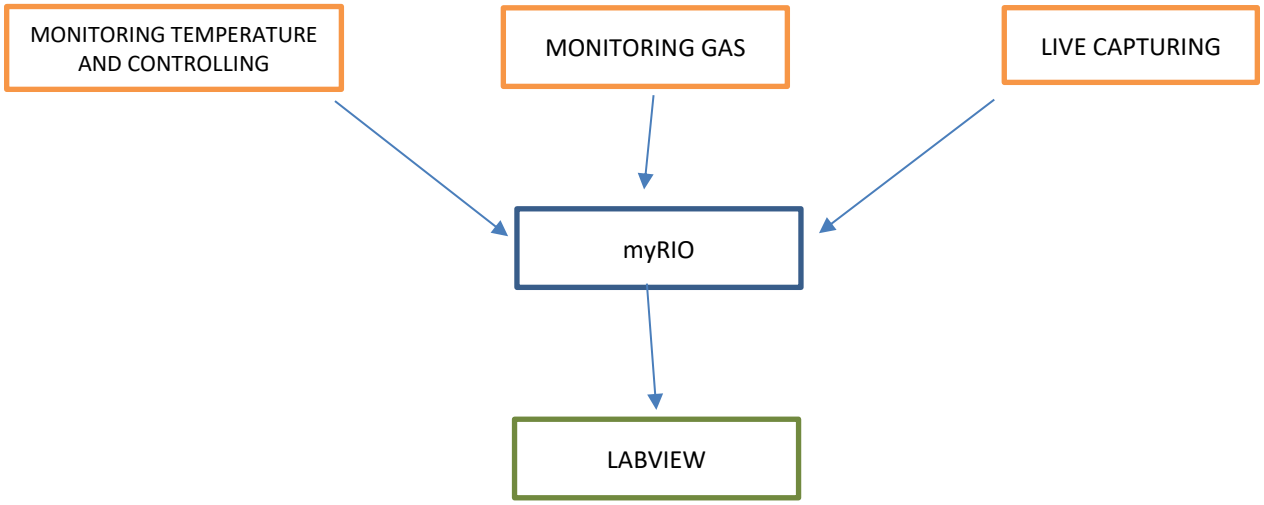
Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9314

III. METHODOLOGY

The configuration is split into three parts: temperature monitoring in the incubator, gas level monitoring, and live video capture of the infant.

Temperature signals are read by myRIO kit, which is interfaced with the sensor, and the temperature sensor (LM35) is placed within the incubation. When the temperature of the incubation rises, the incubation bulb is turned off by a relay. A gas sensor (MQ135) is also installed inside the incubator, and the gas level is constantly monitored; if any anomalies occur, the sensor alerts the nearby nursing station. The baby's motion is captured in real time by the camera module.



Flowchart of the Project

IV. RESULTS

MyRIO collects data from all of the sensors and interfaces it with LabVIEW programming to control the whole process. By sending the temperature out value to the relay that is connected with the bulb, the bulb is turned on when the temperature of the incubator is below 35 C and turned off when the temperature is above 38 C. When the gas level is abnormal, it generates an alert, and the Waveform Chart displays the gas level in real time.

The below mentioned labview programming is for temperature sensing unit.

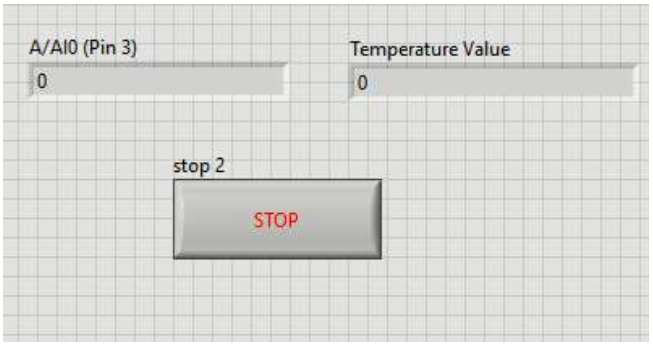


Fig a.Front Panel

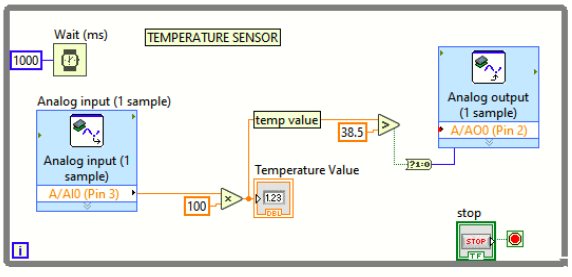


Fig b.Block diagram

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

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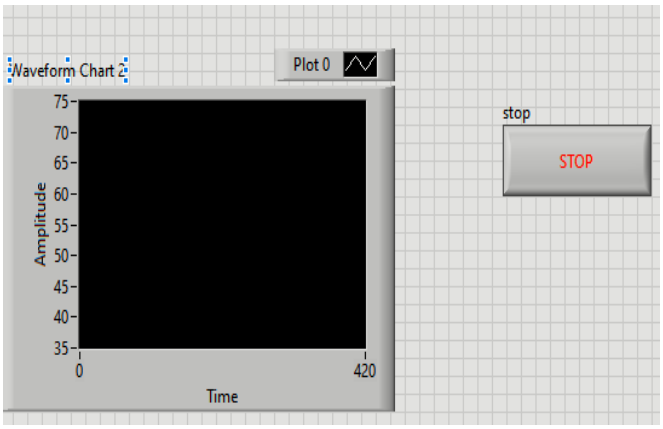
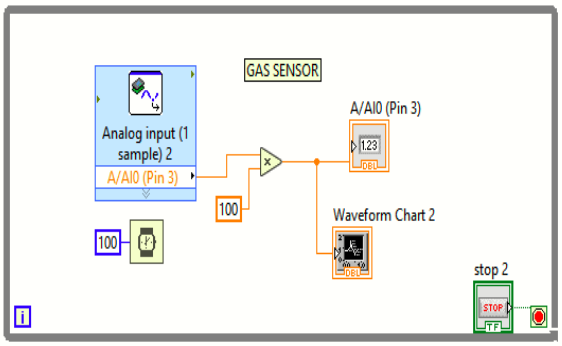
The below mentioned labview programming is for gas sensing unit.



b.Block Diagram



a.Front Panel

Results Desired and Achieved

S.No	Parameter Value	Desired Action	Achieved Action
1.Temperature	<36	Bulb ON	Bulb ON
2. Temperature	>38	Bulb OFF	Bulb OFF
3. Gas Level	<70% RH	Indicates ORANGE light	Indicates ORANGE light
4. Gas Level	>75% RH	Indicates RED light	Indicates RED light
5. Image	- Acquire Images Displayed on Front panel		

Tab.1

V. CONCLUSION

Real time parameters like tempereature,gas level, images are acquired and even danger situations can bee implemented to save the life of neonatal's .Even more sensors can be implemented for wet body detection,reduce noise vibration etc. Remote monitoring and control of parameters is useful especially in case of transport incubators and also remote treatment of babies where proper medical facilities are not available. The cost incurred is the equipment cost and the effect is life saving one.

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| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003001

DISTRIBUTED SENSOR NETWORK FOR DETECTION OF FOREST FIRE USING MATLAB

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ABSTRACT: Forest fire causes tragic loss of lives to valuable natural and individual properties including thousands of hectares of forest and hundreds of houses.It is mostly an unplanned fire caused by human activities or a natural phenomenon such as volcanic eruption or lightning.It has become a concern as the flora and fauna are affected.In order to overcome this the only solution can be detecting and preventing at an early stage .The objective of our project is to design an Iot based real-time system that can predict fire using sensors that are placed in series with a logic to go ON using MATLAB code.We integrated our circuit with sensor components,wireless Zigbee module,microcontroller board and a buzzer to produce sound on the event of fire.This system proves to be of great accuracy and conversion of analog input to digital output is done by the coding mechanism .Further process of prevention like sprinklers with water circulated from nearby pond or artificially created pit can be innovated.

KEYWORDS: MATLAB,Zigbee controls,sensors,IoT network,microcontroller.

I.INTRODUCTION

The most common hazard in a forest is wildfire.They seriously affect the biodiversity and the ecology.High atmospheric temperatures and dryness favor fire to start ,however rain extinguishes without causing much damage when not widespread.Similarly ,80% of the wildfire is through human causes.Unfortunately forest fire spread very fast than on land.Adapting small methods seek more time and hence it become unstoppable to control fire.This paper clearly shows a real-time system that prevents this massive destruction.

The main objective is initial stage prevention that is through the distributed sensor network.The collection of sensors makes it easy to sense and transfer the analog output to the zigbee that consists of code to convert to digital output.Transfer of information is done by the IoT i.e. Low Power Wide Area Network(LPWAN).A message or mail can be sent to the official to alert the fire department also a ranges that change on the display at the field.Similarly an alarm sound with LCD display as “FIRE DETECTED” will be seen in the forest.Zigbee transmitter and receiver are used as a main part and the microcontroller interfaces the information.Experiments show that it is capable of achieving best accuracy and less false alarms on different types of scenarios .The MATLAB visualization makes it much easier to see the variations on scale.Also the exact location will be shared by GPS to the officials.This is a low cost prototype that is very flexible and requires less than a minute to send information as the whole process involves internet and new technologies .

Occurrence of forest fires	Images of forest fire	Existing methods

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003001

California Exceeds 4 million acres burned by wildfires in 2020		The technique employs satellite drone technologies to observe wildfires at an early stage and before they grow out of management. Satellites are accustomed pinpoint probably dangerous fires and drones equipped with IR cameras.
Columbia, Canada Exceeds 1.8 million acres burned in 2019.		Drones are helped in a minimum of thirteen fires up to now, being employed primarily for mapping and hotspot detection. Drones square measure able to manufacture maps long which might be utilized by hearth and evacuation crews very first thing within morning and conjointly to try to alternate important work.
Siberia wildfires reached 2,600,000 hectares**.**		The development combines the work of processor and active operating bodies that considerably increase its potency and scope. Fireproof throwing machine will produce fire proof protecting steps with a breadth of 2 to 8 meter ranges and conjointly extinguish the sting creep hearth at a distance of up to 20m.

Table :Occurence of Fire in Forest

Figure 1: Pie chart on analysis of recent forest fire affected areas

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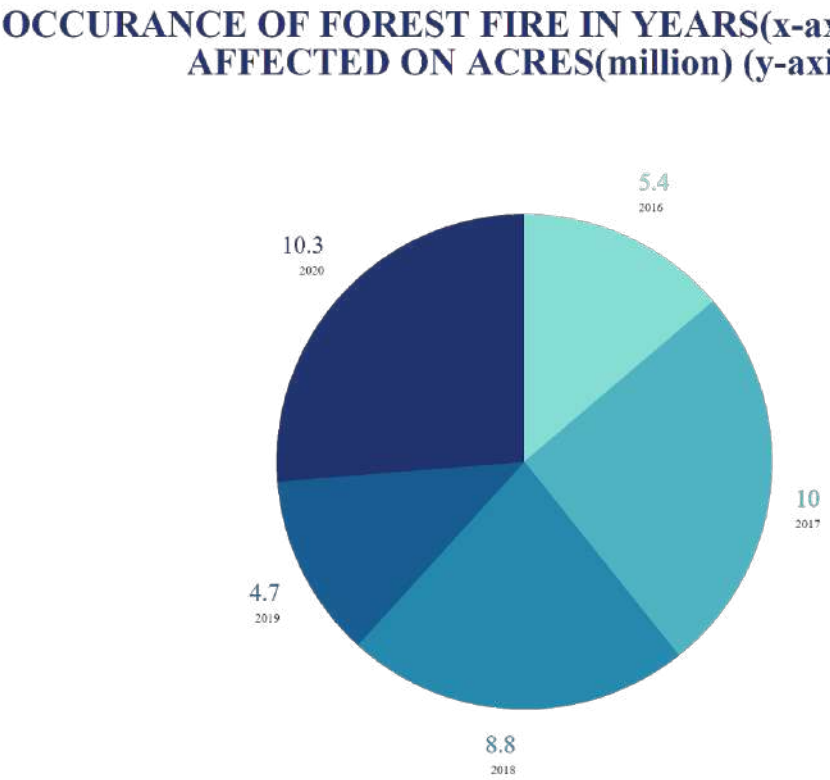
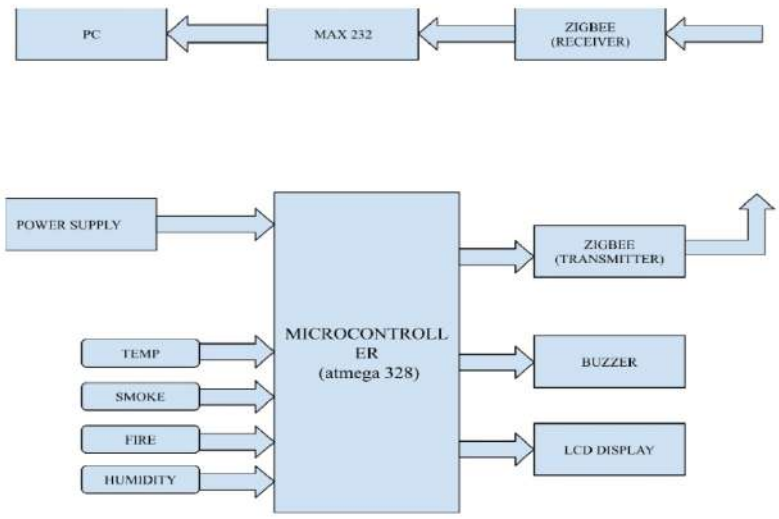
|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003001



The impact of forest fire is represented in the pie chart. It describes the occurrence of forest fires in terms of years versus the area affected in terms of acres. The above details are the analyses of recent years such as 2016, 2017, 2018, 2019, 2020.. Generally forest fire is caused by factors such as logging and forestry operations, transportation and communications, arson, natural factors and other causes.

II.SYSTEM MODEL AND ASSUMPTIONS



| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003001

The voltage regulator is programmed to keep the power constant automatically. The sensors, such as temperature, heat, and smoke, are then attached to the microcontroller (ATmega328), which is a high performance, low power controller from microchip, to detect the specific parameters. A buzzer is attached for the purpose of signalling. A warning such as FIRE DETECTED is shown on the LCD.

The Zigbee protocol is used to transfer data between wireless sensor networks. Additionally, Zigbee is used to receive data that is linked to a computer through the USB port. that sends a mail message to the forest officials The warning includes information such as the location of the area, temperature levels, and a smoke and fire observed message with an alarm. The computer is used to do tasks.

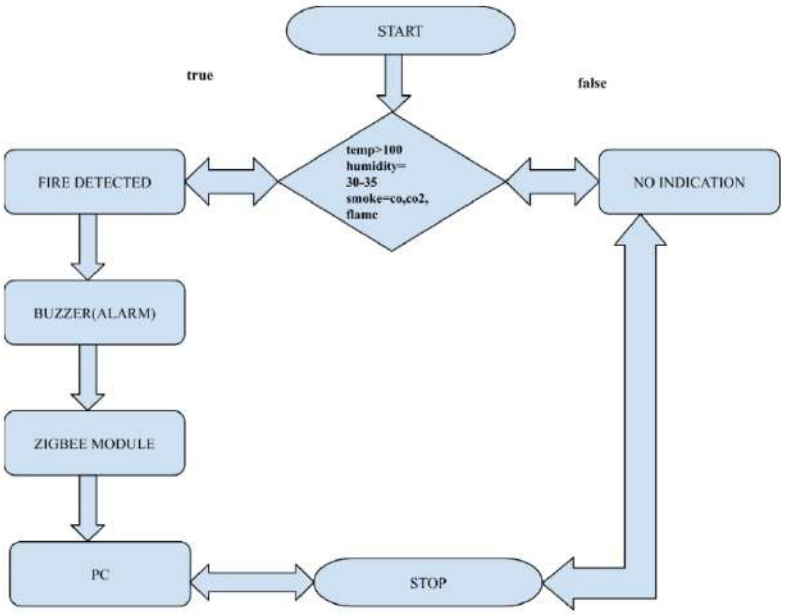
The temperature sensor (LM35) and the fire sensor each have three pins. Vcc is connected to pin 1, output is connected to pin 2, and land is connected to pin 3. The gas sensor (MQ135) has four pins. Vcc is connected to pin 1, land is connected to pin 2, and optical and analogue outputs are connected to pin 3. The Arduino Nano is a microcontroller based on the ATmega328 that is lightweight, full, and breadboard compatible. The LCD is attached to ATmega pins. 4 and 5 are bound by D2 and D3.

The fire sensor is connected to Arduino pin A0, the temperature sensor is connected to Arduino pin A1, and the smoke sensor is connected to Arduino pin A2. The pins on the LCD are attached to the Arduino. The LCD is wired to a preset resistor. A preset resistor is a smaller version of a potentiometer that is fixed on a PCB. It may be used to fine-tune or configure a circuit. When there are n components in a circuit, a preset resistor is used.

Forest fires are widespread as a consequence of unregulated anthropogenic behaviour and abnormal natural conditions.Land fire control and surveillance has become a national problem for forest fire management organisations.Sensor technology has long been used in fire detection, with physical parameters such as friction, humidity, and temperature being commonly sensed. Carbon dioxide, carbon monoxide, and nitrogen dioxide are examples of chemical parameters.

MATLAB is interface with MAX232.Coding part is done in MATLAB.The arduino takes gas,temperature and fire analog inputs through already written code .These values are converted with a formula in comparison with the reference values and displayed as an output in both LCD and pop up window on pc with corresponding ranges.By selecting the particular DO port the interfacing mechanism shows an alert to the officials.The code is written in such a way that a count can be given for the sensors to be ON so that even due to any technical delay the information will wait and then be received to the particular centre.

III.METHODOLOGY



When the power is turned on, the machine checks for parameters such as humidity, temperature, flame, and smoke. The condition will be valid and the protocol will proceed to the next stage if the parameter value changes above the range. It

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|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003001

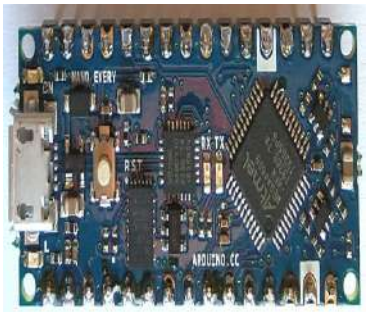
will reveal that a fire has been observed on the LCD panel, as well as a warning signal. An IoT setup is generated in which data is sent to a system using Zigbee module communication, and the parameter value is sent to a computer for display. If the condition check is incorrect, the programme will be terminated immediately.
This is a Low-Power Wide-Area Network (LPWAN) that performs extremely well. As a result, MATLAB visualisation for alarm and warning settings based on sensor data stops fire from spreading.

IV.HARDWARE DESCRIPTION

MICROCONTROLLER

A microcontroller contains one or additional CPUs along side memory and programmable input/output peripherals.ATMEGA328p is high performance,low power controller from semiconductor device.The ATMEGA328 could be a single-chip microcontroller created by Atmel within the megaAVR family(later semiconductor device Technology non heritable Atmel in 2016).It has a changed Harvard design 8-bit RISC processor core.It is the foremost common of all AVR controller because it is often employed in several comes and autonomous systems.It is most typically enforced on the favored arduino development platform,specifically the Arduino UNO and ArduinoNANO.In order to maximise performance and correspondence,the AVR uses Harvard architecture-with separate recollections and buses for program and information.

ARDUINO NANO



The ArduinoNano could be a tiny,complete and board friendly board supported the ATMEGA328p.This board will be supercharged through a type-b micro-USB cable,or through a 9v battery.It is a tiny low size board and conjointly versatile with a good style of applications.

ZIGBEE

Zigbee could be a wireless technology developed as AN open world customary to deal with the distinctive wards of affordable,low-power wireless IoTnetworks.Zigbee is easier and fewer expensive than alternative wireless personal space network.Zigbee is especially liable for aggregation and transporting the special atmosphere parameters of the forest together with temperature,humidity,fire,smoke and then on.Zigbee act as each receiver and transmitter.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

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REGULATOR

A transformer may be a system designed to mechanically maintain a relentless voltage.Depending on the look,it may be wont to regulate one or additional AC or DC voltages.Feedback transformer operates by scrutinizing the particular output voltage to some mounted reference voltage.

SENSOR

TEMPERATURE SENSOR:

A temperature device is associated device that measures the temperature of its atmosphere and converts the information|input file|computer file} into electronic data to record,monitor,or signal temperature changes.

FIRE SENSOR:

Fire detector works by police investigation heat.These devices answer the presence of extraordinarily high temperatures that square measure gift with a hearth.A hearth warning device features a range of devices operating along to find and warn folks through visual and audio appliances once fire or different emergencies square measure gift.

SMOKE SENSOR:

A smoke device may be a device that senses smoke,typically as associate indicator of fireplace.Smoke is detected either by optically or by physical method.

MAX232

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

|| Volume 10, Issue 3, March 2021 ||

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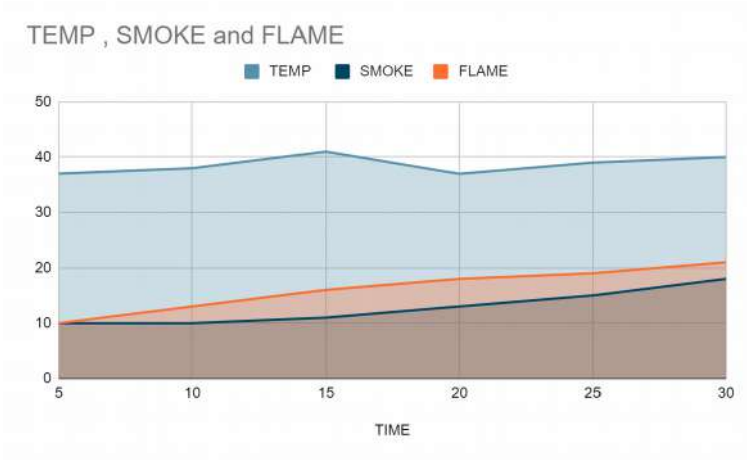
MAX232 is associate degree computer circuit that converts signals from a TIA-232 interface to signals appropriate to be used in TTL-compatible digital logic circuits.The MAX232 could be a twin transmitter/dual receiver that usually is employed to convert the RX,TX,CTS,RTS signals.

LCD

Liquid Crystal show could be a flat panel show technology.Liquid crystal show technology works by block lightweight.It is designed to project on-screen information of a digital computer onto a bigger screen.

V. RESULT AND DISCUSSION



We used the Fire Weather Index (FWI) Method to measure the fire indices. To produce an alert message, the nodes take into account this index as well as the evolution of the raw measurements, such as odd temperature increments, humidity decrements, or gas detection. In a lab setting, various fire simulations were created to detect actual fires and to see if any false alarms were raised.Based on sensed temperature rising by more than 5 degrees in less than 10 minutes and relative humidity declining by more than 10% in the same time frame, the results showed a 100 percent fire detection accuracy. During the experiments, the gas sensors observed major smoke variations in both situations (concentration changes greater than 3 percent)

VI.CONCLUSION

Forest fires are a significant problem in many countries, and global warming can exacerbate the problem. Experts believe that investing in advanced innovations and equipment that require a multifaceted approach is crucial to deter these disasters from occurring.

A WSN for early warning of forest fires is defined in this article. This network is simple to set up in high-traffic areas. We believe that this project would identify fires sooner because each node was fitted with multiple sensors to collect data such as temperature, smoke, and fire flickering in order to classify fire incidents in that area.Furthermore, if a fire is observed, a warning will be sent to the incharge officer via mail. It is capable of maintaining the highest level of accuracy and fewer false alarms in a variety of situations.

Automated applications with less manual operations are used to increase reliability and accuracy.

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IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue x, Month2021

DOI 10.17148/IJIREEICE.2021.9101

LOW COST & EFFECTIVE EARLY FOREST /BUSH FIRE DETECTION WITH WIRELESS SENSOR TECHNOLOGY USING MATLAB

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Assistant Professor, Dept of Instrumentation and Control Engineering, Saranathan College of Engineering, Trichy, India[5]

ABSTRACT :A wildfire is often caused by human activity or sometimes natural phenomenon like lightning or lava.Hence detecting fire during initial stage is vital for preventing such events.Recently huge number of technologies have shown that exploring spatial and temporal features of the sequence is important for this task.Nevertheless,since the long distance smoke usually moves slowly and lacks significant landscapes,accurate smoke prediction and detection is still a challenging task.The objective of this project work is to design and implement an IoT based real-time system which is self-sustaining and would predict and detect the forest fires and sends the exact location to concerned officials which would help fire fighting personnel to extinguish the fire in the location where it starts slowly.It also used a sprinkler which is used to to spray water with a desired pressure.This project presents a low-cost Internet of Things(IoT)prototype for fire detection in outdoor environments based on sensors and Low Power Wide Area Network (LPWAN),focused on the accuracy in the temperature and gas measurement.For this achievement , we integrated sensor components,microcontroller board, and wireless Zigbee module, following the management of information updates through MATLAB visualization for the alarm and notification settings based on the data gathered from the sensors.

Keywords: Include at least 4 keywords or phrases.

I INTRODUCTION

A wildfire is an unplanned fire that burns in a natural area such as a forest,grassland or prairie.The risk of wildfires increases in extremely dry conditions , such as drought , and during high winds. Wildfires can disrupt transportation , communications, power and gas services and water supply.They also lead to deterioration of the air quality and loss of property , crops, resources , animals and people.The main objective of this project is to detect and prevent the damages caused by the forest fire.This process is done by the wireless sensor technology (i.e)Zigbee and MATLAB.Because of some uncontrolled anthropogenic activities and abnormal natural conditions ,forest fires occur frequently.Sensor technology has been widely used in fire detection , usually depending on sensing physical parameters such as changes in pressure,humidity and temperature.

In this paper,the exact location through GPS will be used for effective communication from the forest to the officials. Zigbee module acts as a transmitter and receiver for the transfer of information.MATLAB coding consists of the algorithms written to process the data and controls the entire working of the system.Also the ports are chosen and conversion of analog to digital data is done through this algorithm.As a result the changes in temperature,smoke and light intensity is displayed in the pop up window accompanying in the LCD display as FIRE DETECTED .Through this method we can detect and warn the officials for the emergency occurred to neglect the fire.

IJIREEICE

ISSN (Online) 2321-2004
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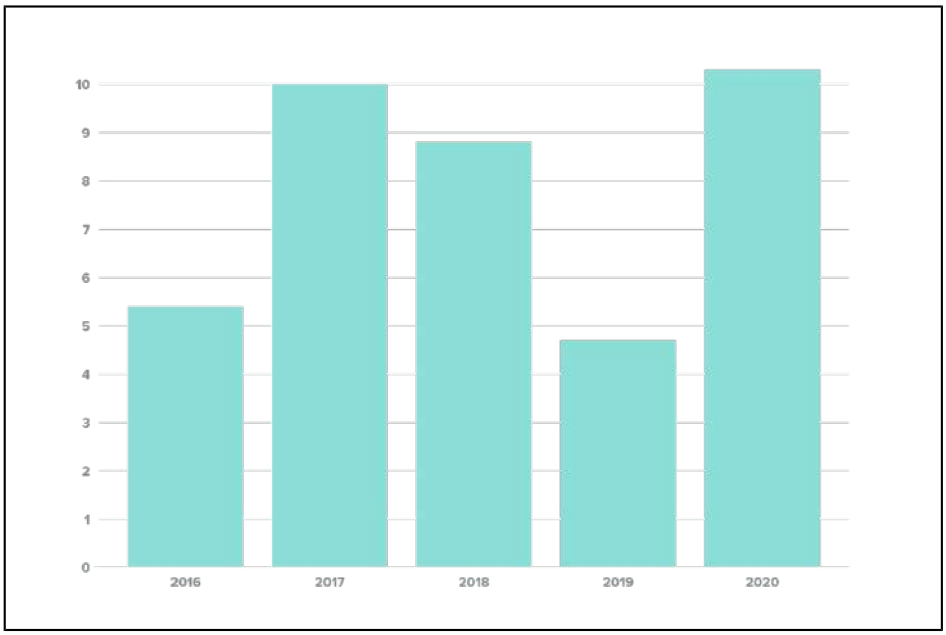

FIGURE 1 : FOREST FIRE OCCURRENCE IN YEARS(x-axis) Vs ACRES IN MILLION(y-axis)

Countries	Places	Areas affected
Asia	Uttarakhand Forest Fire Siberia Wild Fire	1.5 million hectares
Europe	Chernobyl Exclusion zone wild fires	1 million hectares
United States	California Wild Fires Nevada Wild Fires New Mexico Wild Fires Washington Wild Fires Utah Bush fires Oregon Forest Fires	10 million hectares
Oceania	Australian bushfire season	1.2 million heactares

TABLE 1: COUNTRIES FACING FOREST FIRE WITH TOTAL AREA AFFECTED

A wildfire, bushfire, wildland fire or rural fire is an unplanned, unwanted, uncontrolled fire in an area of combustible vegetation starting in rural areas and urban areas.Wildfires are among the most common forms of natural disaster in some regions, including Siberia, California and Australia.. Areas with mediterranean climates or in the taiga biome are particularly susceptible. Fossil charcoal indicates that wildfires began soon after the appearance of terrestrial plants 420 million years ago. The occurrence of wildfires throughout the history of terrestrial life invites conjecture that fire must have had pronounced evolutionary effects on most ecosystems' flora and fauna. Earth is an intrinsically flammable planet owing to its cover of carbon-rich vegetation, seasonally dry climates, atmospheric oxygen, and widespread lightning and volcanic ignitions

IJIREEICE

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II SYSTEM MODEL AND ASSUMPTION

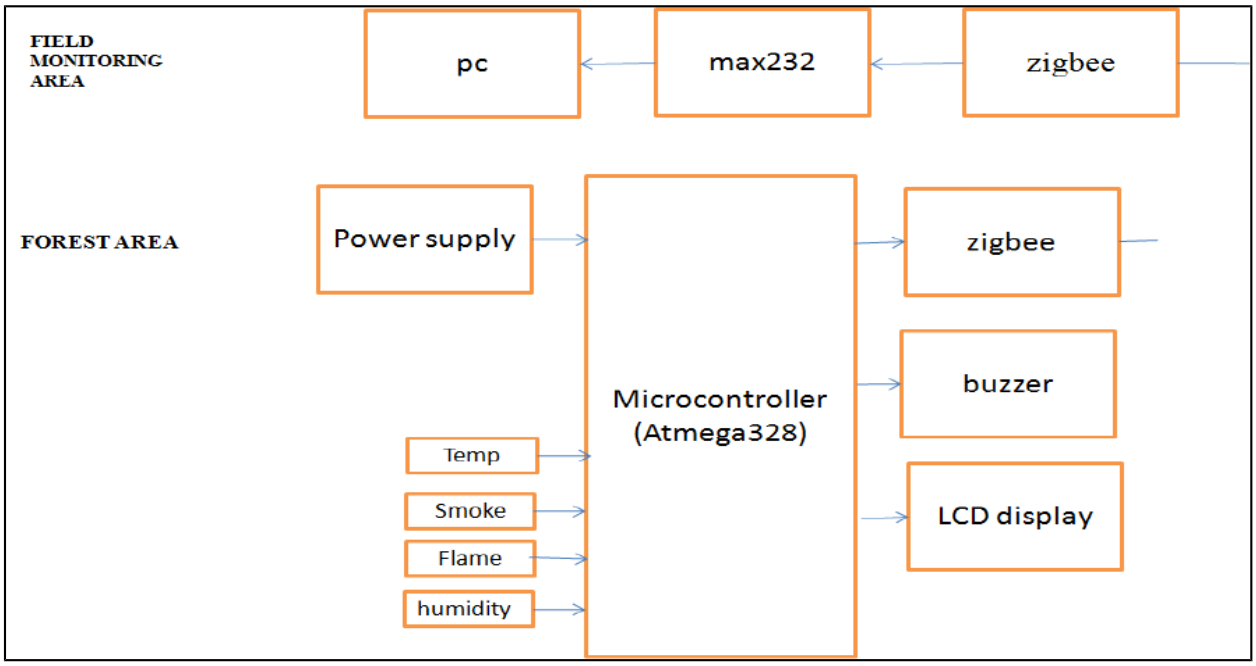

FIGURE 2: SCHEMATIC DIAGRAM OF FOREST FIRE DETECTION WITH WIRELESS TECHNOLOGY

WORKING PRINCIPLE :

The voltage regulator is designed to automatically maintain the constant power. Then the sensors such as temperature, fire and smoke are connected to the microcontroller(ATmega328) to detect the particular parameters which is high performance, low power controller from microchip.Buzzer is connected for the indication purpose. LCD is used to display an alert as FIRE DETECTED. ZIGBEE is the main component which is used for transmitting and receiving purposes.

Zigbee is used to transfer the data which is connected to wireless sensor networks .Also Zigbee is used to receive the data which is connected to pc through the USB port.which gives an output as mail to the forest officials. The mail consists of the following information such as location of that area, ranges of the temperature, smoke and fire detected message with an alert.The pc is used to perform the MATLAB coding.

Temperature sensor (LM35) and fire sensor consists of 3pins .pin1 for Vcc , pin2 for output pin3 for ground. Gas sensor(MQ135) consists of 4pins. pin 1 for vcc, pin2 for ground,pin3,4 for digital and analog outputs and they are interconnected.TheArduinoNano is a small, complete, and breadboard friendly based on ATmega328. ATmega pins are connected to the LCD. D2 and D3 are connected to 4 and 5 of the LCD. D4,D5,D6,D7 are connected to DB4,DB5,DB6.DB7. The last two pins of the LCD are connected to 5v and ground respectively. Coding is performed on the MATLAB platform and is interfaced with the ATmega328 through the USB.

Fire sensor is connected to A0 of Arduino,Temperature sensor is connected to A1 of Arduino and smoke is connected to A2 of Arduino.Arduino is connected to the respective pins of LCD.Preset resistor is connected to the LCD.A preset resistor is a smaller PCB mounted version of a potentiometer.It is useful for adjustment or configuration of a circuit .Preset resistor are used in circuits when it is necessary to alter the resistance.

IJIREEICE

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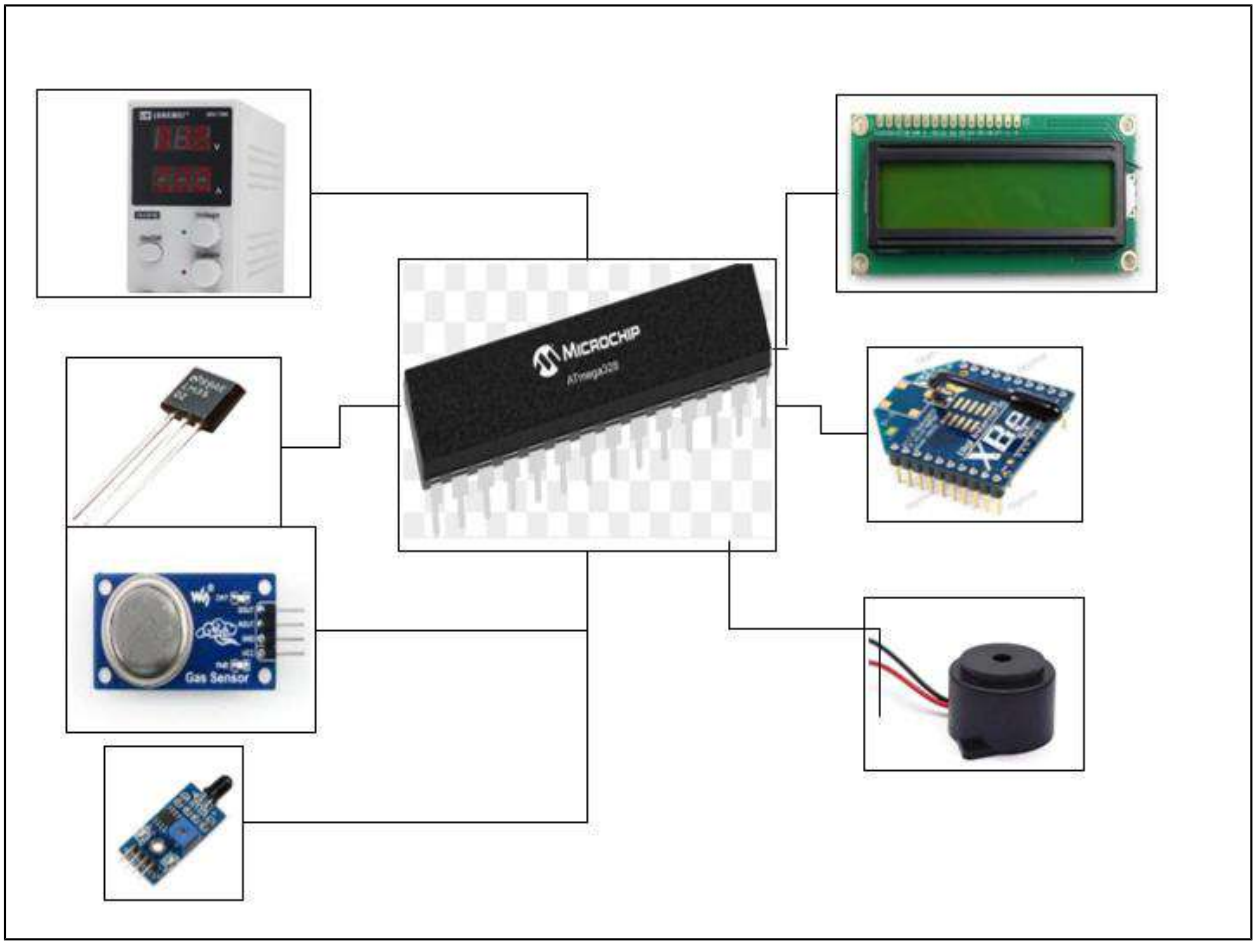
III HARDWARE DESCRIPTION



MICROCONTROLLER

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ARDUINO NANO

The ArduinoNano is a small,complete and breadboard friendly board based on the ATMEGA328p.This board can be powered through a type-b micro-USB cable,or through a 9v battery.It is a small size board and also flexible with a wide variety of applications.

ZIGBEE

Zigbee is a wireless technology developed as an open global standard to address the unique needs of low-cost,low-power wireless IoTnetworks.Zigbee is simpler and less expensive than other wireless personal area network.Zigbee is mainly responsible for collecting and transporting the special environment parameters of the forest including temperature,humidity,fire,smoke and so on.Zigbee act as both receiver and transmitter.

REGULATOR

A voltage regulator is a system designed to automatically maintain a constant voltage.Depending on the design,it may be used to regulate one or more AC or DC voltages.Feedback voltage regulator operates by comparing the actual output voltage to some fixed reference voltage.

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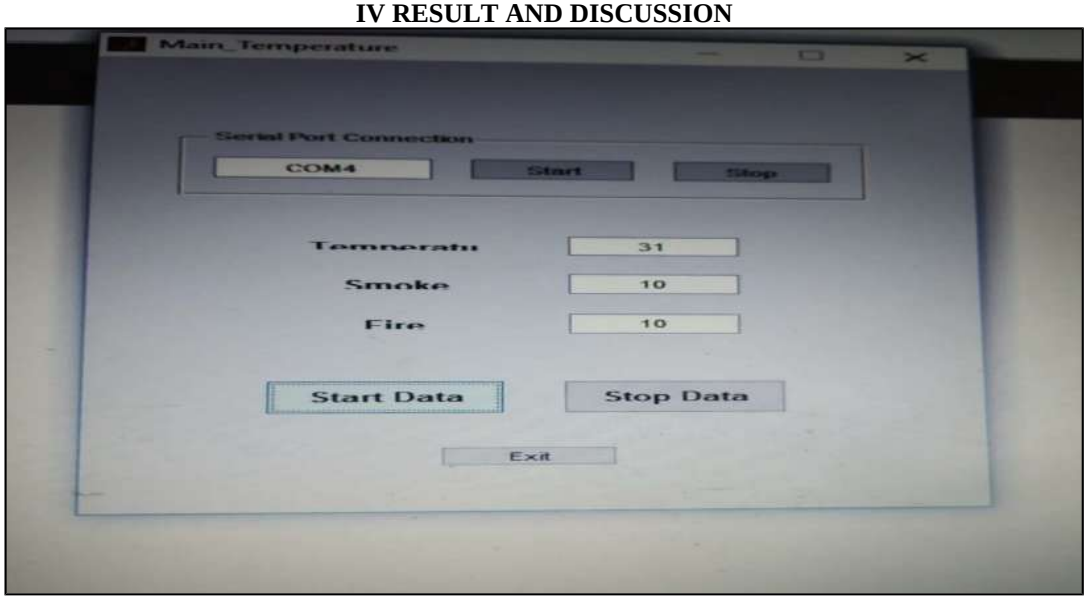
SENSOR

TEMPERATURE SENSOR:A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record,monitor,or signal temperature changes.

FIRE SENSOR: Fire sensor works by detecting heat.These devices respond to the presence of extremely high temperatures that are present with a fire.A fire alarm system has a number of devices working together to detect and warn people through visual and audio appliances when fire or other emergencies are present.

SMOKE SENSOR:A smoke sensor is a device that senses smoke,typically as an indicator of fire.Smoke can be detected either by optically or by physical process.

IV RESULT AND DISCUSSION



In the fig it shows the matlab result

we computed the fire indexes according to the Fire Weather Index (FWI) System. The nodes take into account this index and the evolution of the raw measurements like abnormal temperature increments, humidity decrements, or gas detection, to generate an alarm message. Different fire scenarios were generated in a laboratory environment to detect real fires and check if false alarms were also raised. Results exhibited a 100% fire detection accuracy based on sensed temperature increasing more than 5 in less than 10 minutes and relative humidity decreasing more than 10% in the same period. The gas sensors detected in all cases significant smoke changes during the tests (c**oncentration changes greater than 3%)**

V CONCLUSION

Forest fires are a very serious problem in many countries, and global warming may contribute to make this problem worse. Experts agree that, in order to prevent these tragedies from happening, it is necessary to invest in new technologies and equipment that enable a multifaceted approach.This paper describes a WSN for early detection of forest fires. This network can be easily deployed at areas of special interest or risk.

We conclude that this project will detect the fire earlier, each node was provided with many sensors to get the parameter such as temperature, smoke, fire flickering to define fire incidents in that place.

Adding additional if the fire is detected the notification will be sent via mail to the incharge officer. It is capable of achieving best accuracy and less false alarm on different types of scenarios.

Automated systems are used which have less manual operation so that the flexibility is high and accurate.

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IJIREEICE

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IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Volume 10, Issue 3, March 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.122

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003029

Design and Analysis of PI Controller for A Two Tank Non-Interacting Process System

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ABSTRACT: The objective of the work is to maintain the level in the closed loop at desired set value. This paper emphasisan implementation of internal mode control (IMC) to obtain an optimal PI control setting for non-interacting. System identification of the process is done by process reaction curve method. T**he conventional PI controller cannot reach satisfactory result. The gain parameters of PI control are obtained by IMC tuning method.** Initially, a Proportional Integral (PI) controller based on IMC-PI setting is designed and the results are compared with Ziegler Nichols (ZN), Skogestad controller settings. The robustness of the controllers are endorsed by imposing both servo and regulatory disturbances. The simulation results confirm that IMC-PI controller has improved dynamic performance disturbance rejection.

KEYWORDS: PI Control, Non-interacting process, System Identification, Tuning methods, Servo and regulatory disturbances and Performance indices**.**

I. INTRODUCTION

ThisIndustrial control problems are usually non-linear in nature and have multiple control variables. The systems involved in such industrial process show significant uncertainties, non-minimum phase behaviour and a lot of interactions. The two tank system is a benchmark system used to analyse the nonlinear effects in a multivariable process. This helps in realizing the multi loop systems in industries. The part dealt with the level process by the four-tank system where the experimentation done in non-interacting process. The main objective is to enable PI Controller in real time with the suitable controller which provides efficient control action.

II.NON-INTERACTING PROCESS

A physical system can be represented by first order process connected in series the outlet flow from first tank is an inlet flow to second tank. In non-interacting process, the flow of R1 depends only on h1. The variation in h2 in tank 2does not affect the transient response curve

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

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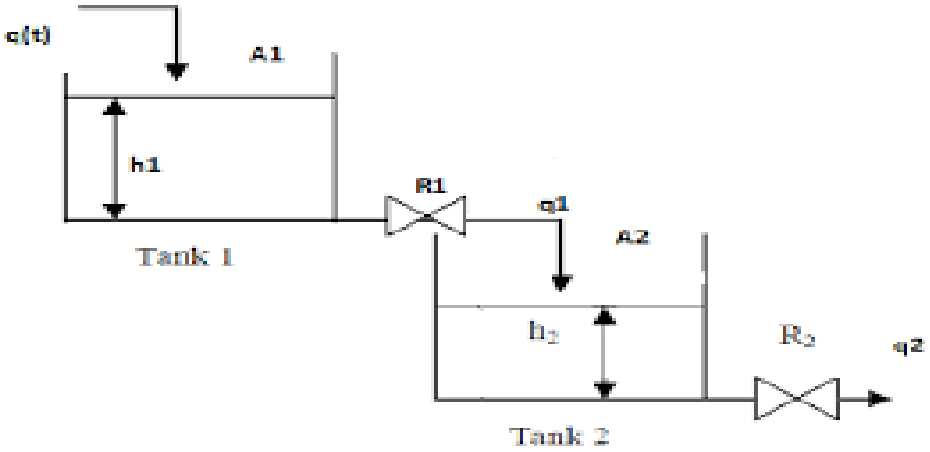

Figure 1 Schematic representation of non-interacting system

The transfer function of tank 1 and tank 2, the general transfer function is

$$\frac{H2(S)}{Q(S)} = \frac{1}{C_1 S + 1}\frac{R_2}{C_2 S + 1}$$

With the transfer function of non-interacting process, the procedures of system identification and control tuning process is carried out in MATLAB.

III.SYSTEM IDENTIFICATION AND CONTROL TUNING PROCESS

I.SYSTEM IDENTIFICATION

Process Reaction Curve Method:

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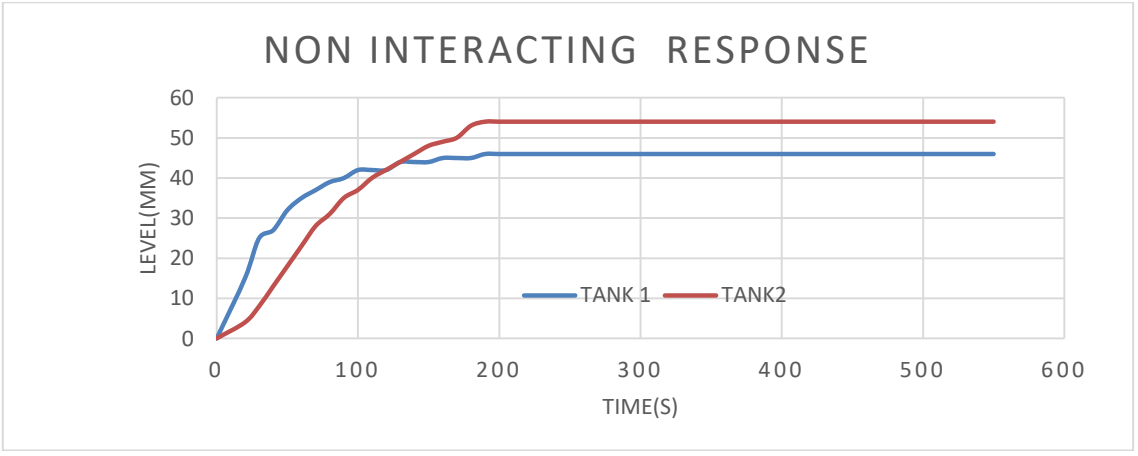

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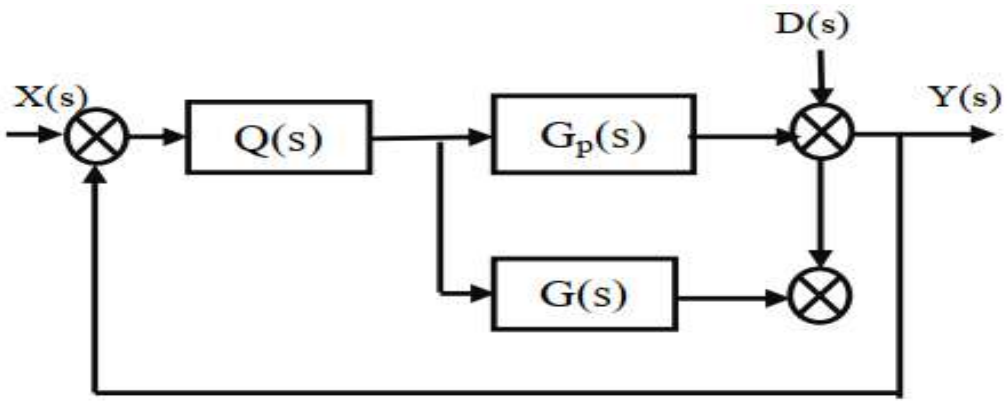

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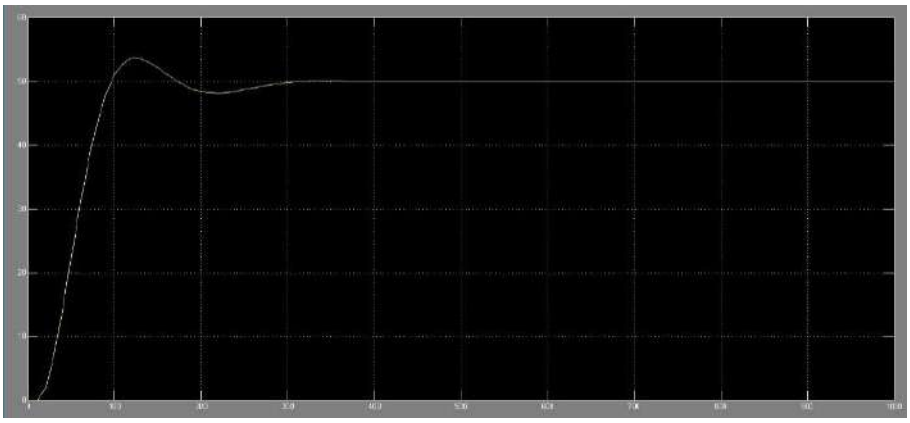

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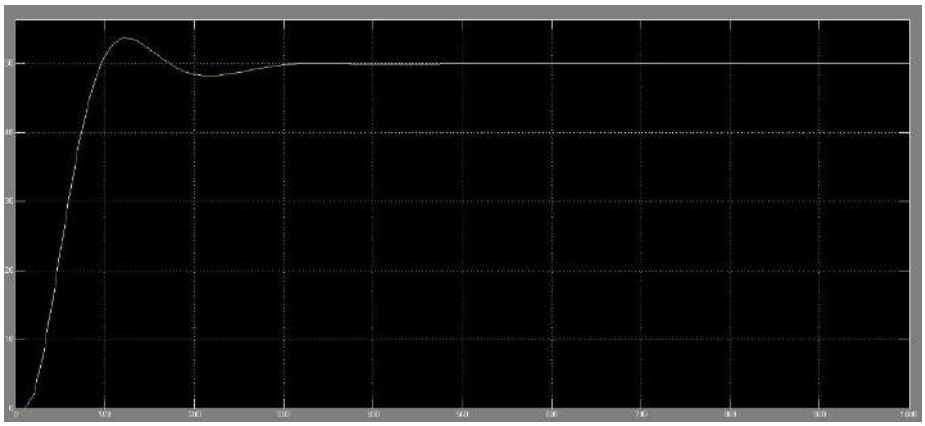

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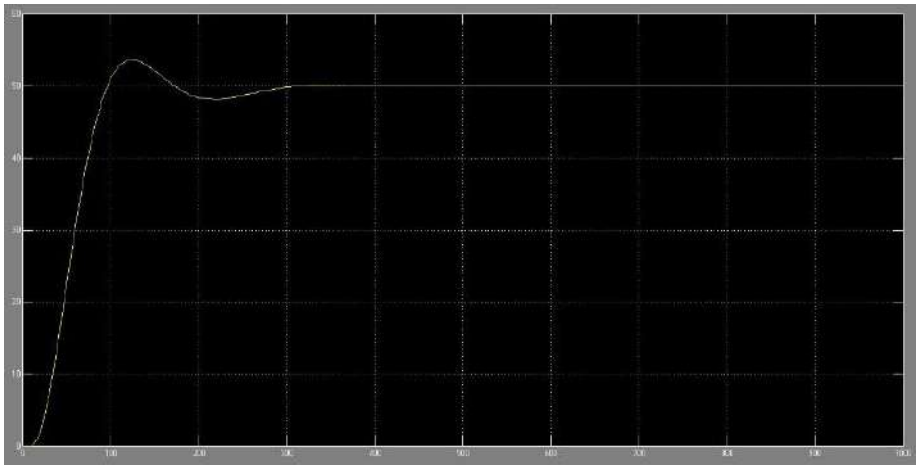

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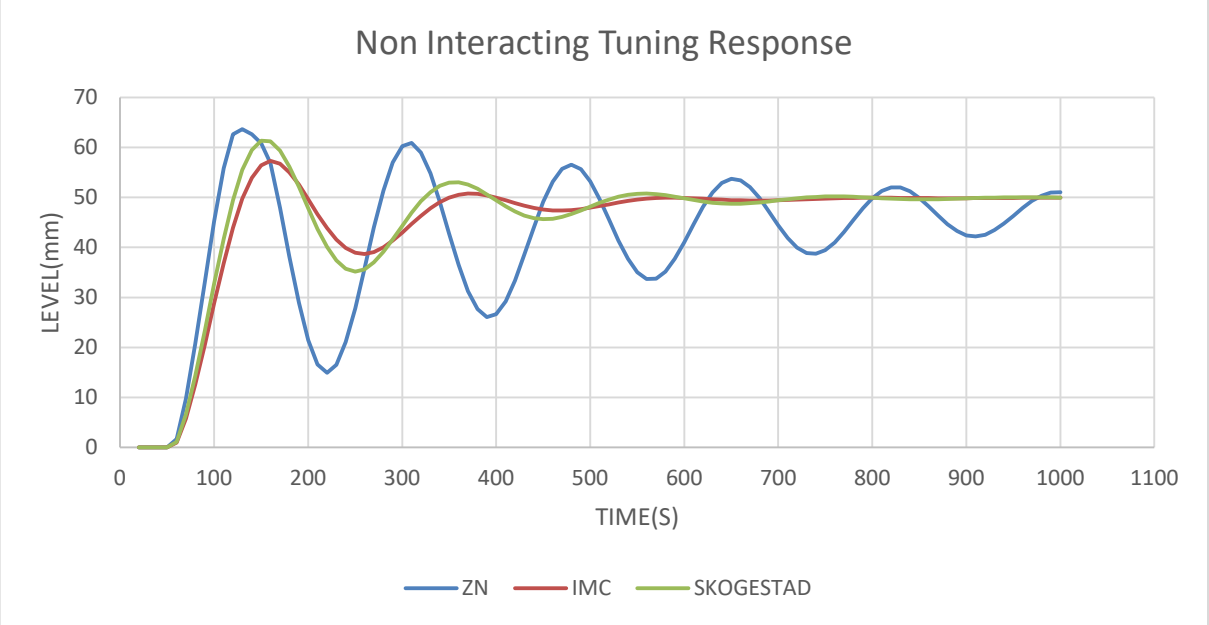

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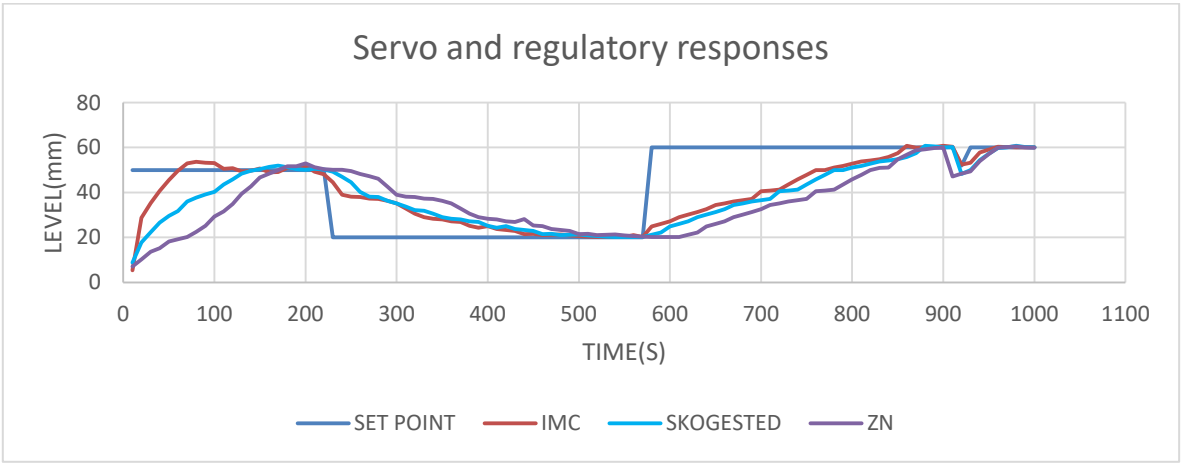

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We have proposed an effective method to design the PI controller that can be implemented in real time level process. The result is shown that IMC-PI controller have given good results than ZN-PI and SKOGESTAD-PI controller. From the consequences, the response of IMC was shown satisfactory in terms of ISE, IAE and MSE when compared to the ZN-PI and SKOGESTAD-PI setting. From the response, it is witnessed that the IMC-PI tracks the setpoint with less oscillation when compared to ZN-PI and SKOGESTAD-PI setting. The simulation results has proven that IMC-PI control setting is more effective way in disturbance rejection and to enhance the stability of system.

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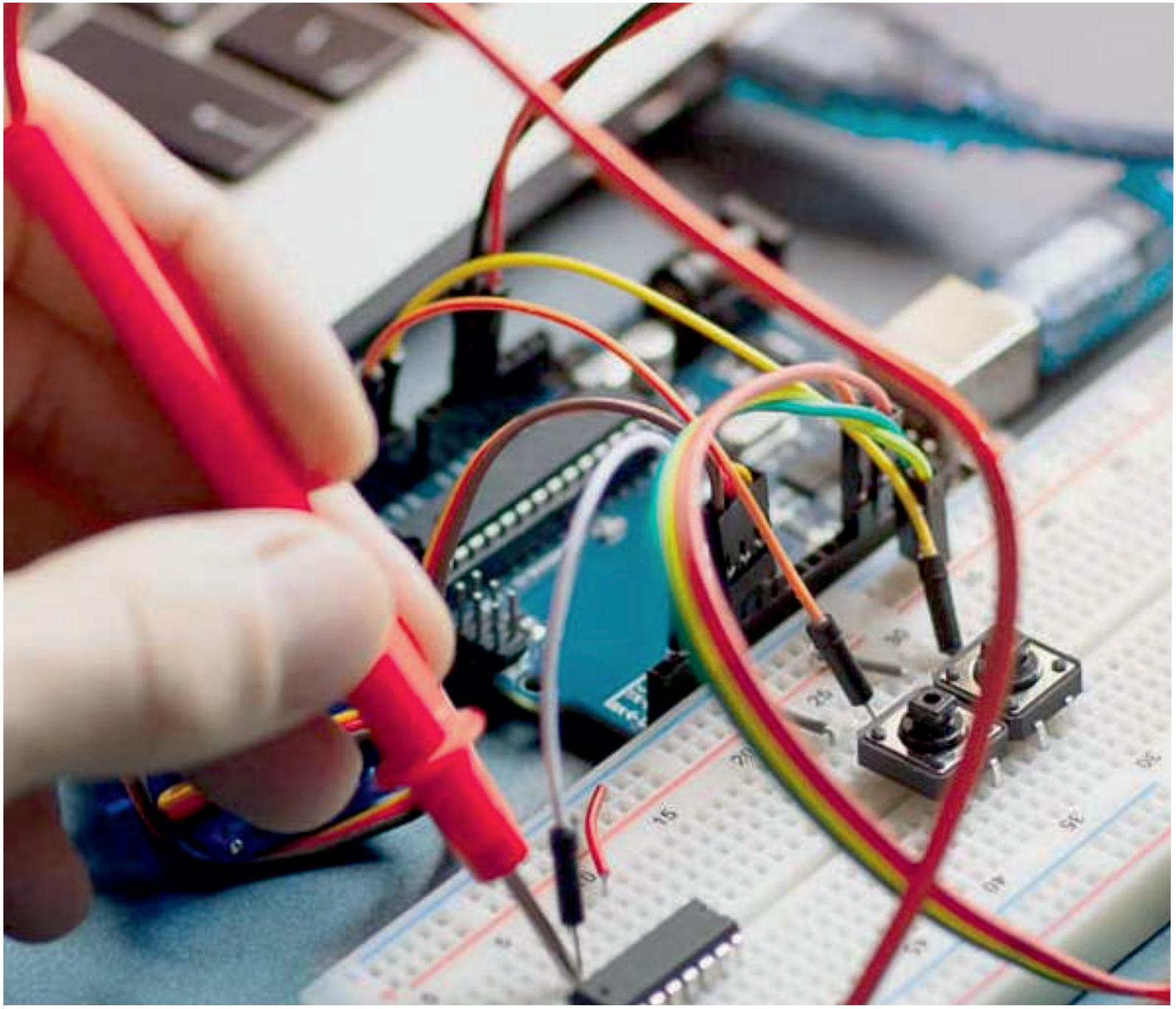

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ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

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International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

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IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 4, April 2021

DOI 10.17148/IJIREEICE.2021.9401

IMC based PI controller for a two tank interacting process system

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S.M. GIRIRAJ KUMAR[4], **ARAVIND P** [5]

Student, Dept of Instrumentation & Control Engineering, Saranathan College of Engineering, Trichy, TN, India[1,2,3]

Professor, Dept of Instrumentation & Control Engineering, Saranathan College of Engineering, Trichy, TN, India[4]

Assistant Professor, Dept of Instrumentation & Control Engineering, Saranathan College of Engineering, Trichy, TN, India[5]

Abstract: The objective of the work is to maintain the level in the closed loop at desired set value. This paper emphasis an implementation of internal mode control (IMC) to obtain an optimal PI control setting for interacting. System identification of the process is done by process reaction curve method. T**he conventional PI controller cannot reach satisfactory result. The gain parameters of PI control are obtained by IMC tuning method.** Initially, a Proportional Integral (PI) controller based on IMC-PI setting is designed and the results are compared with Ziegler Nichols (ZN), Skogestad controller settings. The robustness of the controllers are endorsed by imposing both servo and regulatory disturbances. The simulation results confirm that IMC-PI controller has improved dynamic performance disturbance rejection.

Keywords: PI Control, Non-interacting process, System Identification, Tuning methods, Servo and regulatory disturbances and Performance indices**.**

I. INTRODUCTION

This Industrial control problems are usually non-linear in nature and have multiple control variables. The systems involved in such industrial process show significant uncertainties, non-minimum phase behaviour and a lot of interactions. The two tank system is a benchmark system used to analyse the nonlinear effects in a multivariable process. This helps in realizing the multi loop systems in industries. The part dealt with the level process by the four-tank system where the experimentation done in non-interacting process. The main objective is to enable PI Controller in real time with the suitable controller which provides efficient control action.

II.NON-INTERACTING PROCESS

A physical system can be represented by first order process connected in series the outlet flow from first tank is an inlet flow to second tank. In non-interacting process, the flow of R1 depends only on h1. The variation in h2 in tank 2does not affect the transient response curve

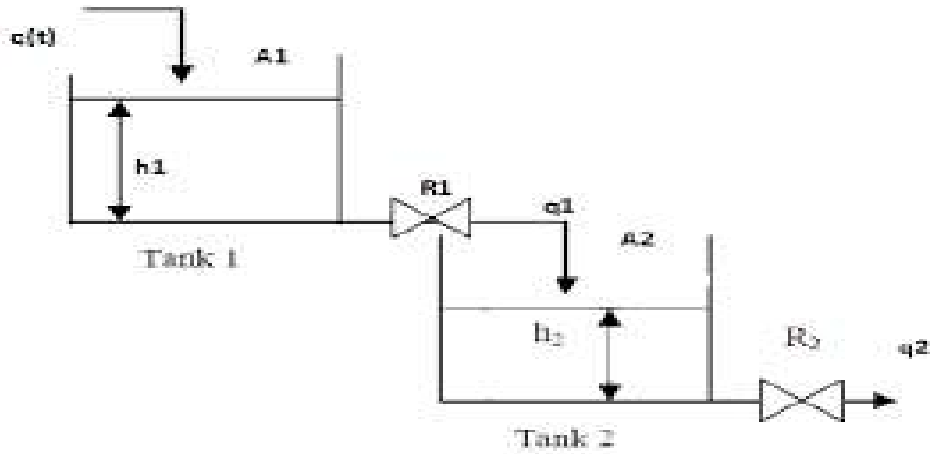

Figure 1 Schematic representation of non-interacting system

IJIREEICE

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The transfer function of tank 1 and tank 2, the general transfer function is

$$\frac{H2(S)}{Q(S)} = \frac{1}{C_1 S + 1}\frac{R_2}{C_2 S + 1}$$

With the transfer function of non-interacting process, the procedures of system identification and control tuning process is carried out in MATLAB.

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I.SYSTEM IDENTIFICATION

Process Reaction Curve Method:

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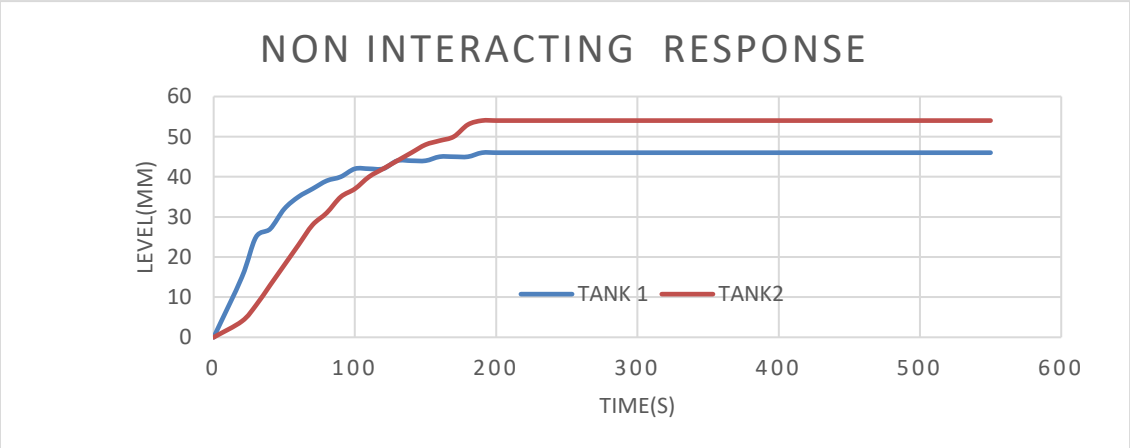

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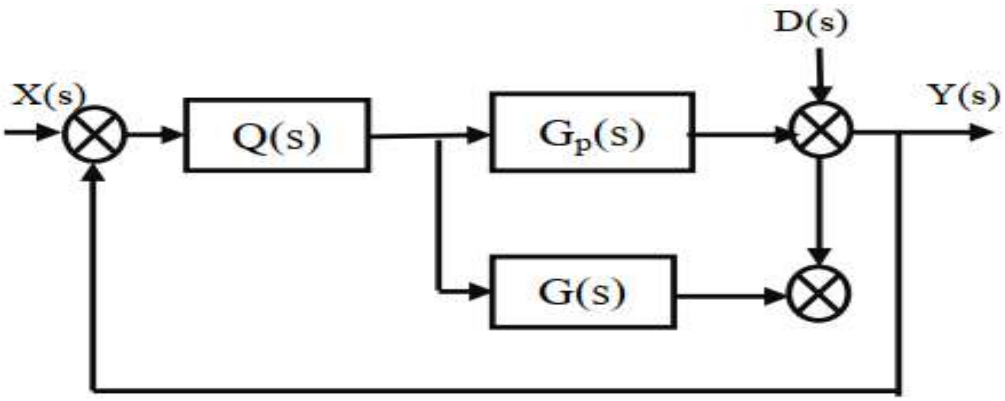

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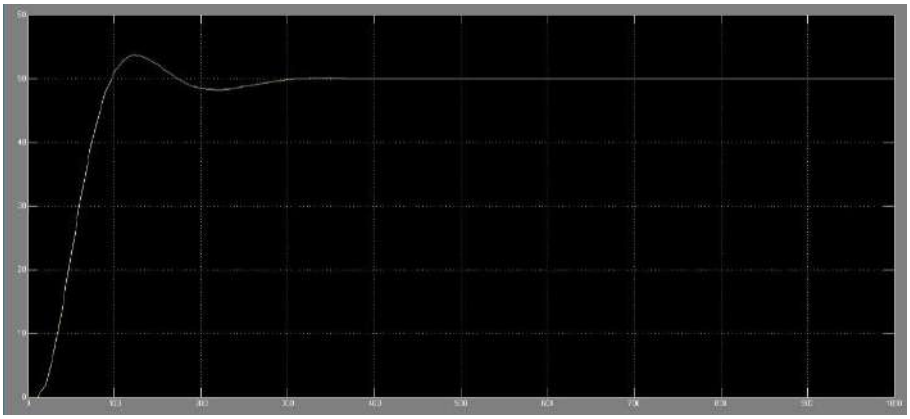

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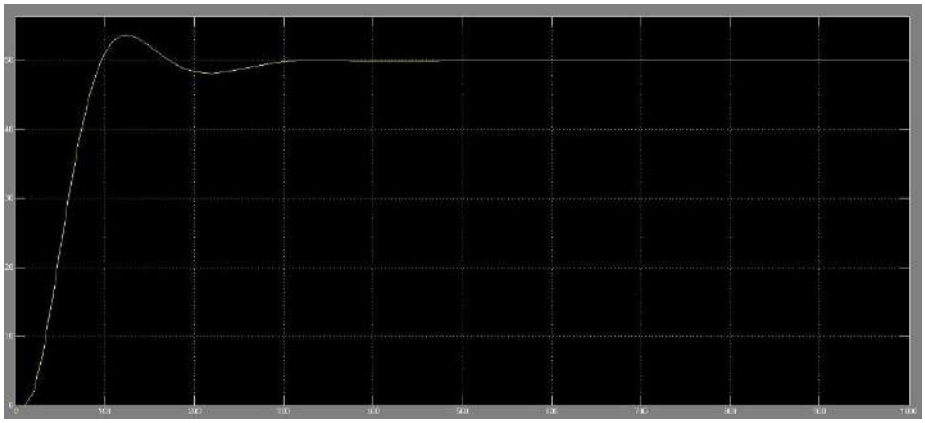
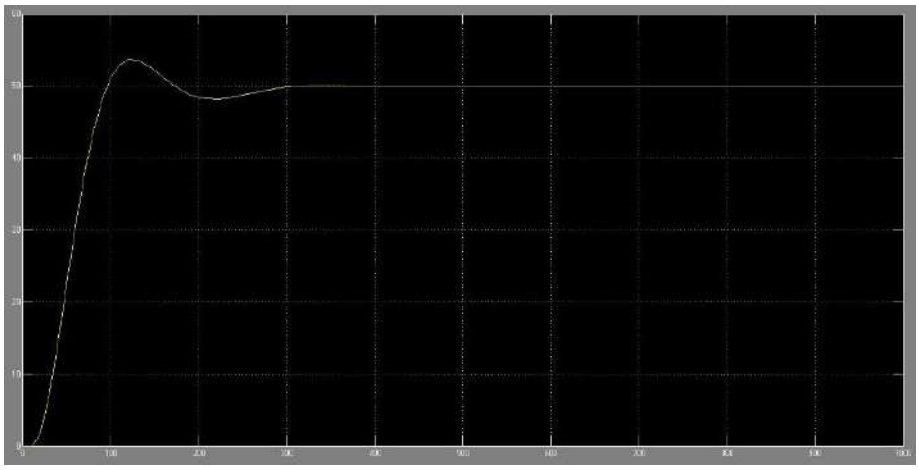


Figure 5 ZN TUNING RESPONSE



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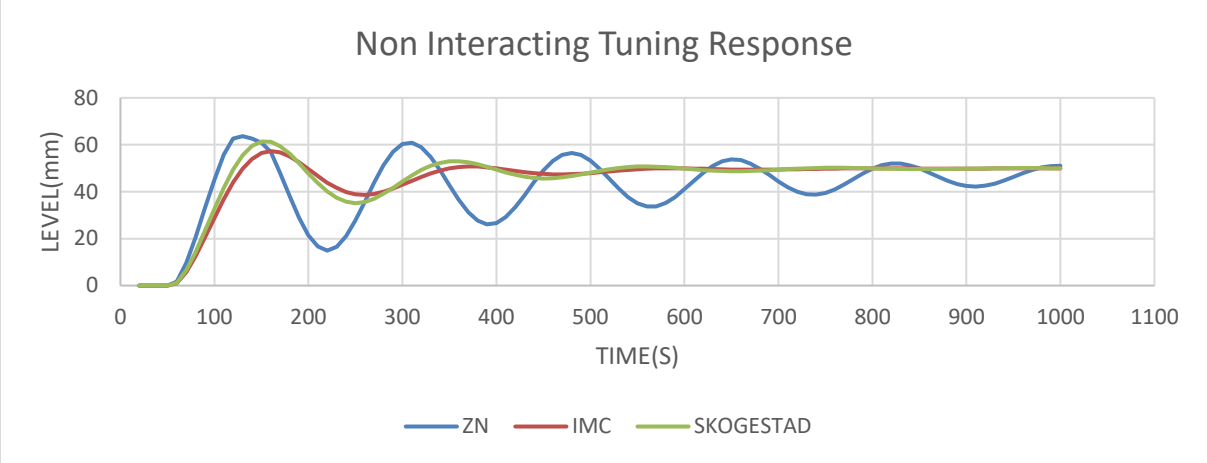

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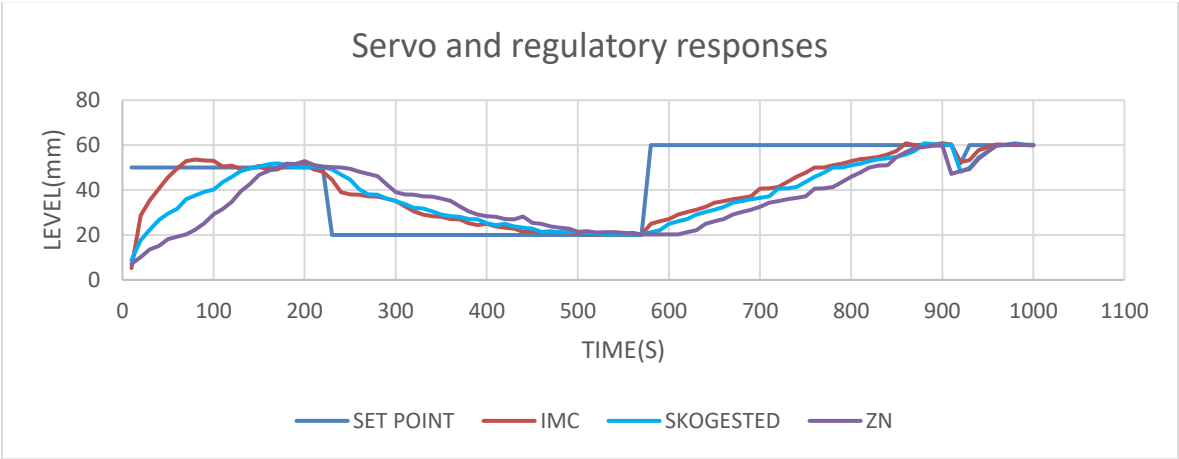

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IJIREEICE

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Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9312

Automatic Drip Bottle Exchange System Using Electric Solenoid By LabVIEW

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Student, Department of Instrumentation and Control Engineering, Saranathan College of Engineering, Trichy, India[2,3,4]

Abstract: In day to days lifestyle, the drip bottle injection plays a most vital role in saving the patient's life. As the level of diabetic, accident survivors and other causality out patients getting increased, the amount of dripping glucose bottle will also get increased. Drips are so important that the required nutrients for the patients and the supplements are sometimes passed through drip bottle and other things including daily fluid to people who cannot drink water during surgery and also to maintain patient's hydration and blood sugar levels. In this project, the level of the drip bottle and the temperature of the patient's body is monitored by LabVIEW and the information is passed to mobile through IoT technology. The level of the fluid is sensed by sensors and the data is passed to LabVIEW. In most of the hospitals, the drip bottle will be emptied and the another one will be exchanged by attendants. We are making to involve the automation in this area by exchanging the next drip bottle automatically. For this we use electric solenoid for exchanging the drip bottles automatically.

Keywords: LabVIEW, IoT, Cloud computing, Sensors, Data Monitoring, Electric Solenoid

I.INTRODUCTION

The system is Designed as a smart glucose drip bottle which can intimate and control the glucose flow automatically in hospitals. It is used to prevent the back flow of blood to the glucose bottle. It helps in reducing human work and to switch the next glucose bottle automatically if bottle is emptied. If Attendant in Hospitals have forgotten to change the Glucose drip bottle at once it emptied, it would bring a bad consequence to the Patient's health. An alerting signal like sound alarms for replacing the glucose drip bottles is being used in very few hospitals. The sound alarms may not be heard by Attendants at sometimes, if they are not too near to the Patient. Obviously, the sound cannot be increased in the hospital zone. Hence, Replacing the sound alarms with the alerting phone message may be considered as an efficient method. So, the level sensor is used to sense the level of the glucose in the drip bottle. The sensed level will be sent to the mobile through Wi-Fi module. The measured level will be displayed both in LabVIEW and Cloud Server and the time of the level also will be monitored and stored.

II.LITERATURE REVIEW/SYSTEM MODEL

S.NO	PAPER TITTLE	AUTHOR-YEAR	OBSERVATION
1	Automatic Indication level of Glucose System in Glucose trip bottle	S.Gayatri , et al; - 2019	Alert message sending to nurse method
2	Remote Monitoring the glucose bottle Level in Hospitals	S.Ram Kumar, et al; - 2018	GSM and alarm used to indicate Glucose level
3	Intravenous Fluid Level Indicator	A. Arulious ,2017	Load sensor used to detect the glucose level

In this module, the flow monitoring system is designed with glucose bottles. Each Glucose bottles are connected with Solenoid valves to each other. PIC Controller board and level sensors are interfaced with glucose bottles.

The Glucose level is observed by PIC Controller along with it patient's Body temperature and they are measured by corresponding sensors which are interfaced with PIC Controller and these values are stored in LabVIEW also. The PIC Controller is connected to pass the information to the server which is the cloud storing IoT technology.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

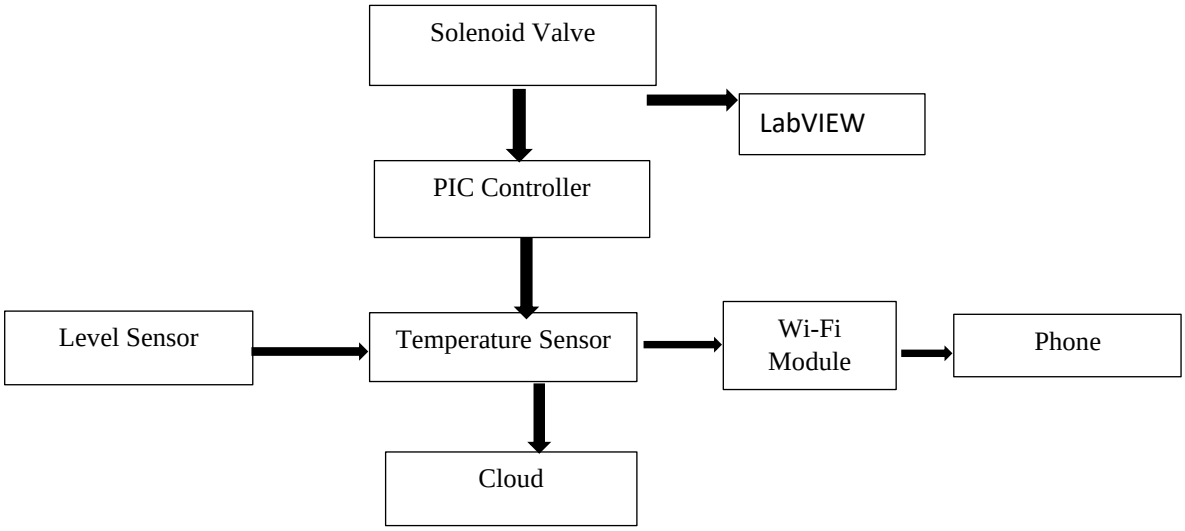
International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9312

This data with (4) Stop Message send to user by Wi-Fi Module (i.e.) Starting of Bottle (1) Stopping of Bottle (1) and Starting of Bottle (1) and Stopping of Bottle (2) each (4) Message sending with Patient details also to user.

FLOW CHART



Once the module Started collecting the patient details such as Body temperature, level are measured by their sensors. These details are stored in server by IoT technology and the drips will start to flow is controlled by solenoid valve through PIC controller.

Whether Glucose will flow or not also it's flow Speed controlled by flow control Mechanism that is the flow values sensing mechanism. After Starting of first Bottle dripping ((i.e.) flow feedback is normal Means) the Message (i.e.) Bottle (1) dripping Started and normal Message with Patient details (Body temperature) send to user.

In case any Problem occurs((i.e.) flow rate value is high/solenoid valve not work properly fault/error Message will send to user. After Bottle (1) tripping completion, if flow rate value is not coming for Particular time delay Means Bottle (1) is Completed.

First Solenoid valve starts to deenergized and after deenergizing valve will Starts for some Time Example one Minute Second Bottle Solenoid will be getting energized and again it's flow rate and flow Speed are sensed and Controlled by flow Control mechanism if everything Normal Means System Start and Normal Message will send to user with Patient, Body temperature output, else fault/error Message will send to user. From which attendants will monitoring the patient's temperature and fluid level periodically.

All details including flow rate, level of Glucose Bottle, Solenoid valve number, Patient Body temperature Periodically Stored in cloud by LabVIEW.

Here Wi-Fi Module is used to send Message to user four times only (i.e.) 1) Bottle (1) Starts Normal/error and 2) Bottle (2) Starts Normal/error and 3) Bottle (1) completion 4) Bottle (2) completion with all-time Patient details.

III.COMMUNICATION

IoT (internet of things) is used to communicate the sensor data's with other devices for messaging purposes. The Internet of Things (IoT) is a modern technology that describes the network of physical objects "things" that are interface with sensors, software, controllers and other technologies for connecting and share data's with other device and store data's through internet or Local area network (LAN) using CLOUD storing technology. Here communication is connected between PIC Controller and mobile device through IoT Think speak server technology. In this model, we have used "Think Speak"-IoT web server is a web based(server) open application IoT source that carried data's to store and retrieve in future from the cloud source or Local Area Network as a communication server. Think Speak provides instant visualizations of data inferred by your device through internet. Think Speak stores the data from sensor that analyse and visualize with software. In this module, information collected by Think speak technology is pass to other devices like mobiles etc. for alerting purposes. Think speak communication act as "Data packet" which is interface with "PIC Controller". The server will store the data's and the data's in cloud will be stored as permanently and then the data's can be used to communicate with other device like mobile etc... We can easily send sensor data's to other modules. In this sensor data's are processed and will be send to mobile from cloud through IoT. Communication is easy in this module because of modern IoT.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9312

IV.SCOPE OF MODEL

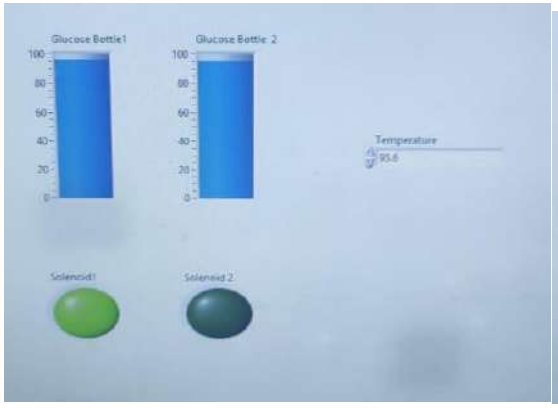
The Fluid level and body temperature is monitored periodically and visualized in graphical representation in LabVIEW software. Automatically exchange drip bottles once it emptied through mechanical actions like Electrical solenoid valve. Communication server is used to store and retrieved data's and alert messages will also be sent to the mobiles though IoT.

V.RESULT

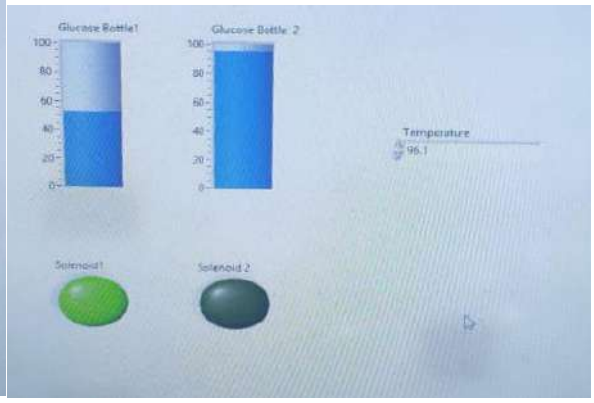
The output of our model shows in figure

Glucose 1

Full level:

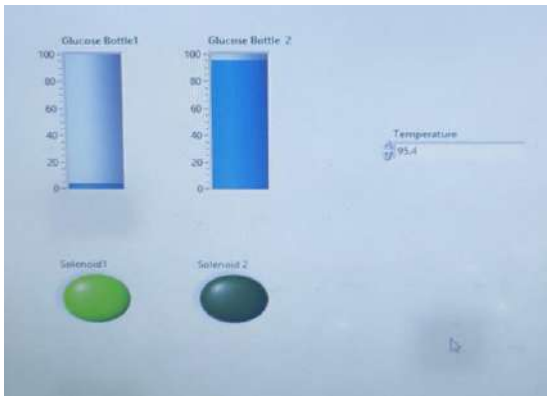


Medium level:

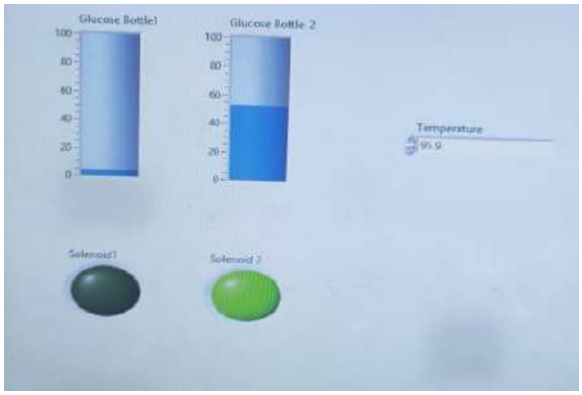


Glucose 2:

Full level:



Medium level:



VI.FUTURE SCOPE

In future, we have an idea to add GSM module for alerting in SMS methodology along with some extra patient monitoring parameters like heart rate measurement, Blood pressure monitoring, flow rate monitoring and pulse rate measurement will be monitored periodically.

VII.CONCLUSION

We have developed a model with sensors for monitoring level and temperature with LabVIEW. In addition, with that drip bottle exchange by solenoid valve is a major part in our module. For communication, IoT technology using web server (Wi-Fi module) is used for efficient communication.

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IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Volume 10, Issue 3, March 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.122

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003018

Smart Automatic Drip Bottle Exchange System Using LabVIEW

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Assistant Professor, Department of Instrumentation and Control Engineering, Saranathan College of Engineering, Trichy, India[4]

ABSTRACT: Now a days, Drip bottle injection is one of the most commonly practised procedure to aid in treating a person. Modern lifestyle has led to a dramatic increase in health condition such as diabetics, irregular blood pressure, heart condition etc., which need frequent assistance of drip bottle injection during clinical procedure. Drip injection also plays a major role in aiding patients with proper hydration, sugar level and intake of essential fluid needed for recovery. In this project, the level of the bottle is monitored by LabVIEW and the information is passed to mobile through IoT technology. The level of the fluid is sensed by level sensors and the data's are shared to LabVIEW. We use cloud computing to handle bulk data's without any reductions in efficiency. The common procedure to replace the empty drip bottle is by manually replacing them with the help of the attenders which is not efficient all the time. To avoid any error or lack of attention by the attenders which leads to patient's wellbeing, we incorporate the techniques of automation by utilizing anelectric solenoid to replace the empty bottle with a new one at the right time.

KEYWORDS: LabVIEW, IoT, Cloudcomputing, Sensors, Data Monitoring, Electric Solenoid

I. INTRODUCTION

If Attendant in Hospitals have forgotten to change the Glucose drip bottle at once it emptied, it would bring a bad consequence to the Patient's health.An alerting signal like sound alarms for replacing the glucose drip bottles is being used in very few hospitals. The sound alarms may not be heard by Attendants at sometimes, if they are not too near to the Patient. Obviously, the sound cannot be increased in the hospital zone. Hence, Replacing the sound alarms with the alerting phone message may be considered as an efficient method. So the level sensor is used to sense the level of the glucose in the drip bottle. The sensed level will be sent to the mobile through Wi-Fi module. The measured level will be displayed both in LabVIEW and Cloud Server and the time of the level also will be monitored and stored.

II. LITERATURE REVIEW/SYSTEM MODEL

S.NO	PAPER TITTLE	AUTHOR-YEAR	OBSERVATION
1	Automatic Indication level of Glucose System in Glucose trip bottle	S.Gayatri , et al; - 2019	Alert message sending to nurse method
2	Remote Monitoring the glucose bottle Level in Hospitals	S.Ram Kumar, et al; - 2018	GSM and alarm used to indicate Glucose level
3	Intravenous Fluid Level Indicator	A. Arulious ,2017	Load sensor used to detect the glucose level

In this module consists two Glucose bottles with flow monitoring system. Each Glucose bottle connected by Solenoid valves (each one). These valves are connected with PIC Controller and level sensors.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

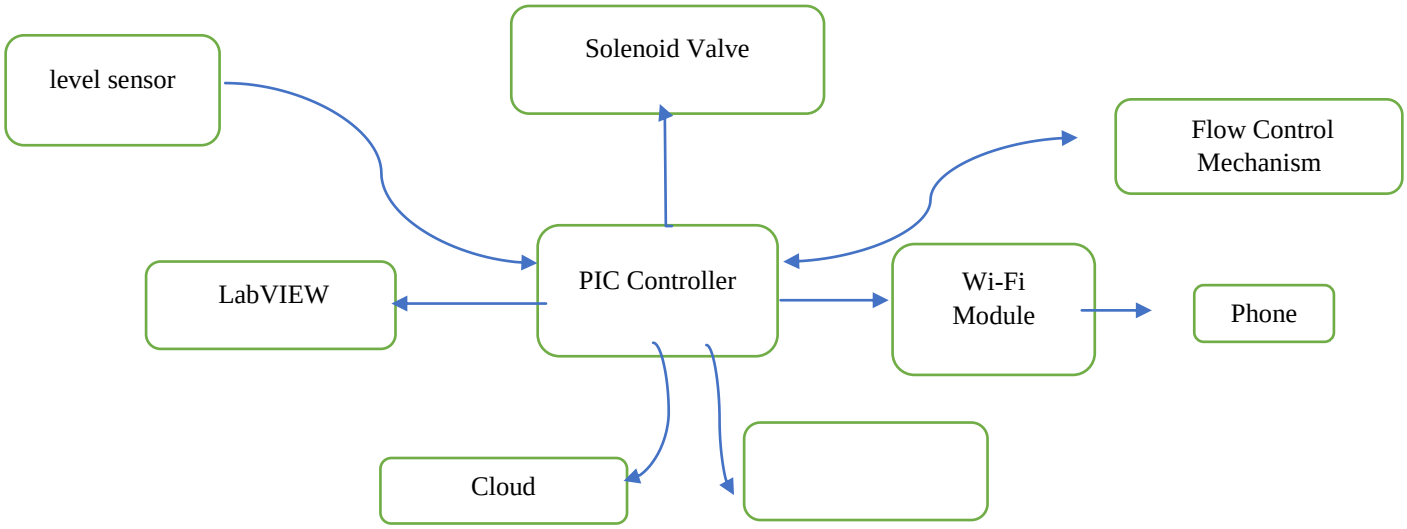
||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003018

The Glucose level is observed by PIC Controller along with-it patient's Body temperature and they are measured by corresponding sensors which are interfaced with PIC Controller and these values are stored in LabVIEW also. The PIC Controller is connected to pass the information to the server which is the cloud storing IoT technology.

This data with (4) Stop Message send to user by Wi-Fi Module (i.e.) Starting of Bottle (1) Stopping of Bottle (1) and Starting of Bottle (1) and Stopping of Bottle (2) each (4) Message sending with Patient details to user.

Block Diagram



Once the module Starts first patient details (i.e.) Body temperature is measured by sensor. These details are stored in server by LabVIEW and after that solenoid valve (1) getting energized by PIC Controller and tripping will starts.

Whether Glucose willflow or not also it's flow Speed controlled by flow control Mechanism that is the flow values sensing mechanism. After Starting of first Bottle dripping ((i.e.) flow feedback is normal Means) the Message (i.e.) Bottle (1) dripping Started and normal Message with Patient details (Body temperature) send to user.

In case any Problem occurs((i.e.) flow rate value is high/solenoid valve not work properly fault/error Message will send to user. After Bottle (1) dripping completion, if flow rate value is not coming for Particular time delay Means Bottle (1) is Completed.

First Solenoid valve starts to deenergized and after deenergizing valve will Starts for some Time Example one Minute Second Bottle Solenoid will be getting energized and again it's flow rate and flow Speed are sensed and Controlled by flow Control mechanism if everything Normal Means System Start and Normal Message will send to user with Patient, Body temperature output, else fault/error Message will send to user. From which attendants will monitoring the patient's temperature and fluid level periodically.

All details including flow rate, level of Glucose Bottle, Solenoid valve number, Patient Body temperature Periodically Stored in cloud by LabVIEW.

Here Wi-Fi Module is used to send Message to user four times only (i.e.) 1) Bottle (1) Starts Normal/error and 2) Bottle (2) Starts Normal/error and 3) Bottle (1) completion 4) Bottle (2) completion with all-time Patient details.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 3, March 2021||

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III. COMMUNICATION

The Internet of Things (IoT) is a modern technology that describes the network of physical objects "things" that are interface with sensors, software, controllers and other technologies for connecting and share data's with other device and store data's through internet or Local area network (LAN) using CLOUD storing technology. In this model, we have used "Think Speak"-IoT web server is a web based(server) open application IoT source that carried data's to store and retrieve in future from the cloud source or Local Area Network as a communication server. Think Speak provides instant visualizations of data inferred by your device through internet. Think Speak stores the data from sensor that analyse and visualize with software. Think speak communication act as "Data packet" which is interfaced with "PIC Controller". The server will store the data's and the data's in cloud will be stored as permanently and then the data's can be used to communicate with other device like mobile etc.., .The primary feature of Think Speak communication is "channel" that have field for data, location and status of data's which stored in Think Speak. We can easily send sensor data's to other modules. In this sensor data's are processed and will be send to mobile from cloud through IoT. Here two way of communication is possible one with graphical representation (LabVIEW) and other with status of data's through cloud.

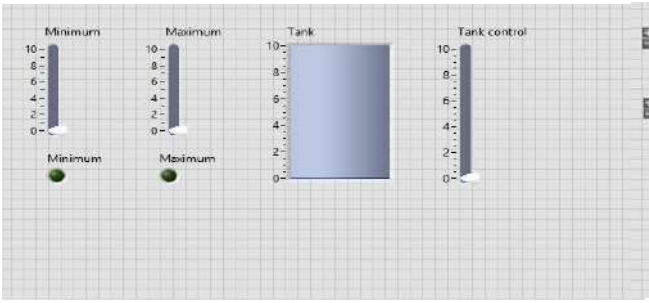
IV. SCOPE OF MODEL

The Fluidlevel and Temperature is monitored periodically and visualized in graphical representation in LabVIEWsoftware. Automatically exchange drip bottles once it emptied through mechanical actions like Electrical solenoid valve. Communication server is used to store and retrieved data's and alert messages will also be sent to the mobiles though IoT.

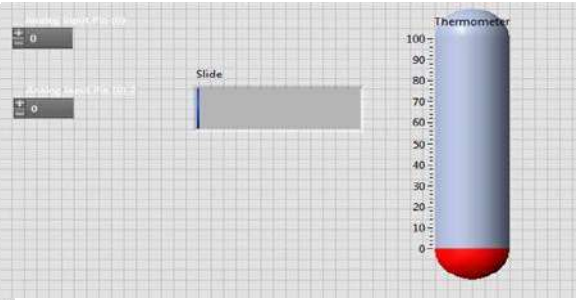
V. RESULTS

The figure shows the output of level and Temperature using LabVIEW

LEVEL MEAUREMENT



TEMPERATURE MEASUREMENT



VI. CONCLUSION

We have developed a model in which we sense temperature, flow, level and monitor by LabView with PICController. Through our model the fluid flow control through solenoid valve and if the drip bottle gets emptied next bottle exchange by opening next valve automatically. From which we monitoring as well as automatically exchange the bottle. The data's from sensor pass to alerting devices through IoT Think speak web server technology.

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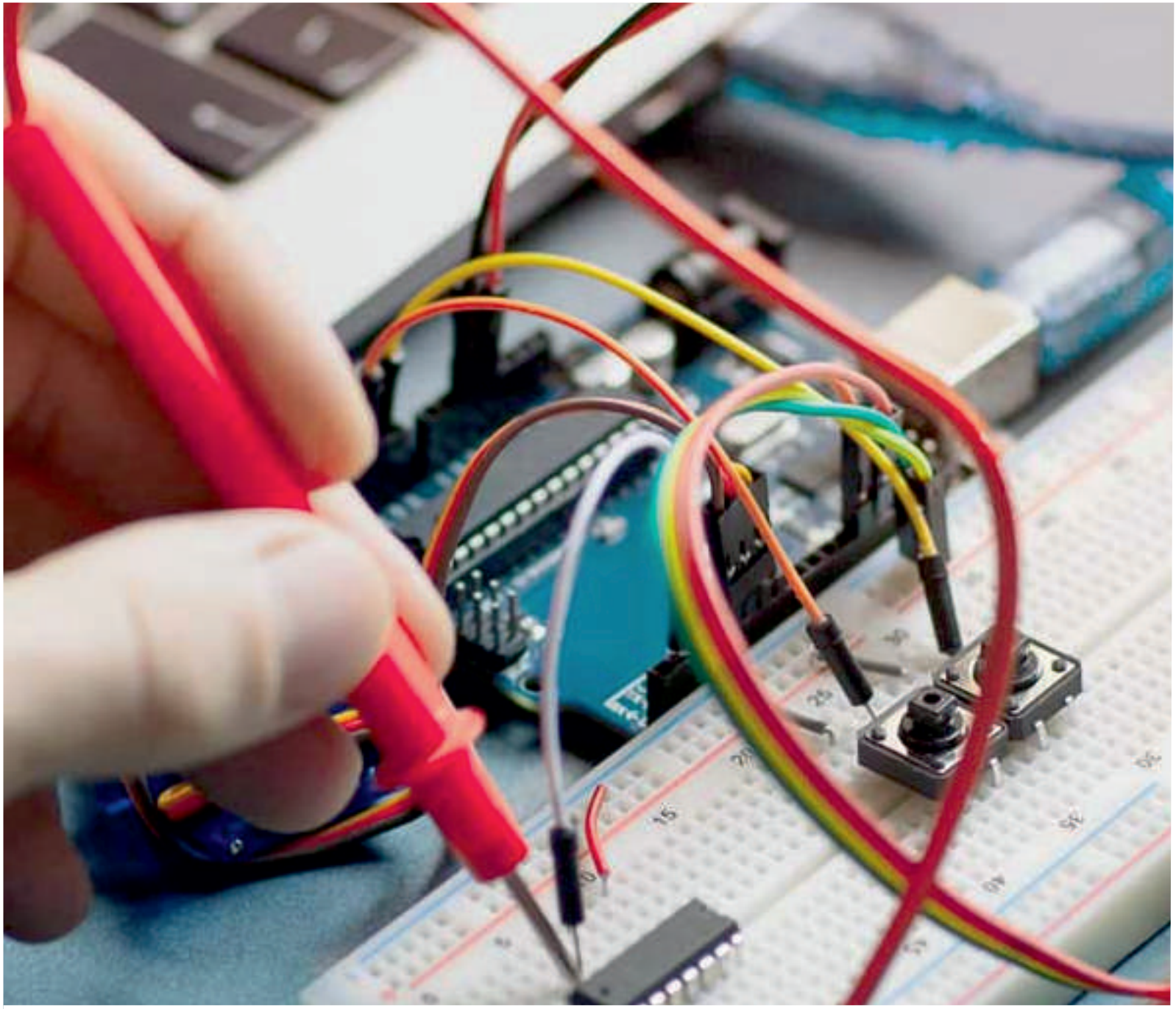

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Impact Factor:
7.122

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

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International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

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IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9313

Solar powered water skimming robot with remote control Access

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Abstract: As we likely know about all the water bodies are polluted and they are used for releasing untreated sewages and strong waste. Most of the waste is unloaded in the lake, stream of other water resources. The rubbish which are arranged in the water bodies like lakes, streams, in light of which the water get dirtied which we can't use that water for our daily use and the water will similarly get wasted. To vanquish this issue, we have arranged a skimming robot to assemble the refuse which are gliding on water. This assignment is similarly successful and work on the sun-based energy, no external force supply is required. A battery of 12v is utilized to store the energy which accumulated by the sun-based plate, by then this battery will use this set away energy to work all out boat. The essential mark of this thought is to diminish labour and time use for cleaning the stream. This paper proposes such modest framework. It utilizes customized android application, microcontroller (NodeMCU-ESP8266) and a hand-off leading body of 2 yield channels, the orders are encoded by the application and it imparts the control sign to the hand-off board through microcontroller. At long last, the framework is associated with a Wi-Fi network which makes the framework as Internet of Things (IoT) The machine is generally a boat sort of thing which will glide on the water body to gather the light and skimming waste present in the water

Keywords: water skimming robot, trash collector, Remote control robot, eco-friendly robot, Wi-Fi module, Node MCU(ESP8266)

INTRODUCTION

Clean water is a fundamental necessity for each living being. however, water tainting is the most certifiable natural perils that we face today. Our lakes and stream are logically getting contaminated. Pivoting the effect of water defilement is amazingly inconvenient and can require quite a while to dispense with every one of the dangerous substances from the water. Moreover, a more noteworthy number of work and monetary arrangement would be expected to clean something similar. Rubbish is a huge issue generally speaking thought. This issue is seen by the affiliations that assists with fixing this issue, similar to Ocean Conservancy, this is a non-advantage environmental affiliation which is arranged in Washington, D.C., United States. The affiliation gives a record in 2013, that over the span of ongoing years, almost 9.5 million volunteers have taken out nearly 165 million pounds of waste from more than 330,000 miles of coastline and streams in 153 countries and regions. They have likewise expressed that, at present more than 10 million pounds of garbage along very nearly 20,000 miles of coastlines were gathered by more than 5lakhs people.

The innovative system that we propose offers an amazing and robotized way to deal with handle water tainting by discarding actual work likewise growing capability and diminishing the cost and time required. The central mark of this skimming waste task is to gather the waste which coasts on water bodies likewise keeping the water clean consequently diminishing pollution. This undertaking being far off worked is constrained by our advanced cell. we use DC engines to anticipate the bearings. To make the boat self-sensible we have coordinated Solar sheets which would charge the battery. Wire measure net is used for garbage assortment.

SOFTWARE

The android application is created by utilizing the open-source stage called MIT App Inventor. MIT App innovator is a web application coordinated improvement climate, at first gave by Google, and now kept up by the Massachusetts Institute of Technology (MIT). It grants rookies to PC programming to make application software(apps) for two working frameworks (OS): Android (working framework) |Android, and iOS, it is free and open-source programming released under Multi-approving. It uses a graphical UI (GUI) generally equivalent to the programming language Scratch (programming language) and the Star Logo, which licenses customers to move visual articles to make an application that can run on cells. In making App Inventor, Google drew upon basic before research in enlightening handling, and work done inside Google on online improvement conditions.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9313

SI.No	Button pressed	Operation
1.	Forward button	Moves forward
2.	Left button	Moves left
3.	Right button	Moves right
4.	Backward button	Moves back
5.	No button pressed	Stop / stand still

Table 1. operation of mobile application

Fig .1 Mobile application interface

DATABASE

A continuous information base is one that stores information and brings information from it rapidly. A Realtime Database is a cloud-supported educational record. Information is dealt with as JSON plan and synchronized consistently to each associated customer. Precisely when you make cross-stage applications with IOS, Android, and JavaScript SDKs, most of your clients' benefit depends upon one Realtime Database case and henceforth getting refreshes with the most current information. The verification includes in firebase let the approved client to get to their application. Firebase gives login through Gmail, GitHub, Twitter, Facebook and additionally allows the expert to make custom endorsement. Data set in firebase is a cloud-based educational assortment and needn't sit around idly with SQL-based requests to store and get information. The information base is fundamentally solid since it keeps the information even the association is lost.

METHODOLOGY

The sun beam's occurrence on sun-oriented boards and it changes light energy over to electrical energy. This produced energy is put away into the battery, the stockpile is taken from battery to all gadgets and electrical gadgets. The microcontroller is customized to provide orders to change the movement of the boat, pivot of transport line and so on This boat will absolutely work by sunlight-based energy so no outside power supply is required. The Wi-Fi module is associated with the microcontroller and can be worked by utilizing a User Defined portable application i.e., Wi-Fi regulator application. The four engines will work as it gets the order from Microcontroller.

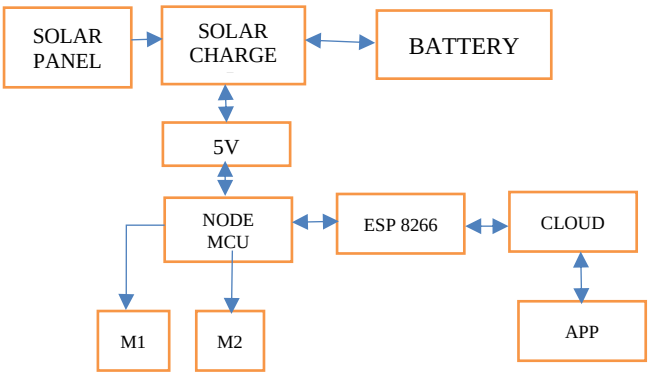

Fig. 1. System architecture

The Wi-Fi is utilized to work in a wide reach up to 50m. A Float is utilized to adjust the pack. This unit is likewise intended to clean oil slick in water for that water and oil separator is utilized to isolate oil from water. The ultrasonic sensors will distinguish the impediments utilizing communicating and getting signals which impart this sign to Microcontroller. Microcontroller provides order to engines and afterward to transport and propeller. At that point the

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9313

transport will begin turning which will gather the trash through water. The transport line will move the trash to the trash can. The compartment additionally comprises of an ultrasonic sensor which will detect the degree of trash. As the trash increments past the level, it will give a sign to Microcontroller which will provide order to engines to quit gathering the trash by transport line. The reserve season of the battery is 2-3 hours around evening time. We can build the working hours according to our necessity by expanding the size of battery

OPERATION

The portable application is associated with the google firebase through the IP address to convey the signs between the microcontroller and the versatile application. At the point when the forward button is squeezed the condition of the relay1 and relay2 will be changed to high and the robot will push ahead. in the event that the forward button is delivered the condition of the relay1&relay2 will be changed to low, because of this the robot will quit moving.

At the point when the left catch is squeezed the condition of the relay1 will be changed to high and the condition of the relay2 will be changed to low, because of this the robot will turn towards left. At the point when the correct catch is squeezed the condition of the relay1 will be changed to low and the condition of the relay2 will be changed to high, because of this the robot will turn towards right. A cross section type compartment is fixed before the robot. At the point when the robot moves the garbage will be caught inside the cross-section type holder, when the compartment is loaded up with rubbish it tends to be taken out from the robot and fixed again after the evacuation of that junk.

ADVANTAGES

- No skilled person needed.
- Eco-friendly robot.
- Easy to operate and understand the work flow.
- Less man power is needed.
- Low investment needed.
- Remote controlled.

FUTURE WORK

Hence the proposed system works as predicted and in future it can be updated. Now our robot can be remotely operated up to 50m, it can only collect 2.6kg of trash at single run and it is not easy to operate our robot in running water. Considering the above reasons as a disadvantage it can be over come by replacing the Wi-Fi module with RF transmitter and RF receiver, to increase the trash collection capacity the size of the floater and wire mesh can be increased. Finally, to make our robot to run in running water the dc motor can be replaced with relevant propeller system.

CONCLUSION

The robot proposed in this paper if powerful in time-wise and cost-wise and it is Simple to manage, and straightforward the working fundamentals of the robot. It needn't bother with powers like oil or diesel to work, contamination factor is furthermore lessened. The Endeavor is arranged with the view that it ought to be a great deal of reasonable, viable and steady to stream and lake cleaning.

The issues were perceived and thought with the assistance of the data assembled during the examination and applying the fundamental data on planning for vanquishing the issue. Finally, we have thought of a robot with an organized direct part. It is a non-regular waste cleaning robot.by utilizing this robot the debased water bodies can be cleaned with insignificant measure of man just as monetary force. To make our task eco-accommodating there is no use of fills like oil and diesel can be saved because of battery worked

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IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Volume 10, Issue 3, March 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.122

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003009

Remote Controlled Solar Powered Water Trash Collector

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ABSTRACT: This paper presents a proposal for a Remote Controlled Solar Powered Water Trash Collector. As we probably are aware of all metropolitan water bodies are contaminated and they are utilized for discharging untreated sewages and solid waste. The greater part of the trash is dumped in the lake, stream of other water assets. The trash which are disposed in the water bodies like lakes, waterways, because of which the water get dirtied which we can't utilize that water for our day-by-day use and the water will likewise get squandered. To conquer this issue, we have planned a skimming robot to gather the trash which are floating on water. This task is likewise effective and work on the sun-based energy no outside power supply is required. A battery of 12v is used to store the energy which gathered by the sun-based plate, at that point this battery will utilize this put away energy to work total boat. The primary point of this idea is to decrease man power and time utilization for cleaning the stream. This paper proposes such inexpensive system. It uses personalized android application (developed using MIT app inventor), microcontroller (NodeMCU-ESP8266) and a relay board of 4 output channels, the commands are encoded by the application and it sends the control signal to the relay board through microcontroller. Finally, the system is connected to a Wi-Fi network which makes the system as Internet of Things (IoTThe machine is fundamentally a boat kind of thing which will float on the water body to collect the light and skimming trash present in the water.

KEYWORDS*:* Trash collector, Remote Controlled Robot, IoT, Sewage, android application, Node MCU ESP 8266, Solar powered bot,firebase.

I.INTRODUCTION

Clean water is an essential requirement for every living being. yet water contamination is the most genuine ecological dangers that we face today. Our lakes and stream are progressively getting polluted. Turning around the impact of water contamination is extremely troublesome and can require a very long time to eliminate all the unsafe substances from the water. Additionally, a greater number of labour and financial plan would be needed to clean the same.

Trash is a significant issue overall consideration. This issue is seen by the associations that helps to fix this issue, like Ocean Conservancy, this is a non-benefit ecological association which is situated in Washington, D.C., United States. The association gives an account in 2013, that in the course of recent years, nearly 10 million volunteers have taken out 163 million pounds of waste from in excess of 330,000 miles of coastline and streams in 153 nations and areas. They have also stated that, at present over 10 million pounds of junk along almost 20,000 miles of coastlines were collected by more than 5lakhs individuals

The creative framework that we propose offers a remarkable and robotized approach to handle water contamination by disposing of physical work accordingly expanding proficiency and decreasing the expense and time required. The fundamental point of this skimming waste project is to collect the waste which floats on water bodies accordingly keeping the water clean thus decreasing contamination. This project being remote-operated is controlled by our smart phone. we use DC motors to plan for the directions. To make the boat self-manageable we have integrated Solar boards which would charge the battery. Wire measure net is utilized for trash collection.

II.SYSTEM MODEL

The system has 3 basic blocks they are,

1.microcontroller & relay module block

2. android application & database block

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||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003009

3.android application & microcontroller block
The microcontroller act as a central control unit which controls the relay module according to the commands received from the database through mobile application

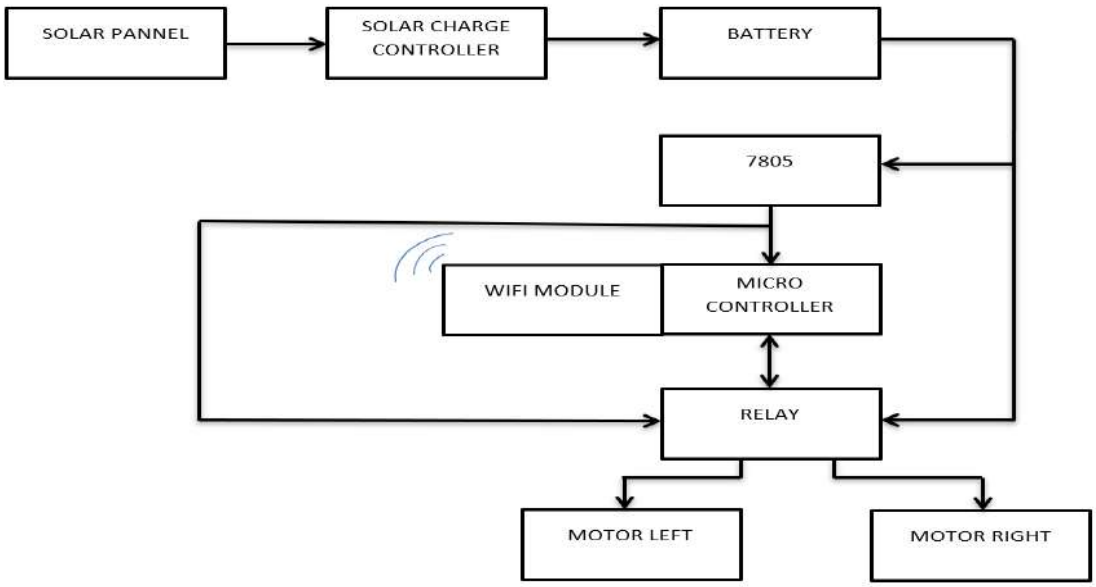

Fig.1.system block diagram

III. COMPONENTS DESCRIPTION

A. Power source:
Lithium-ion batteries are normal rechargeable batteries that are fundamentally utilized for convenient hardware, with a high energy thickness, no memory impact. The 12V 3AH Lithium-particle battery highlights with an implicit battery creation framework that keeps the battery running at peak performance and protects the cells for thousands of cycles.

B. DC Motor:
A DC motor is a class of turning electrical engines that converts direct flow electrical energy into mechanical energy. The most well-known sorts depend on the powers created by attractive fields. Practically a wide range of DC engines have some inward system, either electromechanical or electronic, to occasionally alter the course of current in piece of the engine. A 100RPM 9-volt DC motor is used in our project.

C. Voltage Regulator:
A voltage controller is a framework intended to keep a consistent voltage. A voltage controller may utilize a basic feed-forward plan or may incorporate negative feedback. It might utilize an electromechanical instrument, or electronic parts. depending upon the plan, it might be utilized to control AC or DC voltages. voltage7805 is a three terminal voltage regulator, first pin is used to give input, second pin is used for grounding purpose and third pin is used to take 5V constant output.

D. Microcontroller:
The NodeMCU (Node Microcontroller Unit) is an open-source software and hardware development environment that is built around a very inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266 is designed and manufactured by Express, contains all crucial elements of the modern computer: CPU, RAM, networking (wi-fi), and even a modern operating system.

E. Wi-Fi module:
The ESP8266 is the name of a micro controller designed by Expressive Systems. The ESP8266 itself is a self-contained Wi-Fi networking solution offering as a bridge from existing micro controller to Wi-Fi and is also capable of running self-contained applications. This module comes with a built in USB connector and a rich assortment of pin-outs. With a

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||Volume 10, Issue 3, March 2021||

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micro-USB cable, you can connect NodeMCU devkit to your laptop and flash it without any trouble, just like Arduino. It is also immediately breadboard friendly.

IV. SOFTWARE

A. ANDROID APPLICATION

The android application is developed by using the open-source platform called MIT App Inventor.
MIT App inventor is a web application integrated development environment, initially gave by Google, and now kept up by the Massachusetts Institute of Technology (MIT). It permits newcomers to PC programming to make application software(apps) for two operating system (OS): Android (working system) |Android, and iOS, it is free and open-source programming discharged under Multi-authorizing
It utilizes a graphical UI (GUI) fundamentally the same as the programming language Scratch (programming language) and the Star Logo, which permits clients to relocate visual articles to make an application that can run on cell phones. In making App Inventor, Google drew upon critical earlier research in instructive processing, and work done inside Google on online improvement conditions.

Fig2. Application interface.

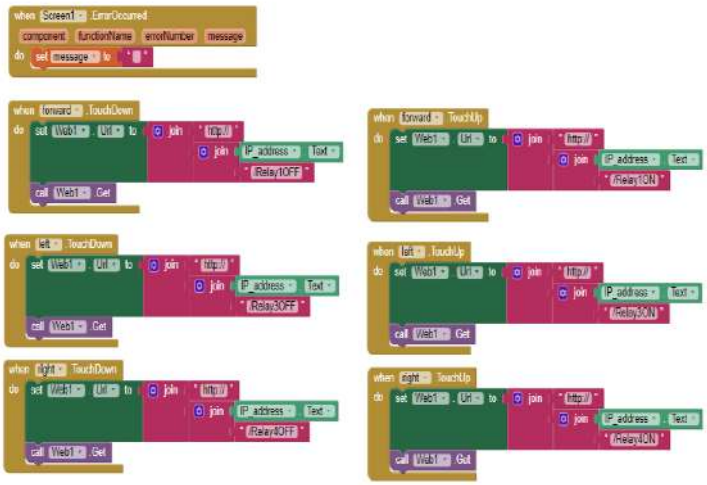

Fig3.work flow of the application.

BUTTON PRESSED	DIRECTION OF THE ROBOT
Forward button	Moves forward
Left button	Moves left
Right button	Moves right
Backward button	Moves back
No button pressed	Stop / stand still

B. Realtime database (Firebase)

A real-time database is one that stores data and brings data from it quickly. A Realtime Database is a cloud-encouraged informational index. Data is taken care of as JSON plan and synchronized continually to each connected client. Exactly when you create cross-stage applications with IOS, Android, and JavaScript SDKs, the greater part of your customers' advantage relies upon one Realtime Database case and hence getting updates with the most current data. The authentication feature in firebase let the authorised user to access their application. Firebase gives login through Gmail, GitHub, Twitter, Facebook and moreover permits the specialist to make custom approval. Database in firebase is a cloud-based informational collection and needn't waste time with SQL-based inquiries to store and get data. The data

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base is significantly reliable because it keeps the data even the connection is lost.When the buttons in application is pressed, the States of S1, S2, S3, S4 will get Changed and these signals will be Communicated with the microcontroller to act upon it.

Fig 4. Realtime database console**.**

V. METHOLOGY

The sun ray's incident on solar panels and it converts light energy to electrical energy. This generated energy is stored into the battery, the supply is taken from battery to all electronics and electrical devices. The microcontroller is programmed to give commands to change the motion of the boat, rotation of conveyor belt etc. This boat will totally work by solar energy so no external power supply is required. The Wi-Fi module is connected to the microcontroller and can be operated by using a User Defined mobile app i.e., Wi-Fi controller app. The four motors will operate as it receives the command from Microcontroller. The Wifi is used to operate in a wide range up to 50m. A Float is used to balance the kit. This kit is also designed to clean oil spill in water for that water and oil separator is used to separate oil from water. The ultrasonic sensors will detect the obstacles using transmitting and receiving signals which send this signal to Microcontroller. Microcontroller gives command to motors and then to conveyor and propeller. Then the conveyor will start rotating which will collect the garbage through water. The conveyor belt will transfer the garbage to the garbage container. The container also consists of an ultrasonic sensor which will sense the level of garbage. As the garbage increases beyond the level it will give a signal to Microcontroller which will give command to motors to stop collecting the garbage by conveyor belt. The standby time of the battery is 2-3 hours at night. We can increase the working hours as per our requirement by increasing the size of battery.

VI. WORKING

The mobile application is connected to the google firebase through the IP address to communicate the signals between the microcontroller and the mobile application. When the forward button is pressed the state of the relay1 and relay2 will be changed to high and the robot will move forward. if the forward button is released the state of the relay1&relay2 will be changed to low, due to this the robot will stop moving. fig. 5 Realtime image of the robot**.** When the left button is pressed the state of the relay1 will be changed to high and the state of the relay2 will be changed to low, due to this the robot will turn towards left. When the right button is pressed the state of the relay1 will be changed to low and the state of the relay2 will be changed to high, due to this the robot will turn towards right. A mesh type container is fixed in front of the robot. When the robot moves the trash will be trapped within the mesh type container, when the container is filled with trash it can be removed from the robot and fixed again after the removal of that trash.

VII. LITERATURE REVIEW

[1]Tharini M et al(2020) proposed a paper on iot based garbage system powered with solar cell. they have utilized the Arduino and Wi-Fi module to transfer the data. solar panel is the power source of the system .one battery was used and that battery was powered by solar panel. and three ultrasonic sensors was used its used to indicate the level of the garbage. 3 steps of indication were there 25%,50%, 75%.and the information transmitted .one led was connected uses of night time visibility.

[2] C.Z Eugene et al(2019) proposed a paper on Battery powered rc boats. In this rc boat three types of motor were used (hydroplanes, monoplanes, multi-hulled) and these three are different shapes and uses in the different purposes. outrigger hydroplanes in this type were better stability in straight line it is fastest boat and calm water surface it goes in

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maximum speed. catamaran it moves all direction. Similar to hydroplane. Some components are use in the system dc motor was used to move the boat two was there (brushed and brushless) was used rubber was used to steering device. propeller was used to it's a combination of diameter, rotation speed, number of blades, pitch diameter ratio. electronic speed controller is used to connect motor and power source two type was used brushed and brushless. power source was given to the chargeable battery.

VIII. CONCLUSION

The robot proposed in this paper if effective in time-wise and cost-wise and it is Simple to deal with, and easy to understand the working basics of the robot. It doesn't need powers like petroleum or diesel to work, pollution factor is additionally diminished. The venture is planned with the view that it should be a lot of affordable, effective and supportive to waterway and lake cleaning.

The issues were recognized and concentrated with the help of the information gathered during the investigation and applying the essential information on designing for conquering the issue. At last, we have come up with a robot with a coordinated straightforward component. It is a non-conventional trash cleaning robot.by using this robot the contaminated water bodies can be cleaned with minimal amount of man as well as financial power. To make our project eco-friendly there is no utilization of fuels like petroleum and diesel can be saved due to battery worked

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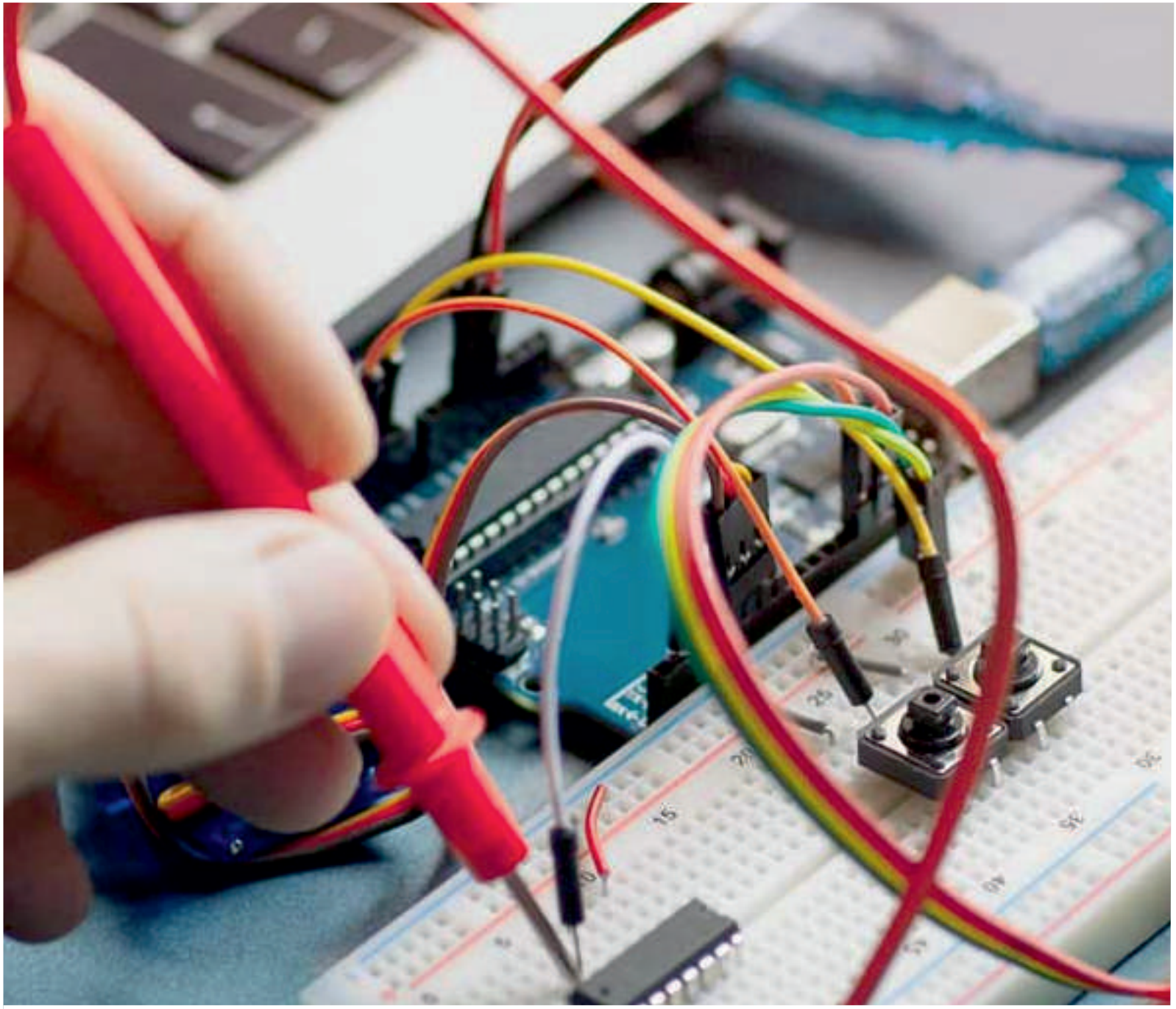

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Impact Factor:
7.122

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e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research

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Volume 10, Issue 3, March 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.122

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003022

Implementation of Regenerative Power Storage for Automobiles

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ABSTRACT:According to the Energy Conservation Law, the world is a storehouse of energy, which cannot be generated or destroyed but can be converted from one type of energy to another. We, on the other hand, are squandering the resources at our disposal. We're about to run out of it. As a source of energy, we are moving toward renewable fuels, but our main focus should be on the resources we are wasting.We're using rotational energy that cars don't use. While the car is driving, the energy is converted to electricity and stored in the battery (wheel rotating). It's done by blending a generator and a gear. We'll use that battery to provide power while the car (engine) is turned off.We can save money on fuel and take advantage of rotational motion by doing so. It can be used in traditional automobiles, hybrid automobiles, and electric automobiles. We may be able to extend the range (mileage) of an electric vehicle. If this project succeeds, it will mark a turning point in the automobile industry.To ensure that our resources are preserved for future generations, we must repurpose those that are no longer in use. We can break the use of the loads by using two batteries, so that the load runs on one battery when the engine is running and on the other battery when the engine is off, extending the battery's life and increasing the car's performance.

KEYWORDS: Energy Conservation Law,Arduino, DC Motor, Regenerative Power System, Car, 4-Wheeler.

I.INTRODUCTION

The project's basic concept is to harvest mechanical energy from a vehicle and convert it to useful electrical energy. Potential energy and/or kinetic energy are two types of mechanical energy that can be converted to electrical energy.In many situations, the goal of the interfacing mechanism is to optimise the rate or amount of mechanical energy transferred to the transducer. Mechanical energy can be used in a variety of ways, such as linear or rotator vibration.We create a storehouse of energy using this principle, and according to the energy conservation law, energy cannot be generated or destroyed but can be converted from one form to another. However, we are squandering our time. In this paper, we propose a hybrid, E-vehicle revolution by consuming and storing energy for future use.The drawback of an e-car is that the customer must keep an eye on the battery level at all times. If the battery runs out in an emergency, the vehicle will be stranded somewhere where a charging station is closer. In that case, we must make use of the resources that we are currently wasting.We are converting mechanical energy that would otherwise be wasted when the car is running into electrical energy, which is then stored in the battery for future use. We are running out of the big fossil fuels, so we must work to conserve them for future generations.We are wasting different forms of energy, and we can turn one form of energy into another, according to the law of conservation of energy. We're turning our car's mechanical action into an electrical charge here. If it comes into play, we will be able to repurpose the energy that is wasted or dissipated during the travel process.

II.LITERATURE REVIEW

[1]Hub dynamos for bicycles have a greater efficiency and produce less noise than other dynamos. As a result, a large number of people turn on the hub dynamos installed on their bicycles at night. Hub dynamos, on the other hand, are heavy and large in size, and as a result, they have not spread to bicycles where weight is critical, such as racing bicycles.[2] In the case of a simple model that simulates the end portion of the turbine generator, the validity of the calculation procedure is proved by comparing the measured and calculated results. The technique is also used to explain the eddy current distribution on a real machine.The proposed technique is used to simulate the core-ends of a

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003022

turbine generator using a simple model. To ensure that the method is valid, the calculated losses and flux distributions are compared to the measurement.[3] In electric vehicles, the regenerative process and rotational speed measurement are particularly useful. In all cases, to achieve precise and real-time motor drive control. The measurement of rotational speed will aid in maintaining a healthy control over the applied breaking force. In a regenerative electric vehicle, this simultaneous method of measuring rotational speed information.This work was also extremely useful in distinguishing between the ideal and actual positions of the Hall Effect sensor.[4] For EVs with HESS and Brushless DC (BLDC) motors, a new Regenerative Braking System (RBS) is proposed. The BLDC acts as a generator during regenerative braking. The DC-link voltage is increased as a result of the appropriate switching algorithm, and the energy is transferred to the super-capacitor or battery through the inverter.The harvested energy can be used to increase vehicle acceleration and/or prevent deep discharge of the battery pack while driving uphill. Braking force distribution is achieved through an Artificial Neural Network in order to provide a reliable and smooth brake (ANN).[5] The dc machine satisfies these criteria, but it necessitates ongoing maintenance. Brushes are not used in brushless permanent magnet motors, so they require less maintenance. Because of their low inertia, quick response, high reliability, and low maintenance, brushless dc motors are commonly used in applications that require a wide range of speed and torque control.This three-phase current controlled approach is based on the generation of quasi-square wave currents with only one controller. For the power transistors, the current control strategy uses a triangular carrier, which is simpler and more precise than any other alternative.[6] By installing an energy storage system and discharging the energy based on the load situation, greater energy efficiency can be achieved.Flywheels, nickel-metal hydride batteries, lithium-ion batteries, electric double layer capacitors (EDLC), and other energy storage systems are commonly used. At the Haijima and Okegawa substations, the East Japan Railway Company also installed two energy storage units using lithium-ion batteries. The installed results of these energy storage systems are documented in this paper.

III.EXPERIMENTAL SETUP

This experimental setup is made up of a variety of hardware components that play a key role in the regenerative process. The most important components in this setup are:

A. Gear system:

When the vehicle's engine is turned on, the gear system engages, and the vehicle begins to move forward. The shaft connected to the wheel rotates a wheel in a counterclockwise direction.A wheel's rotation is connected to a gear installation in the wheel's axle. As the car moves forward, the gear shifts. Electric power is generated in a clockwise direction. The gear rotates in the opposite direction of the clock when the car is reversing.

B. Motor:

A current of electricity is generated by the gear motion, which is coupled with a 12V BLDC motor with a range of 0-24 VDC. When the object is moving backwards, the gear engages and the wheel rotates counterclockwise. The motor spins in a counterclockwise direction.By spinning it in the opposite direction, you can turn it into a generator. A truck is said to be in reverse motion when it moves backwards and forwards. The bypass removes the engine from the generation process.

C. Voltage:

A resistive voltage sensor is used to determine the amount of voltage induced. Depending on the speed, the amount of voltage produced varies. The motor provides 1400 rotations per minute during the rotation.A fraction of a second the mileage of a vehicle is proportional to its size and the voltage produced. The amount of voltage produced is proportional to the amount of energy used when power usage is based on mileage.

D. Battery:

In a battery, electrons flow from the anode to the cathode, according to the electron flow principle. The energy is stored in the car's lead acid battery. Electricity is used in the chemical reaction. Aside from the main battery, the energy generated is stored in a 12 V DC secondary battery.

E. Relay:

The message relay is connected to both batteries and acts as a switching device between the battery and the circuit, allowing the vehicle's battery to be used as a backup source of energy. As soon as the charge in the main battery is depleted.The secondary battery is switched on by a relay based on a threshold value, and the vehicle's electric charge is given.

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||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003022

F. Arduino:

The Arduino Uno is an open-source microcontroller board designed by Arduino and based on the Microchip ATmega328P microcontroller. The board has a number of digital and analogue input/output (I/O) pins that can be used to connect to different expansion boards (shields) and other circuits.The board has 14 digital I/O pins (six of which are capable of PWM output), 6 analogue I/O pins, and is programmable via a type B USB cable using the Arduino IDE (Integrated Development Environment). It can be powered by a USB cable or an external 9-volt battery, with voltages ranging from 7 to 20 volts.

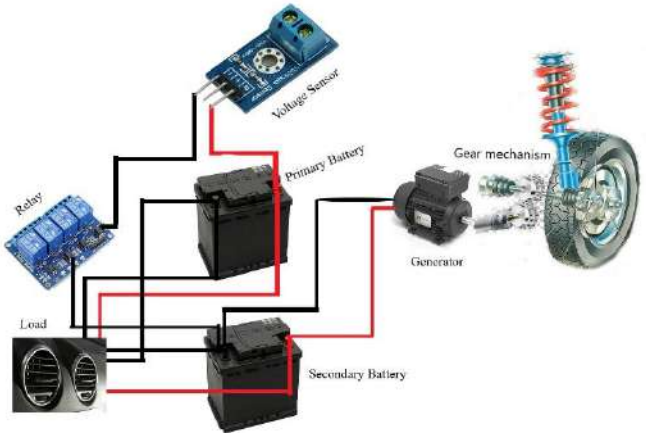

Fig.1 Circuit diagram of the system

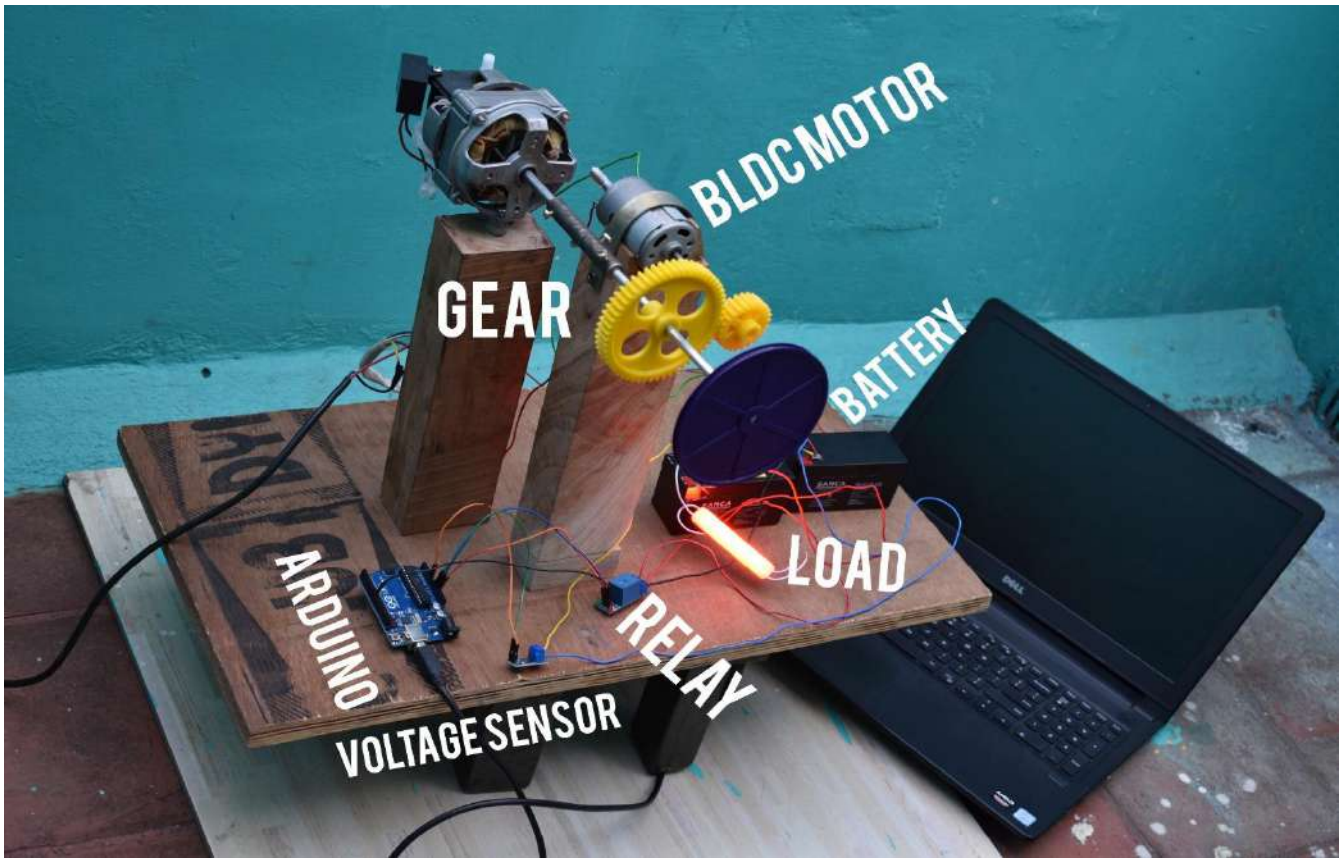

Fig.2 Overall Experimental Setup of the Project

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IV. WORKING

The car wheel shaft is connected to the 12V BLDC generator through a gear mechanism. The two gears that will be paired have a 1:3 ratio (shaft: motor). The dc motor's gear, for example, should be three times less than the wheel's gear. The charge is then stored in the secondary battery by feeding the output voltage to it.A voltage sensor is connected in parallel to the primary battery to monitor the voltage level. The relay is triggered when the voltage falls below the threshold. The NO (Normally Open) terminal of the primary battery is connected to the NC (Normally Close) terminal of the secondary battery, latching the secondary battery's line.As a result, power will begin to flow from the secondary battery to the load. The relays are switched using Arduino code, and the power supply to the load is distributed in a variety of ways.

A. Gear system:

When one gear rotates clockwise, the other rotates counterclockwise. As a result, the gear that is connected to the generator rotates.

B. Voltage sensor:

The operating range of the voltage sensor is 3V to 12V. If the battery voltage drops below 3 volts, the load should be switched to a secondary battery or the main battery should be used to power the load.

C. Relay:

The primary battery is in NO (normally open), while the secondary battery is in NC (normally closed) (normally close). The voltage sensor input causes the relay to switch the battery.

D. Arduino:

Arduino program to switch the batteries,

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```
#include "LiquidCrystal.h"

const int voltageSensor = A0;
int rel_pin=8;
float vOUT = 0.0;
float vIN = 0.0;
float R1 = 30000.0;
float R2 = 7500.0;
int value = 0;

LiquidCrystal lcd(7, 6, 5, 4, 3, 2); // RS, E, D4, D5, D6, D7

void setup()
{
Serial.begin(9600);
lcd.begin(16,2);
lcd.print(" Measure > 25V  ");
delay(2000);
pinMode(rel_pin,OUTPUT);
}

void loop()
{
  value = analogRead(voltageSensor);
  vOUT = (value * 5.0) / 1024.0;
  vIN = vOUT / (R2/(R1+R2));
  Serial.print("Input = ");
  Serial.println(vIN);
  lcd.setCursor(0,0);
  lcd.print("Input =          ");
  lcd.setCursor(9,0);
  lcd.print(vIN);
  delay(500);
  if(vIN <= 1)
  {
```

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sketch_mar23a §

```
int value = 0;

LiquidCrystal lcd(7, 6, 5, 4, 3, 2); // RS, E, D4, D5, D6, D7

void setup()
{
Serial.begin(9600);
lcd.begin(16,2);
lcd.print(" Measure > 25V  ");
delay(2000);
pinMode(rel_pin,OUTPUT);
}

void loop()
{
  value = analogRead(voltageSensor);
  vOUT = (value * 5.0) / 1024.0;
  vIN = vOUT / (R2/(R1+R2));
  Serial.print("Input = ");
  Serial.println(vIN);
  lcd.setCursor(0,0);
  lcd.print("Input =          ");
  lcd.setCursor(9,0);
  lcd.print(vIN);
  delay(500);
  if(vIN <= 1)
  {
    digitalWrite(rel_pin,HIGH);
  }
  else if(vIN > 1)
  {
    digitalWrite(rel_pin,LOW);

  }
}
```

Fig.3,3A Arduino program for battery switching

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||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003022

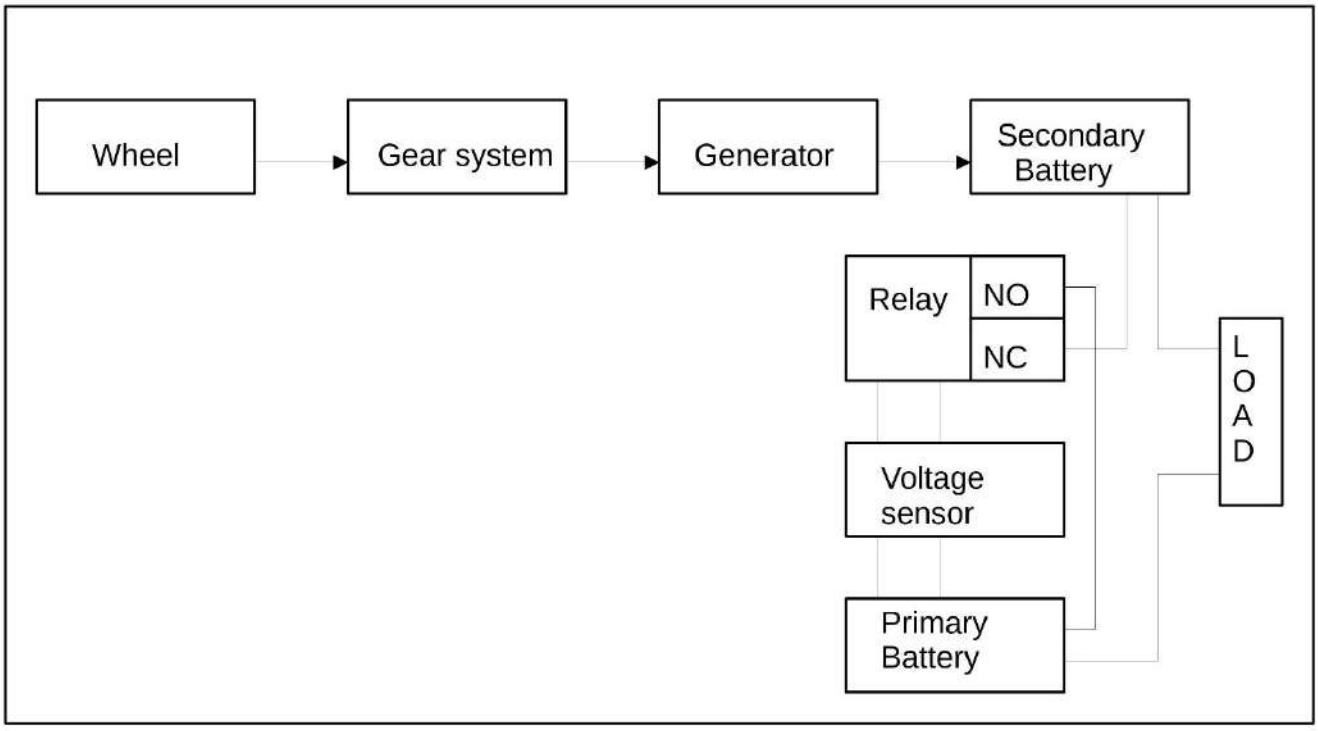

Fig.4 Block diagram of the process

V. RESULT AND DISCUSSION

The model is fixed to the car (four-wheeler), and the voltage produced varies as the car is driven at different speeds. The relationship between the car's speed and the voltage produced is directly proportional. The rpm generated for the car's speed is tabulated and plotted as a graph below.

Speed of the car(Km/hr)	RPM of the wheel
10	156
20	312
30	468
40	624
50	780
60	935
70	1092
80	1248
90	1402
100	1560

Table 1 Speed of the car vs rpm of the wheel

There are numerous actions and motions all around us that can provide us with power generation resources. Because four-wheelers are so common, the proposed system is the best choice in this case. The setup can be installed inside the car without interfering with the car's normal setup because it takes up very little space.This model can be improved by incorporating advanced controllers such as fuzzy and adaptive fuzzy to increase its effectiveness.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003022

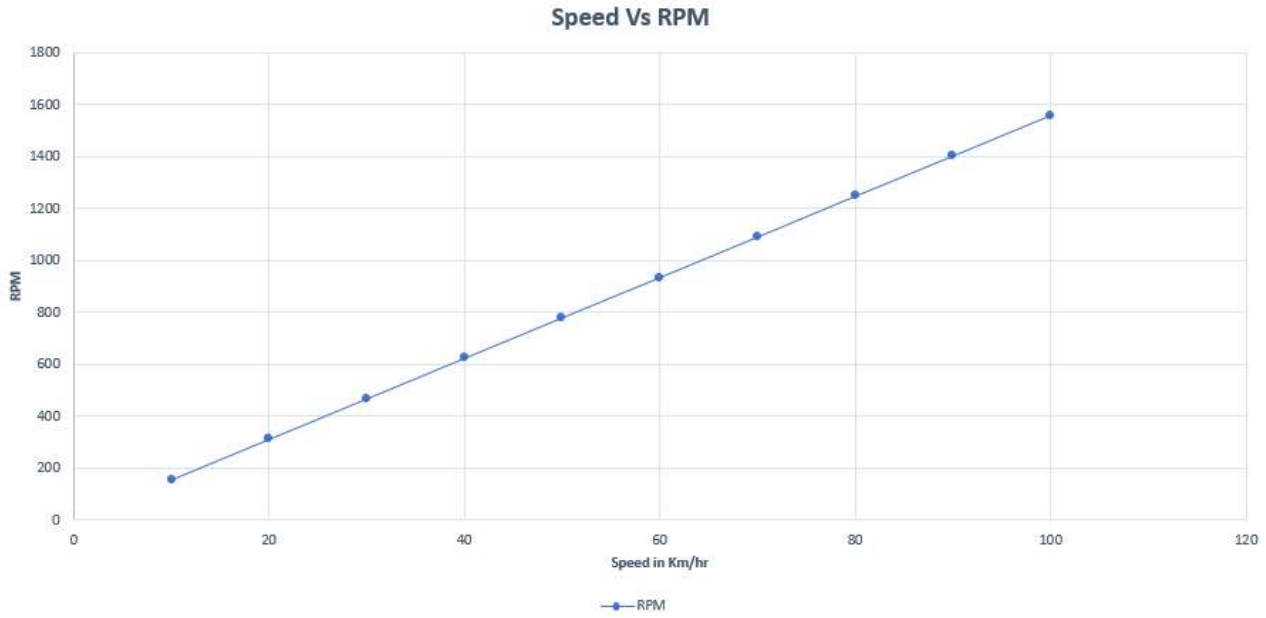

Fig.5 Speed of the car vs rpm of the wheel graph

VI.CONCLUSION

This paper focuses on the output, which consists of various parameters. It depends on the gear coupling system and the processes that take place on the road. It spins at 1400 rpm without gear in its normal state. It spins at 1360 rpm with gear, which is 97.6%. This equates to a 2.4 percent decrease in value.The speed of this system determines how long it takes to charge. Consider how much the battery will be charged after 5 hours and 8 minutes of driving at top speed. The battery determines the charging speed.Fuel efficiency could be increased by 12% as a result. After accounting for the 2.4 percent loss, we have an overall efficiency of 9.6% in the previous model.

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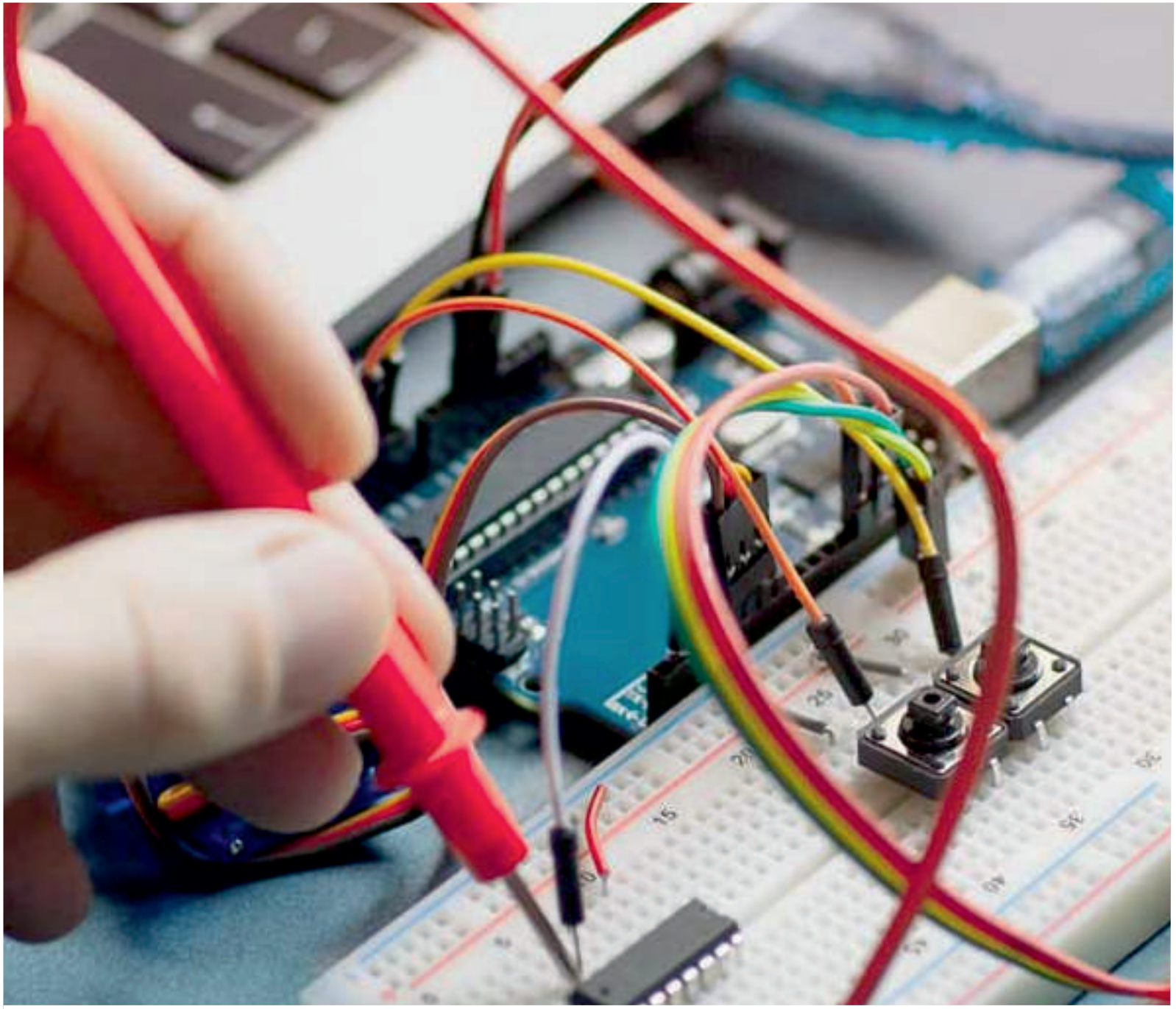

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ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर
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International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

9940 572 462 6381 907 438 ijareeie@gmail.com

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IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue x, Month 2021

DOI 10.17148/IJIREEICE.2021.9101

Regenerative Power Storage and Supply System for 4-Wheeler Automobiles using Gear Coupled Generator

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Abstract: The world is a storehouse of energy, and energy cannot be produced or destroyed, but it can be converted from one type of energy to another, according to the Energy Conservation Law. However, we are squandering the resources available to us. We're running out of it. We are moving toward renewable fuels as a source of energy, but our primary focus should be on the resources we are squandering. We are using the rotational energy that is not used by automobiles. The energy is transformed into electricity and stored in the battery while the car is driving (wheel rotating). It's accomplished by combining a gear and a generator. We'll provide power from that battery while the car (engine) is switched off. We can save money on fuel by doing so, and we can take advantage of rotational motion. It can be used in traditional vehicles, hybrid cars, and electric cars. We may increase the distance (mileage) that an e-car travels. This project would be a watershed moment in the car industry if it succeeds. We must reuse the resources that are not being used in order to maintain our resources for future generations. We can break the use of the loads by using two batteries, so that when the engine is running, the load will run on one battery and when the engine is off, the load will run on the other battery, extending the battery's life and improving the car's performance.

Keywords: Energy Conservation Law, Regenerative Power System, Arduino, DC Motor, Car, 4-Wheeler

I. INTRODUCTION

The process of harvesting mechanical energy from vehicle and converting it to usable electrical energy is basic idea of the project. The input mechanical energy to be converted to electrical energy may be in the form of potential energy and/or kinetic energy. ... For example, in many cases, the interfacing mechanism is desired to maximize the rate or amount of mechanical energy transferred to the transducer. Mechanical energy is used in a number of ways for example, through linear or rotator vibration. By using this concept, we make a store house of energy and according to energy conservation law energy can neither be created nor destroyed but can be transformed from one form to another form. But we are wasting In this paper we bring a revolution in hybrid, E-vehicle by consuming and saving the energy for future use .E-vehicle has a disadvantage that the customer should always have eye on the battery level in some emergency situation it will lead to be held up somewhere the charging station is somewhat nearer. In that case, if we have to utilize the resources around us which we are wasting. We are making use of mechanical energy which is getting wasted while the car is running and is converted into electrical energy and which is stored in the battery for the future use. We are running out of the major fossil fuels to preserve for our future generation we need to work on certain things. We are wasting various forms of energy according to the law of conservation of energy, we can convert one form of energy into another form. Here we are converting the mechanical action of our car into electrical charge. If it gets into picture, we can reuse the energy which is wasted or dissipated from the travelling process.

II. LITERATURE REVIEW

[1]Hub dynamos for bicycles have a higher efficiency than other dynamos and does not have the noise. Therefore, the number of people turning on the hub dynamos that are installed to their bicycles at night is high. However hub dynamos are heavy and big in size, and as a result have not spread to bicycles whereby being light is of the upmost importance, such as racing bicycles. [2] The validity of the calculation method is verified by comparing the measured and calculated results in the case of a simple model that simulates the end part of the turbine generator. The method is also applied to the real machine to clarify the eddy current distribution. The proposed method is applied to the simple model that simulates the core-ends of the turbine generator. The calculated losses and flux distributions are compared with the measurement to verify the validity of the method.[3] Regenerative process and measurement of rotational speed in

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue x, Month 2021

DOI 10.17148/IJIREEICE.2021.9101

electric vehicles are specially used. In all cases for realization of accurate and real-time control of motor drives. Acquisition of rotational speed values will help for a healthy control over applied breaking force. This simultaneous method of measuring rotational speed information in regenerative electric vehicle. This presented work also made a remarkable benefaction in distinguishing the ideal and actual positions of the Hall Effect sensor.[4] A new Regenerative Braking System (RBS) is proposed for EVs with HESS and driven by Brushless DC (BLDC) motor. During regenerative braking, the BLDC acts as a generator. Hence, using appropriate switching algorithm, the DC-link voltage is boosted and the energy is transferred to the super-capacitor or the battery through the inverter. The harvested energy can be utilized to improve the vehicle acceleration and/or keep the battery pack from deep discharging during driving uphill. In order to provide a reliable and smooth brake, braking force distribution is realized through an Artificial Neural Network (ANN).[5] The dc machine fulfils these requirements, but it requires constant maintenance. In the brushless permanent magnet motors, they do not have brushes and so there will be lesser maintenance. Brushless dc motors are widely used in applications which require wide range of speed and torque control because of its low inertia, fast response, high reliability and less maintenance. This current controlled technique is based on the generation of quasi-square wave currents using only one controller for the three phases. The current control strategy uses a triangular carrier for the power transistors which is simpler and more accurate than any other options [6] Greater efficiency in energy use is achieved through the installation of the energy storage system by discharging the energy depending on the load situation. The energy storage systems are usually used flywheel, nickel-metal hydride batteries, lithium-ion batteries, electric double layer capacitor (EDLC), etc. East Japan Railway Company also installed two energy storage devices using lithium-ion batteries at Haijima and Okegawa substations. This paper describes the installed results of these energy storage systems.

III. EXPERIMENTAL SETUP

This experimental setup consists of various hardware components which acts as a major role in this regenerative process, the basic components used in this setup are,

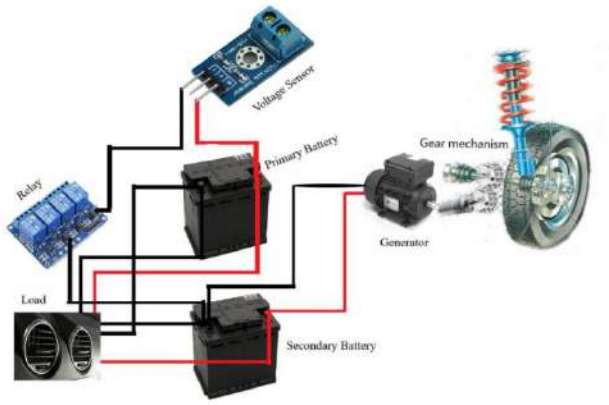

Fig. 1 Circuit diagram of the system

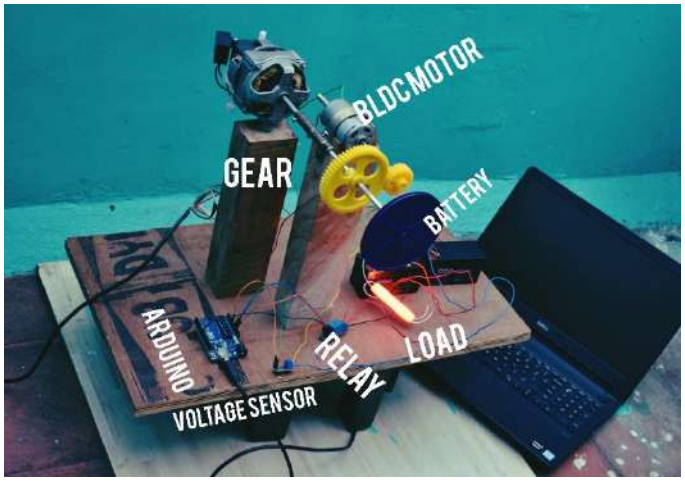

Fig.2 Overall Experimental setup of the project

IJIREEICE

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Electrical, Electronics, Instrumentation and Control Engineering

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A. Gear system:

When the vehicle's engine is started, the gear system kicks in and the vehicle begins to move forward, the shaft connected with wheel rotates a wheel in a counter clockwise direction in a counter clockwise direction An installation of gear in the wheel's axle is connected to the wheel's rotation a wheel The gear shifts as the car goes forward. Generates a rotation in the clockwise direction electric power When the car is reversing, the gear rotates in the opposite direction of the clock.

B. Motor:

The gear motion, which is coupled with a 12V BLDC motor with a range of 0-24 VDC, is used to generate a current of electricity When the motion of the object is the gear is in reverse and the wheel is turning counter clockwise. The motor is rotated in a clockwise direction. Making it a generator by spinning it in the opposite direction. When a vehicle is moving backwards and forwards, it is said to be in reverse motion. With the bypass, the motor is removed from the generation process. Diode is an abbreviation for "diode.

C. Voltage:

The amount of voltage induced is calculated using a resistive voltage sensor. The amount of voltage produced varies depending on the speed. During the rotation 1400 rotations per minute are provided by the motor. A split-second Vehicle mileage is proportional to its size to the voltage that is generated Power usage based on mileage the amount of voltage generated is proportional to the amount of energy used. The motor's pace

D. Battery:

According to the electron flow principle, electrons in a battery flow from the anode to the cathode. The car's lead acid battery is used to store the energy. The chemical reaction uses electric energy. Other than the main battery, a 12 V DC secondary battery the energy produced is stored in a battery. Relay the message is connected to both batteries and serves as a switching device between the battery and the circuit the amount of energy contained in the vehicle's battery can be used as a backup. as soon as the primary battery's charge has been depleted. Relay switches secondary battery based on threshold value and the vehicle's electric charge is given for the automobile.

E. Arduino:

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

IV. WORKING

A gear mechanism couples the car wheel's shaft to the 12V BLDC generator. The ratio of the two gears that will be paired is 1:3 (shaft:motor). The gear on the dc motor, for example, should be three times less than the gear on the wheel. The charge is then stored by feeding the output voltage to the secondary battery. A voltage sensor is connected to the primary battery in parallel, keeping track of the voltage level. When the voltage falls below the threshold, the relay is activated. The main battery is connected to the NO (Normally Open) terminal, while the secondary battery is connected to the NC (Normally Close) terminal, latching the secondary battery's line. As a result, the load's supply will begin to flow from the secondary battery. The relay switching is done with Arduino code, and the transmission of the power supply to the load is diverse.

A. Gear system:

When the gear with three times the dimension of the other is rotated clockwise, the other gear rotates counter clockwise. As a result, the generator is rotated by the gear that is connected to it.

B. Voltage sensor:

The voltage sensor's operating range is 3V to 12V. If the battery level falls below 3V, the load supply should be shifted to a secondary battery or the main battery should be used to power the load.

C. Relay:

The main battery is connected in NO (normally open), and the secondary battery is connected in NC (normally close). The relay switches the battery based on the voltage sensor input.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue x, Month 2021

DOI 10.17148/IJIREEICE.2021.9101

D. Arduino:

Arduino program to switch the batteries,

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```
#include "LiquidCrystal.h"

const int voltageSensor = A0;
int rel_pin=8;
float vOUT = 0.0;
float vIN = 0.0;
float R1 = 30000.0;
float R2 = 7500.0;
int value = 0;

LiquidCrystal lcd(7, 6, 5, 4, 3, 2); // RS, E, D4, D5, D6, D7

void setup()
{
Serial.begin(9600);
lcd.begin(16,2);
lcd.print(" Measure > 25V  ");
delay(2000);
pinMode(rel_pin,OUTPUT);
}

void loop()
{
  value = analogRead(voltageSensor);
  vOUT = (value * 5.0) / 1024.0;
  vIN = vOUT / (R2/(R1+R2));
  Serial.print("Input = ");
  Serial.println(vIN);
  lcd.setCursor(0,0);
  lcd.print("Input =          ");
  lcd.setCursor(9,0);
  lcd.print(vIN);
  delay(500);
  if(vIN <= 1)
  {
```

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```
int value = 0;

LiquidCrystal lcd(7, 6, 5, 4, 3, 2); // RS, E, D4, D5, D6, D7

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{
  value = analogRead(voltageSensor);
  vOUT = (value * 5.0) / 1024.0;
  vIN = vOUT / (R2/(R1+R2));
  Serial.print("Input = ");
  Serial.println(vIN);
  lcd.setCursor(0,0);
  lcd.print("Input =          ");
  lcd.setCursor(9,0);
  lcd.print(vIN);
  delay(500);
  if(vIN <= 1)
  {
    digitalWrite(rel_pin,HIGH);
  }
  else if(vIN > 1)
  {
    digitalWrite(rel_pin,LOW);

  }
}
```

Fig.3,3A Arduino program for battery switching

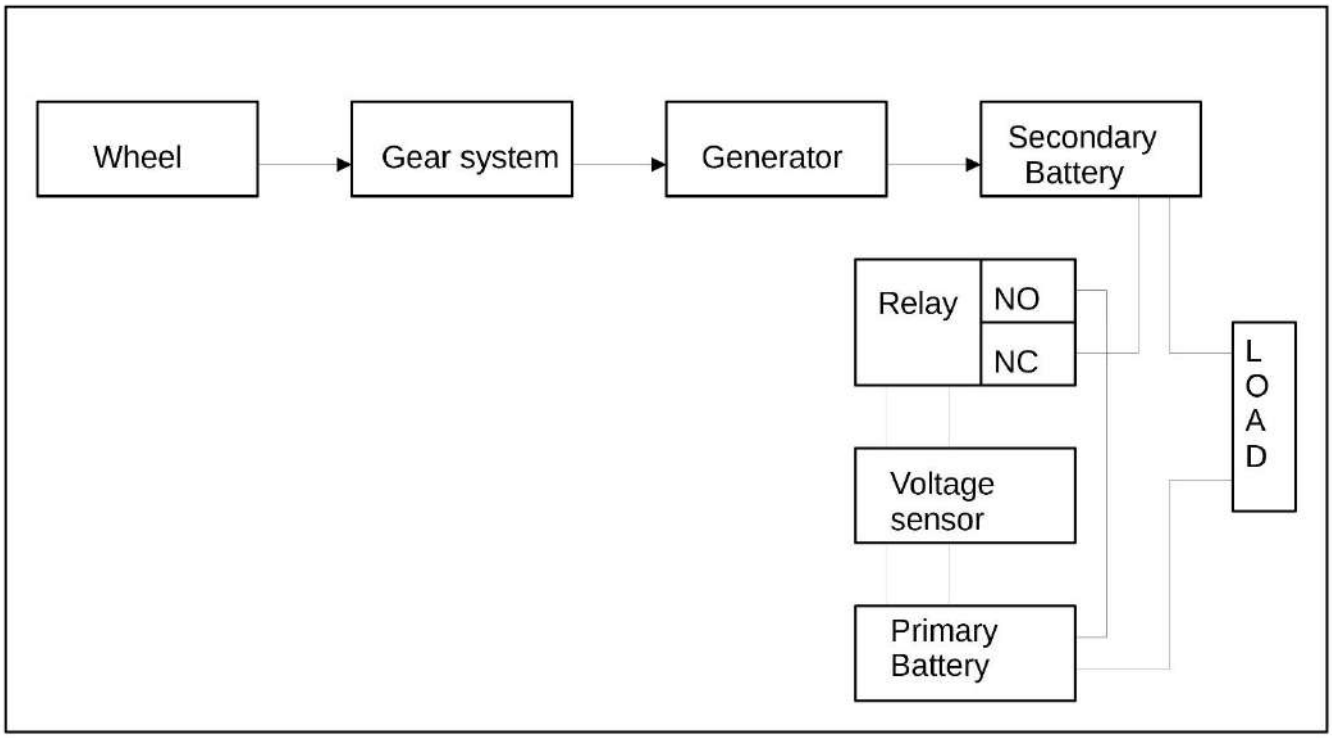

Fig.4 Block diagram of the process

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue x, Month 2021

DOI 10.17148/IJIREEICE.2021.9101

V. RESULT AND DISCUSSION

The model is fixed with the car (four- wheeler), as the car driven in various speeds the voltage generated is also varied. The relation between speed of the car and the voltage generated is directly proportional to each other. The rpm produced for the speed of the car is tabulated below and plotted as graph.

Speed of the car (Km/hr)	RPM of the wheel
10	157
20	313
30	469
40	625
50	780
60	936
70	1093
80	1249
90	1404
100	1561

Table 1 speed of the car vs rpm of the wheel

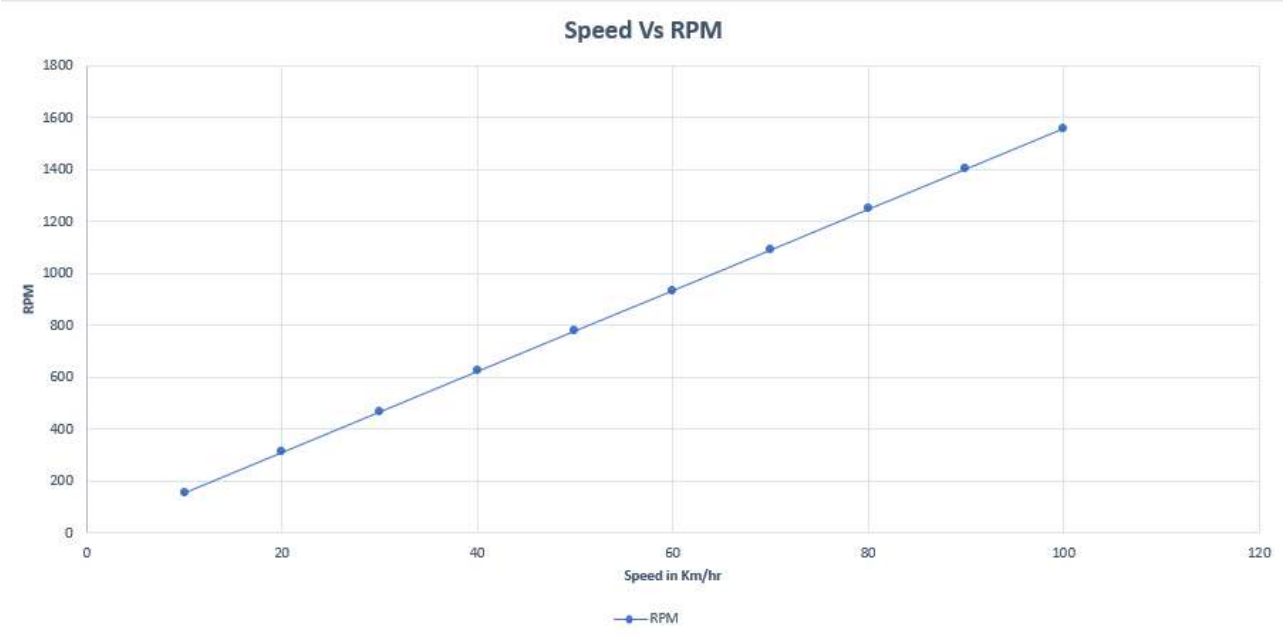

Fig.5 Speed of the car vs rpm of the wheel graph

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

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Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue x, Month 2021

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There are a plethora of actions and motions all around us that can provide us with resources for power generation. In this case, the proposed system is the best option since four-wheelers are ubiquitous. Because the setup takes up very little space, it can be installed inside the car without interfering with the car's usual setup. To improve its effectiveness, this model can be enhanced by integrating advanced controllers such as fuzzy and adaptive fuzzy.

VI. CONCLUSION

The output, which consists of different parameters, is the focus of this paper. It varies depending on the gear coupling system and the processes that occur on the road. It spins at 1400 rpm in its normal state without gear. It has a rpm of 1360 with gear, which is 97.6%. This represents a loss of approximately 2.4 percent. This system's charging time is determined by its speed. Consider how much the battery will be charged if the car is driven at maximum speed for 5 hours and 8 minutes. The charging speed is dependent on the battery. As a result, fuel efficiency can be improved by 12%. In the pre-existing model, we have an overall productivity of 9.6% after compensating for the 2.4 percent loss.

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IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Volume 10, Issue 3, March 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.122

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003007

Automatic Fire Rescue System in Railway by using LabVIEW with myRIO

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ABSTRACT: Even when an accident occurs due to human error or an unexpected situation occurs in the fastpaced automation world, more technologies are developed. As a result, we developed an improved fire rescue system to reduce the number of fatalities in the event of a train fire. Smart sensors and myRIO technology were used to build and implement this system. It will automatically detect a fire and transmit the information to the loco pilot through wireless signal transmission. The fire will be put out first, and information about the accident will be sent to the crossed and approaching stations via Short Message Service (SMS). This SMS accurately conveys the status of a fire accident by transmitting physical parameters such as compartment number and fire intensity. This also shows the specific area code for that GSM Mobile network. The full location where the train is stopped, as well as train details, could be obtained from the control room

KEYWORDS: GSM, Zigbee, myRIO, LabVIEW, Flame sensor, Fire alarm system, Wireless sensor network, Servo engine, Automatic sprinklers

I. INTRODUCTION

Railways are one of the world's best modes of transportation because they are more convenient and comfortable for passengers. In India, around 20 million people travel by train each year. The development of railways in our country has been rapid; however, there are numerous unsolved issues in the way of steady growth, such as train fires, train collisions, and so on. The only precautionary warnings about the fire in each compartment are the notices that say "Do not smoke" and "Do not carry inflammable material." Fire accidents in trains, on the other hand, are common due to failures in the routine maintenance system or the activities of illegal social elements. As a result of these issues, the human death rate has risen. Everyone is responsible for fire safety. Every employee should be aware of how to avoid and respond to a fire.

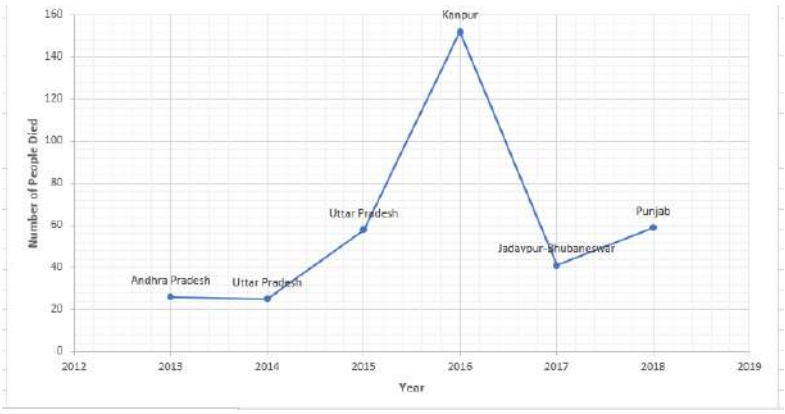

Figure 1. Major fire accident in train

Our project's primary goal is to use automatic water sprinklers, CO2 fire extinguishers, and compartment separation to prevent fire from spreading. Thereby we will scale back the decease rate and make sure the safe journey of passengers.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 3, March 2021||

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II.LITERATURE REVIEW

[1]IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT) FIRE SAFETY AND ALERTING SYSTEM IN RAILWAYS This paper is about detecting fires between temperature ranges and sending an alerting signal to the loco pilot via GSM.

[2]International Conference on Green Computing Communication and Electrical Engineering FIRE RESCUE SYSTEM IN RAILWAYS USING LABVIEW In this project, if a fire breaks out for any reason, the fire sensor installed in each compartment will detect it. To detect a fire, fire detectors are installed in each compartment of the train. For each compartment, a total of 9 sensors will be used. The fire sensors can be addressed, and the sensor's signal can be obtained by LabVIEW. The loco pilot should use the monitor to check the status of each compartment.

III. METHODOLOGY

The flame sensor, which is placed in each compartment of the train to sense the fire, will detect the fire in this project. The fire sensors are addressable, and the signal data from these sensors is read using the LabVIEW software via myRIO. myRIO is the heart of the proposed system and the hardware used; it can easily connect to a wireless network, which aids in quick response, and it also has a wider range of connectivity, so it was chosen for this purpose. Through the monitor, the loco pilot can see the status of each compartment. The project focuses on the integration of Zigbee-based sensor technology with other technologies. The project involves combining Zigbee-based sensor technology with GSM to produce seamless serial communication between the computer and the loco pilot.

IV. COMPONENT DESCRIPTION

a) Flame Sensor: A flame detector is a sensor that detects the presence of a flame or fire, making it possible to detect flames. When the flame sensor detects a change in temperature, the output is sent to myRIO. When used in industrial furnaces, their role is to check that the furnace is operating properly; they can also be used to turn off the ignition system, though in many cases they do nothing more than alert the operator or control system. Because of the mechanisms it uses to detect the flame, a flame detector can often respond faster and more accurately than a smoke or heat detector.

Figure 2. Flame Sensor

b) Servo motor: A servomotor is a linear or rotary actuator. It is made up of a suitable motor and a position feedback sensor. It also necessitates a sophisticated controller, which is often a dedicated module designed specifically for servomotors. Although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system, it is not a particular type of motor. Servomotors are used in robotics, CNC machines, and automated manufacturing, among other applications. In this project, a servomotor rotates a fire that has occurred, along with a water sprinkler, in order to extinguish the fire. To provide position and speed feedback, the motor is connected to a position encoder. Only the position is measured in the most basic case. The measured output position is compared to the command position, which is the controller's external input. If the output position does not match the necessary position, an error signal is produced, causing the motor to rotate in either direction to bring the output shaft to the correct position. The error signal decreases as the positions reach zero, and the engine stops.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

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DOI:10.15662/IJAREEIE.2021.1003007

Figure 3. Servo motor

c) myRIO: myRIO is a portable device that can be used to design and control robots and a variety of other systems with ease. It's a National Instruments real-time embedded assessment board. It's used to create apps that take advantage of the onboard FPGA and microprocessor. The acronym RIO stands for Reconfigurable Input/Output. myRIO has a programmable dual-core ARM cortex A9 processor. A Xilinx Field Programmable Gate Array is included (FPGA). myRIO's requested terminal is a power supply, which we connect to our computer using a USB cable. The data from these sensors is read using the LabVIEW Software and myRIO. The proposed system's heart, as well as the hardware used, is myRIO. It can easily connect to a wireless network, allowing for quick responses and a wider range of connectivity, so it has been used for this purpose.

Figure 4. myRIO

d) Zigbee: ZigBee is a high-level communication protocol that is used to connect devices. Wireless communication technology is the common name for it. The IEEE 802.15 standard underpins ZigBee. ZigBee devices, despite their low power, often transmit data over longer distances by passing data through intermediate devices to reach more distant ones, forming a mesh network. ZigBee is a high-level communication protocol that is used to connect devices. Wireless communication technology is the common name for it. The IEEE 802.15 standard underpins ZigBee. ZigBee devices, despite their low power, often transmit data over longer distances by passing data through intermediate devices to reach more distant ones, forming a mesh network. The loco pilot then comes to a complete halt. When the train is going into the wind, the main reason for stopping the engine is to prevent fire from spreading to other compartments. Simultaneously, the loco pilot requests assistance from the concerned authority.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

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DOI:10.15662/IJAREEIE.2021.1003007

The following are some of the features of the Zigbee protocol:

- Multiple network topologies are supported, including point-to-point, point-to-multipoint, and mesh networks.
- Low duty cycle – extends the life of the battery.
- Spread Spectrum in Direct Sequence (DSSS)
- Each network can have up to 65,000 nodes.
- Secure data connections with 128-bit AES encryption
- Avoiding collisions, retries, and acknowledgments

Figure 5. ZIGBEE.

V. SOFTWARE IMPLEMENTATION

a) Introduction to LabVIEW National Instruments' (www.ni.com) LabVIEW (Laboratory Virtual Instrument Engineering Workbench) could be a graphical programing language for making applications that uses icons rather than lines of text. Virtual Instruments, or VIs for short, are LabVIEW programs/codes. A typical instrument setup based on LabVIEW includes data acquisition, signal processing (analysis), and hardware control. Engineers and scientists should use LabVIEW to create test, control, and measurement applications. On a variety of platforms, including Microsoft Windows, LabVIEW is widely used for data acquisition, instrument control, and industrial automation. LabVIEW 2019, which was announced in May 2013, is the most recent version.

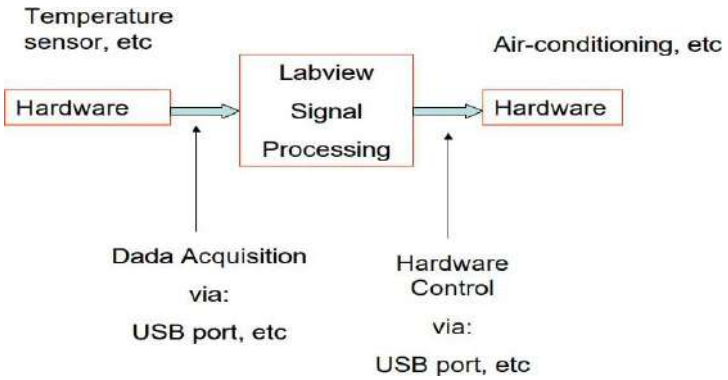

Figure 6. Schematic diagram of an instrument system based on LabVIEW

b)Front panel and block diagram Controls and indicators (input and output/display, respectively) are located on the front panel. Using a set of tools and objects in LabVIEW, we can create a user interface. The front panel is the name given to the user interface. Block Diagram window: Terminals (/Icons) resembling front panel controls and indicators, in addition as constants, function, SubVIs, structure, and wires that connect knowledge from one object to a different. We can add code using graphical representations of functions to control the front panel objects. The block diagram contains this code. To control the front panel objects, we can add code using graphical representations of functions. This code can be found in the block diagram.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

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DOI:10.15662/IJAREEIE.2021.1003007

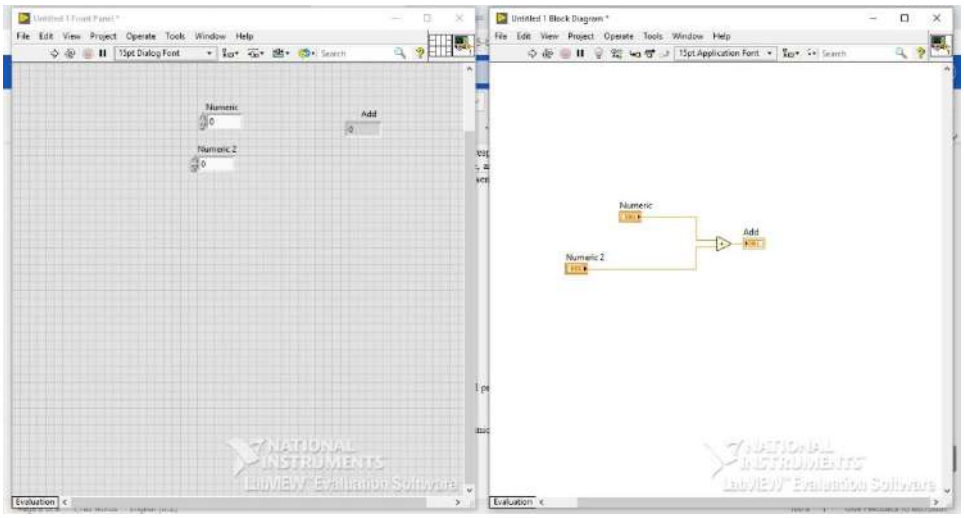

Figure 7. Front panel and block diagram

b) Advantages of using LabVIEW
• The ease with which a DAQ can be acquired for the first time
• Processing in parallel
• FPGA-based programming now has a lower entry hurdle.
• Visualization of measurement data
• Interfacing with instrumentation is easy.
• Interfacing over various communication links is easy

VI. BLOCKDIAGRAM

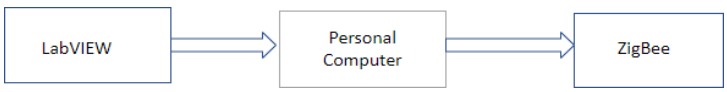

Figure 8. Transmitter Block

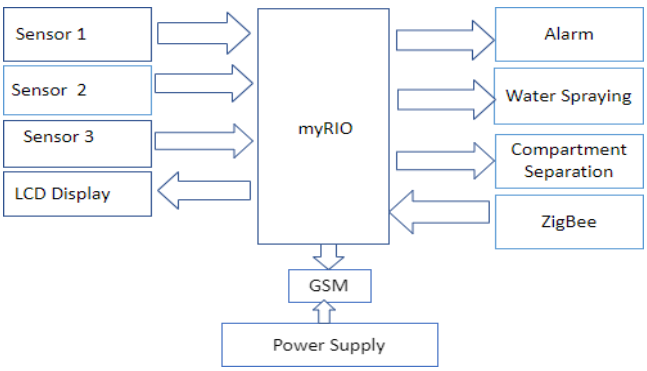

Figure 9. Receiver Block

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VII. PROPOSED WORK

Here we are showing automatic fire alarm and water spraying system which is interface with myRIO by using LabVIEW.

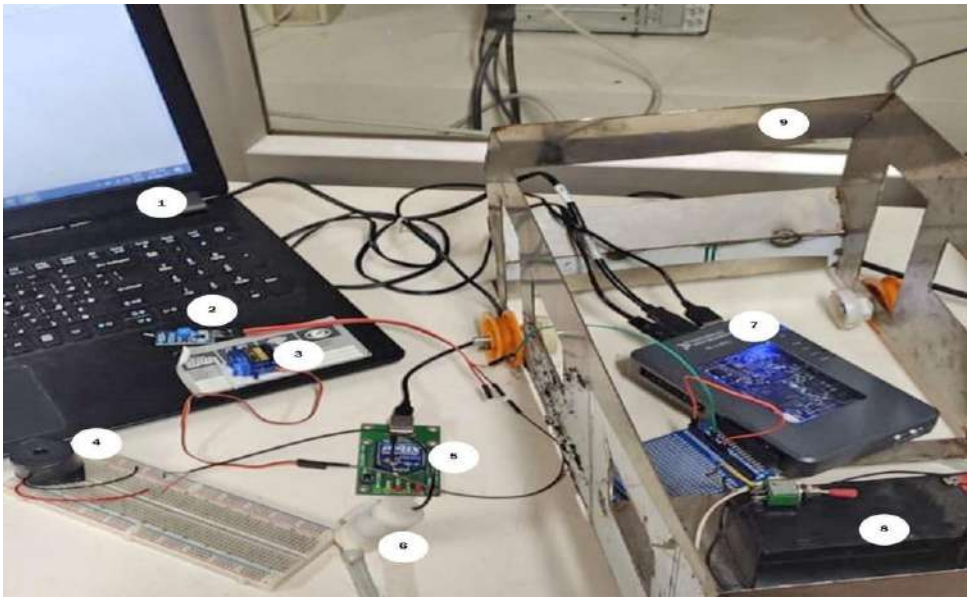

Figure 10. Hardware setup

From figure 10,

1. Programming and Monitoring
2. Flame Sensor
3. Servomotor
4. Alarm
5. Zigbee
6. WaterPumpingmotor
7. myRIO
8. Battery
9. TrainCompartment

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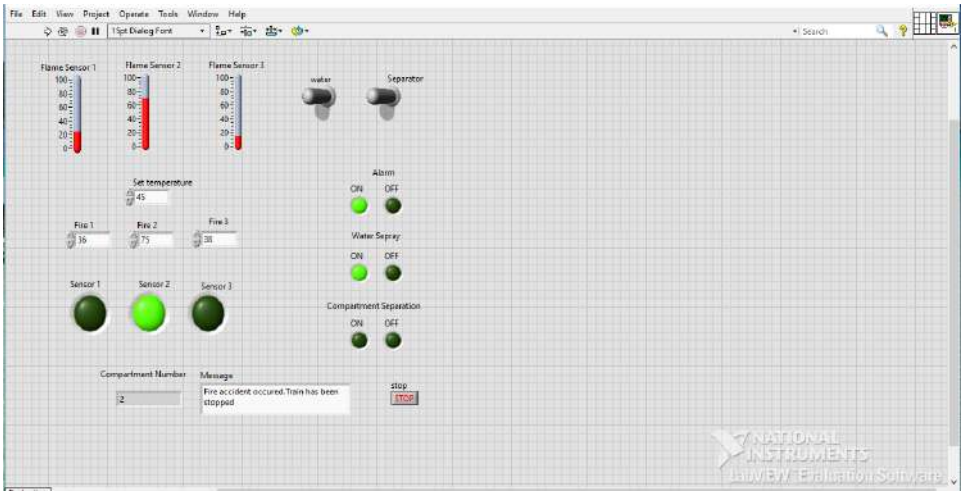

Figure 11. LabVIEW frontpanel

From this front panel we know the fire is detected at compartment 2. So that flame sensor 2 is in ON condition. At the same time the warning alarm and water spray are turned ON automatically.

ADVANTAGES OF PROPOSED SYSTEM

• An automatic fire extinguisher has been installed on the engine side.
• Using LabVIEW and myRIO, the loco pilot monitors the entire compartment through the front panel.
• An automatic water sprinkler and a CO2 fire extinguisher are used to keep the fire from spreading.
• Separation of compartments is fully automated. • The rate of human death has decreased.

VIII. CONCLUSION

myRIO is used to implement this working system. This system will be extremely helpful in preventing accidents by detecting fire at an early stage, alerting passengers, relaying the message to the loco pilot, and taking immediate action to prevent the fire from spreading. As a result, the system is extremely secure. Fire is both a good servant and a bad slave, so we must treat it with caution and caution. We will be able to achieve better results in the future if we use this approach.

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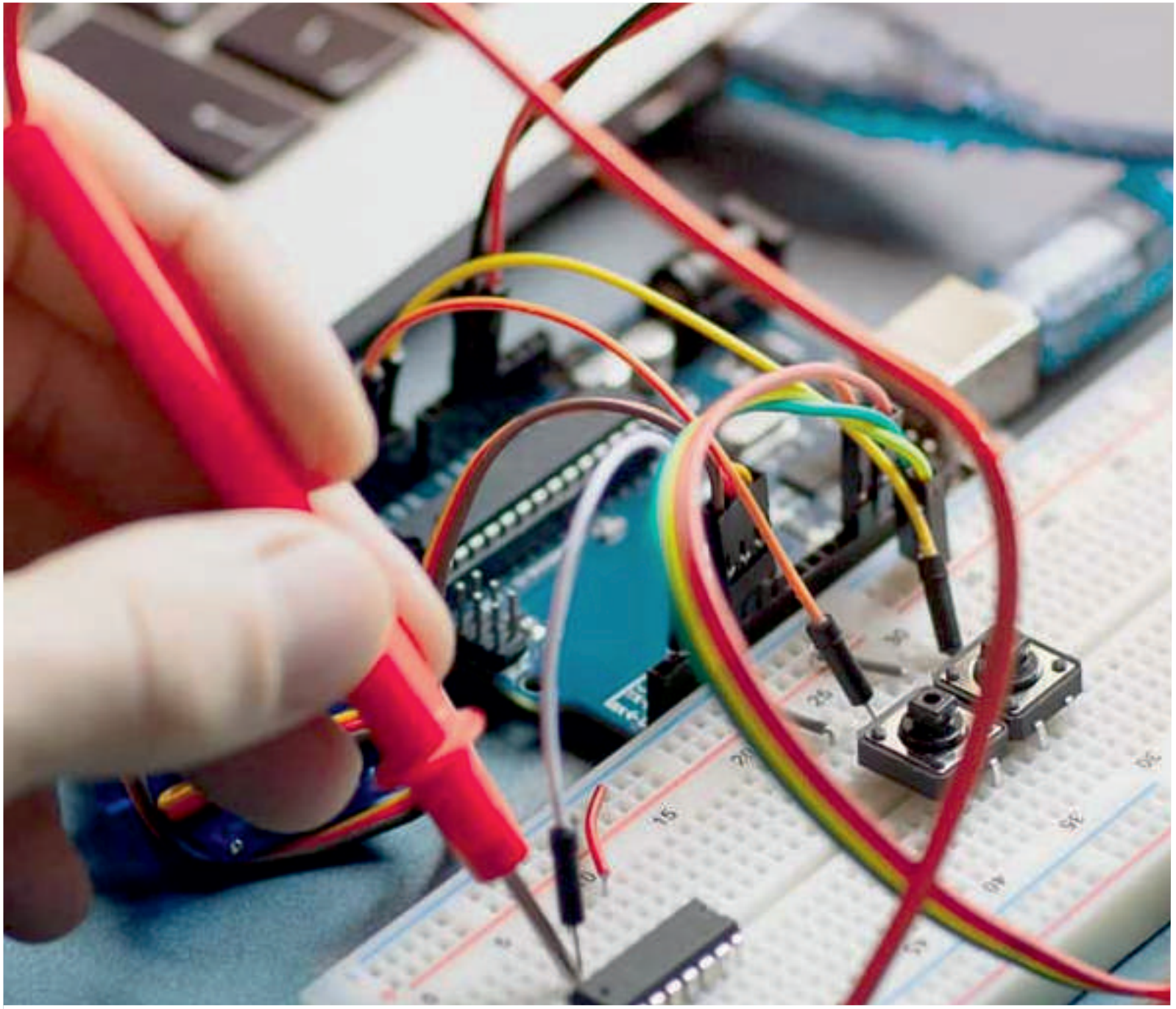

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ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

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International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

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IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9309

Automatic Fire Rescue System in Railways By using myRIO- LabVIEW

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Assistant Professor, Department of Instrumentation and Control Engineering,

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Abstract: Even if an accident occurs due to human error or an unexpected circumstance occurs in the fast-paced automation environment, more technologies are created. So, in order to minimize the number of casualties in the event of a train crash, we developed an improved fire rescue system. Smart sensors and myRIO technology were used to build and implement this device. It will automatically detect a fire and transmit the information to the loco pilot through wireless signal transmission. As a first move, the fire will be extinguished, and information about the accident will be transmitted via Short Message Service (SMS) to crossing and approaching stations, as well as to passengers via an alarm system. This SMS reliably conveys the status of a fire accident by transmitting physical parameters such as compartment number and fire strength. This also shows the same area code for that GSM Mobile network. The complete location where the train is stopped, as well as train information, could be obtained from the control room. As a whole, this mechanism means that the number of people killed in incidents is reduced.

Keywords: Flame Sensor, Fire alarm system, Servo motor, automatic sprinklers, GSM, Zigbee, myRIO, LabVIEW.

I.INTRODUCTION

Railways are one of the world's best modes of transportation because they are more convenient and comfortable for travelers. In India, about 20 million people travel by train each year. The development of railways in our country has been rapid; however, there are numerous unanswered issues in the way of steady growth, such as train fires, train collisions, and so on. The only precautionary alerts about the fire in each compartment are the notes that state "Do not smoke" and "Do not bring inflammable content." Fire accidents in trains, on the other hand, are common due to failures in the routine maintenance system or the actions of illegal social elements. As a result of these concerns, the human mortality rate has risen. Everyone is responsible for fire protection. Any employee should be aware of how to avoid and respond to a fire.

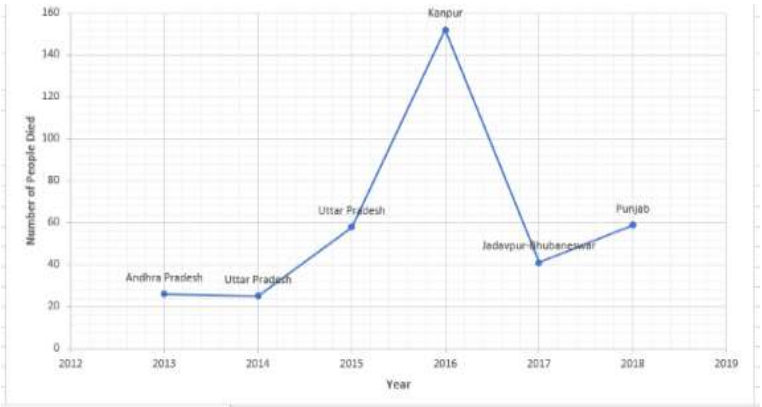

Figure 1. Major fire accident in train

Our project's main goal is to use automatic water sprinklers, CO2 fire extinguishers, and compartment separation to prevent fire from spreading. As a result, we will be able to lower the risk of human mortality while still ensuring the safety of travelers on their journey.

II.METHODOLOGY

In this project, if a fire breaks out for some cause, the flame sensor installed in each compartment will detect it. To detect a fire, fire detectors are mounted in each compartment of the train. For each compartment, three sensors will be used. The fire sensors are discussed, and using myRIO, LabVIEW acquired data signals from the sensor. Through the display, the loco pilot can see the status of each compartment. Water sprinklers are installed in two compartments, and

IJIREEICE
ISSN (Online) 2321-2004
ISSN (Print) 2321-5526
International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering
Vol. 9, Issue 3, March 2021
DOI 10.17148/IJIREEICE.2021.9309

a CO2 Class B fire extinguisher is installed in the engine compartment. The servomotor is used to divide the compartments, and the servomotor and water sprinkler are then interfaced. So that the water sprinkler and servomotor spray water on the compartments together. The use of Zigbee-based wireless sensor technology in conjunction with GSM allows for smooth serial communication between the device and the loco pilot. If a fire begins in the first level, the sensor detects it with a flame sensor and sounds a warning. As a consequence, the passenger, TTE, and loco pilot can be informed. The water sprays and CO2 are released in the second level, and the compartments are separated using a servomotor. The message will be sent to the crossed and upcoming stations at the end of the process. The message contains information about the current state of the fire, the measures taken, the number of compartments that need to be divided, and the location of the fire. The whole procedure was completed at the same time.

Figure 2. Transmitter Block

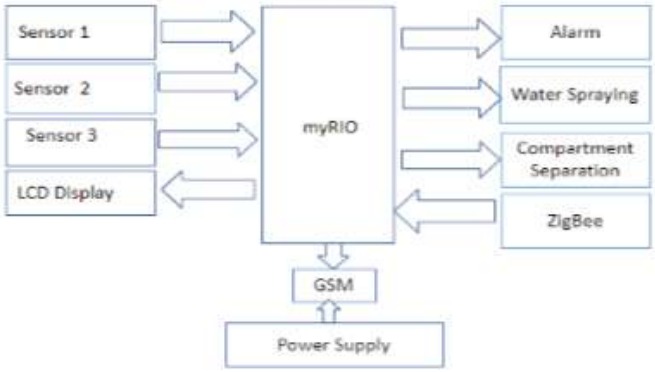

Figure 3. Receiver Block

III.SENSOR IDENTIFICATON

Flame Sensor

A flame detector is a sensor that detects the presence of a flame or fire, making it possible to detect flames. When the flame sensor detects a change in temperature, the output is sent to myRIO. Their function in applications such as industrial furnaces is to confirm that the furnace is operating properly; it can be used to switch off the ignition system, but most of the time it does nothing more than alert the operator or control system. Because of the mechanisms it uses to detect the flame, a flame detector may also respond faster and more accurately than a smoke or heat detector.

Figure 4. Flame Sensor

IV.EXPRIMENTAL WORK

The flame sensor, which is mounted in each compartment of the train to detect fire, can detect it. Through the display, the loco pilot can see the status of each compartment. Here we are displaying automatic fire alarm and water spraying system which is interface with myRIO by using LabVIEW.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9309

Figure 5. Train Engine Compartment

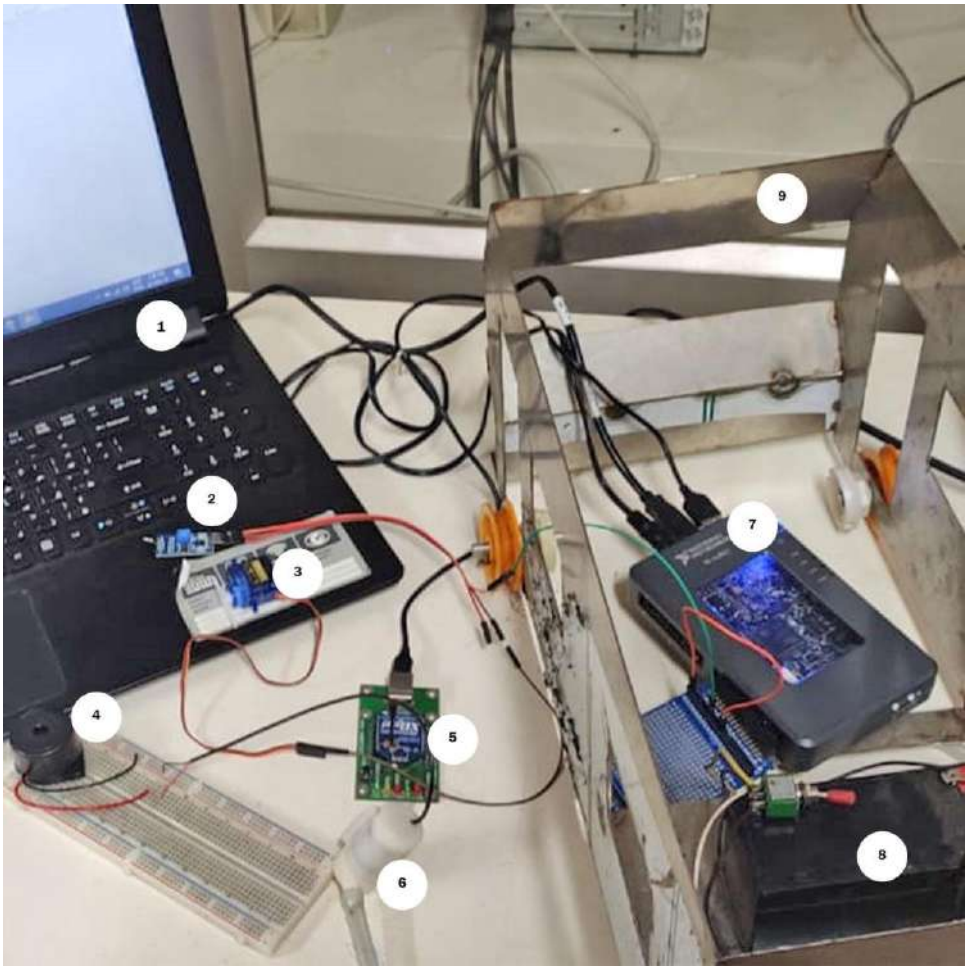

Figure 6. Hardware Implementation

From figure 6,

1. Programming and Monitoring
2. Flame Sensor
3. Servomotor
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IJIREEICE

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Electrical, Electronics, Instrumentation and Control Engineering

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5. Zigbee

The acronym RIO stands for Reconfigurable Input/Output. myRIO has a programmable dual-core ARM cortex A9 processor. A Xilinx Field Programmable Gate Array is included (FPGA). myRIO's necessary terminal is a power supply, which we connect to our device using a USB cable. The data from these sensors is read using the LabVIEW Software and myRIO

V. RESULT AND DISCUSSION

There are several ways to put out a fire, but using myRIO-based tools, we get a very fast response and result in LabVIEW.

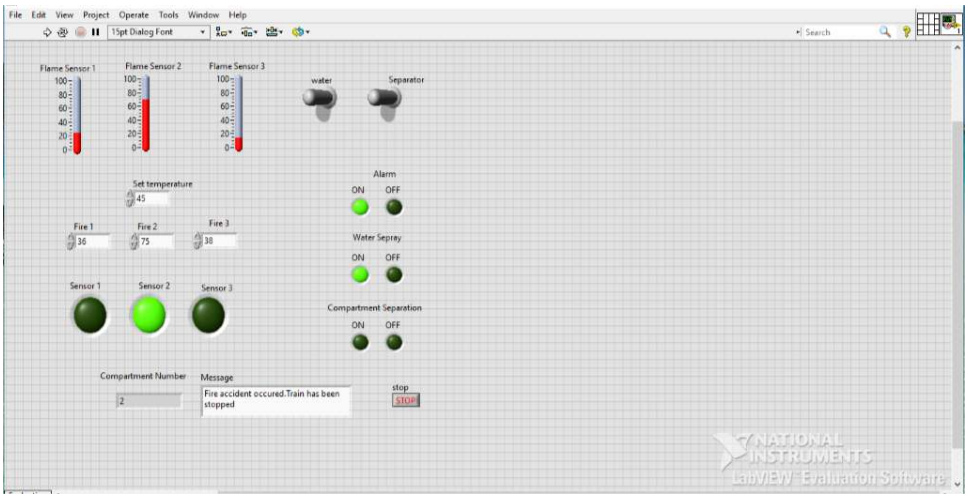

Figure 7. LabVIEW Front Panel

We can presume from this front panel that a fire has been identified in compartment 2. As a result, flame sensor 2 is turned on. The warning alert and water spray are both turned on at the same time.

VI.CONCLUSION

MyRIO is used to implement this working framework. This device would be extremely useful in minimizing fires by detecting fire at an early stage, alerting passengers, relaying the warning to the loco pilot, and taking urgent action to prevent the fire from spreading. As a consequence, the device is extremely stable. Fire is both a good servant and a poor slave, so we must treat it with caution and caution. By using this technique, we can achieve better results in future.

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| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003001

Design and analysis of unhurried heat process using various control strategies

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[5] Assistant Professor, *Dept of Instrumentation & Control Engineering, Saranathan College of Engineering, Trichy, TN,India*

Abstract — The objective of the work is to maintain the temperature in the closed loop at desired set value. The temperature tank has the features of nonlinearity, sluggishness by tuning conventional PID methods. This paper focus on implementation of internal mode control (IMC) to obtain an optimal PID control setting for temperature process. System identification of the process is done by Two-point method. Here delay is approximated with First Order plus Pade Approximation. At first, a Proportional Integral Derivative (PID) controller based on IMC-PID setting is designed and the results are compared with Ziegler Nichols (ZN) and Tyreus-Luyben (TL) controller settings. The robustness of the controllers is endorsed by imposing regulatory disturbances. The simulation results confirm that IMC-PID controller has improved dynamic performance on disturbance rejection.

Keywords: Water Heater, PID controller, Internal Model Control, Ziegler-Nichols and Tyreus-Luyben, Integral Square Error (ISE) and Mean Square Error (MSE).

I.INTRODUCTION

The PID control is the most commonly application of control strategy nowadays, with its simple arrangement, good robustness and wide application range, it is graduallyhighlighted in the control theory. It has been observed that,however, the existing PID controllers may not perform well in the complex control processes, such as the higher-order system and time-delay system. Efforts have been put to fixthis problem, and numerous effective PID controller design and tuning methods for complex processes have been stated [1]

PID tuning has certainly been the key to reasonable performance and robustness. PID controller setting isproposed for several process model. There are three commonly used method of PID tuning, they are Internal Model Control [2], Ziegler- Nichols setting [3] and Tyreus-Luyben setting [4], which still used in several industrial applications. Internal Model Control allow system designer to specify the anticipated system behaviour. The robustness and performance of the model can controlled by the singleparameter (λ). IMC-PID setting is one of the greatest closed-loop method among experts and researchers since it is the easy way to understand. In the context of IMC, Parameter of consequent close-loop models are enhanced with respect to error performance criteria such a Integral Square Error (ISE) and Mean Square Error. The Internal Model Control (IMC) structure offers an appropriate structure for satisfying the ideas. IMC [5] theory has been used earlier and autonomously by a number of other scholars. Using the IMC setting design technique, controller difficulty depends entirely on two factors: the difficulty of the model and the performance necessities indicated by the designer. IMC denotes to a methodical technique for control design based on the Q- parameterization [6] idea that is the source for many current control methods. IMC offers an approach for designing Q-parameterized controllers, has real-world appeal. As a result, IMC has been a widespread design technique in the chemical industries, mainly as a malicious for tuning single loop PID controllers.

II. EXPERIMENTAL SETUP

The physical experimental system comprises of Heater, Rotameter, PLC, control valve, temperature controller, water supply, Analog to digital converter, solid state relay, RTD.

TABLE I: COMPONENTS OF EXPERIMENTAL SETUP

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DOI:10.15662/IJAREEIE.2021.1003001

1.set point 2.PLC 3.Solid State relay 4.Heater 5.Water supply 6.Rotameter 7.control valve 8.RTD

TABLE II: Technical description of experimental setup

Part name	Description
RTD Temperature	50 ~ 500 °C
Temperature transmitter	Input 4-20mA, Output 1-5V
Solid state relay	5V
Motor Pump	0.5 HP 220v
Water Heater	500W
Rotameter	6 – 60L
Communication	USB

System Identification – Two Point method:

Two-time instants of the reaction curve are estimated for two-point methods in order to calculate the characteristic values of a FOPDT system. In this study, the two-point method proposed by Sundaresan and Krishnaswamy (1978) is used. Step response found by two-points method should be thinking without dead time. Because of the system has no dead time.

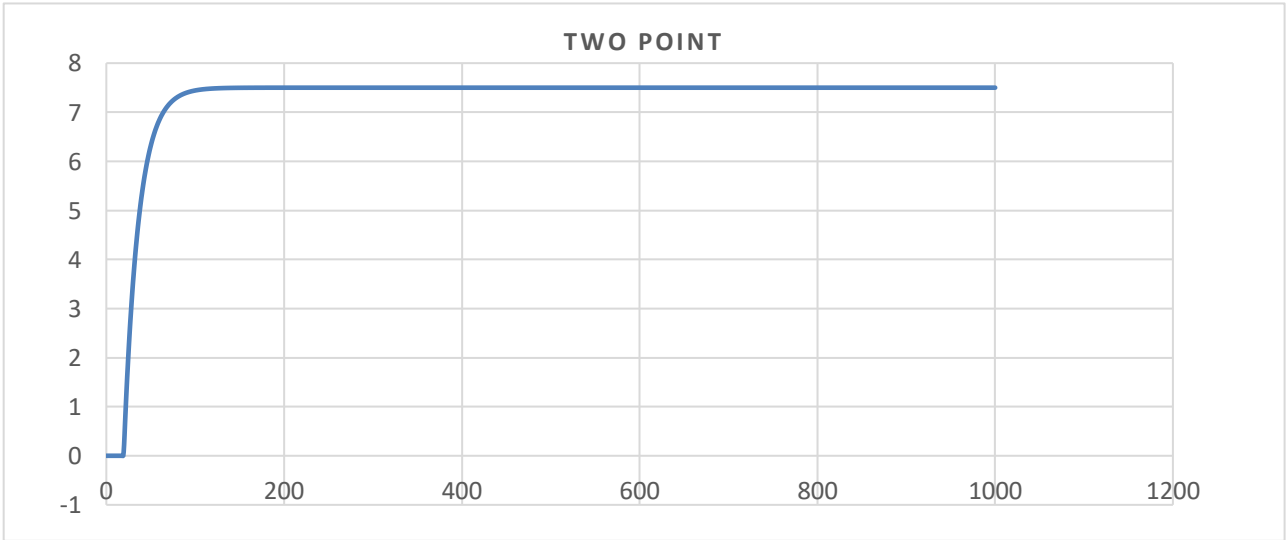

Figure: Close loop response of Two-point Method

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From this Graph we can find k_p, t and τ
The transfer function of Two-Point method given below.

$$G(s) = Ke^{-ts} / \tau s + 1$$

Where k_p is the steady state gain, t is dead time,

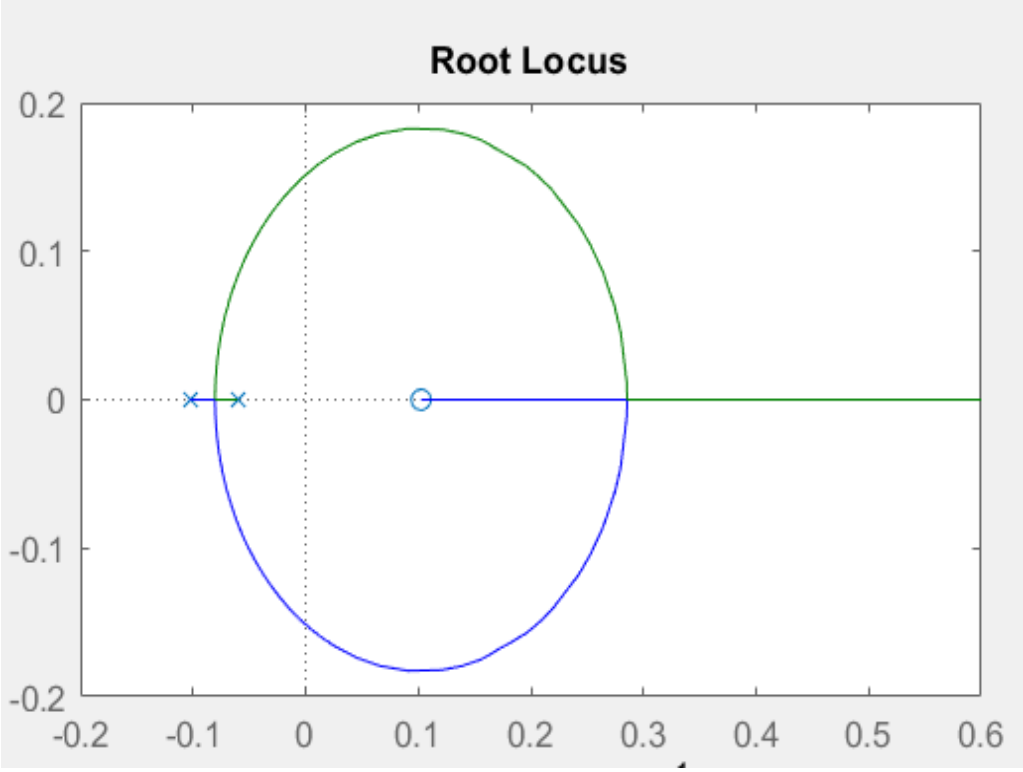
$$G(s) = 0.1875e^{-19.5s} / 16.5s + 1$$

CONTROLLER DESIGN

This paper reports the implementation of PID parameters in three design setting. The ZN-PID method, Tyreus-Luyben and IMC-PID method. With these techniques, tuning of PID parameters is accomplished to achieve a robust design with the anticipated response time. PID controller is tuned by physically regulating design criteria in three design modes. The response has approximately the similar set point after a comparatively extended settling period.

A. ZN and TL based PID:

The procedure to find Ziegler-Nicholas, Tyreus-Luyben PID controller we should know Ultimate Gain (K_u) and Ultimate Period (P_u). using MATLAB code, we can find ultimate gain and ultimate period.



From above diagram we can find **gain** and **Frequency (ω)** where $\mathbf{p_u = 2\pi / \omega}$.

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TABLE III: ZN-PID and TL-PID CONTROL PARAMETERS

PID	K_p	T_i	T_d
Ziegler-Nicholas	$0.6K_u$	$P_u / 2$	$P_u / 8$
Tyreus-Luyben	$K_u / 3.2$	$2.2P_u$	$P_u / 6.3$

B. IMC based PID:

Internal model control (IMC-PID) is based on a precisemodel based on the mathematical model of the process. The control system leads to stable and robust. A stable **control** system is one which keeps suitable control actionfor the dynamic changes in the control system.

IMC controller settings,

$K_p = (\tau + 0.5\theta) / K_p (\lambda + 0.5\theta)$

$T_i = \tau + 0.5\theta$

$T_d = \tau * \theta / 2\tau + \theta$

Where $\lambda > 0.8\theta$, $K_i = K_P / T_i$, $K_d = K_p * T_d$

TABLE IV: CONTROLLER PARAMETERS

Parameter	K_p	K_i	K_d
IMC-PID	5.52268	0.21039	33.8467
ZN-PID	8.76	0.41834	45.8586
TL-PID	4.5625	0.049519	30.32694

Result and Discussion

Internal Model Control, Ziegler Nichols and Tyreus-Luyben Closed Loop Response for PID Controller The transfer function obtained through empirical method of modelling is used as the system for studying the performance of PID Controllers by IMC, ZN, TL closed loop response for PID controller as shown in figure below for the temperature control system for water temperature system is shown in figure.

TABLE V: COMPARISION OF PERFORMANCE INDEX

Specification	IMC-PID	ZN-PID	TL-PID
MSE	1.35	1.94	1.35
ISE	0.042	0.048	0.047

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003001

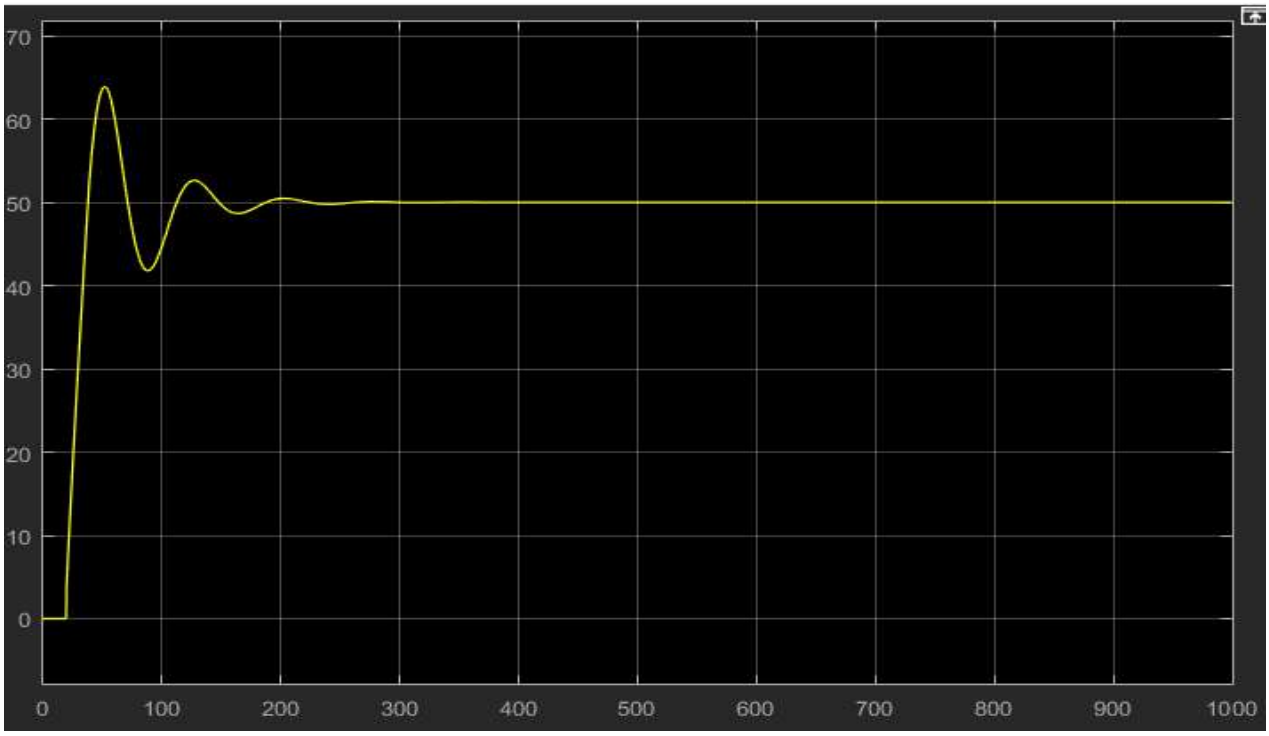

Figure: Close loop response for IMC

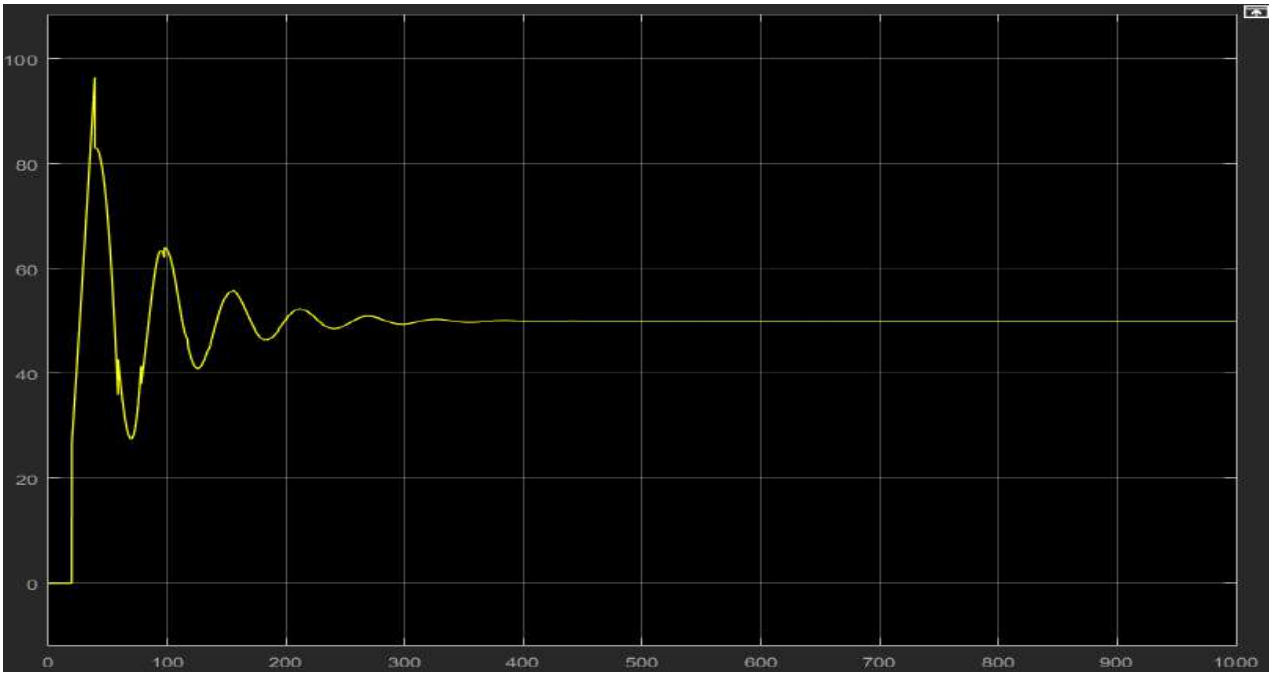

Figure: Close loop response for ZN

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|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003001

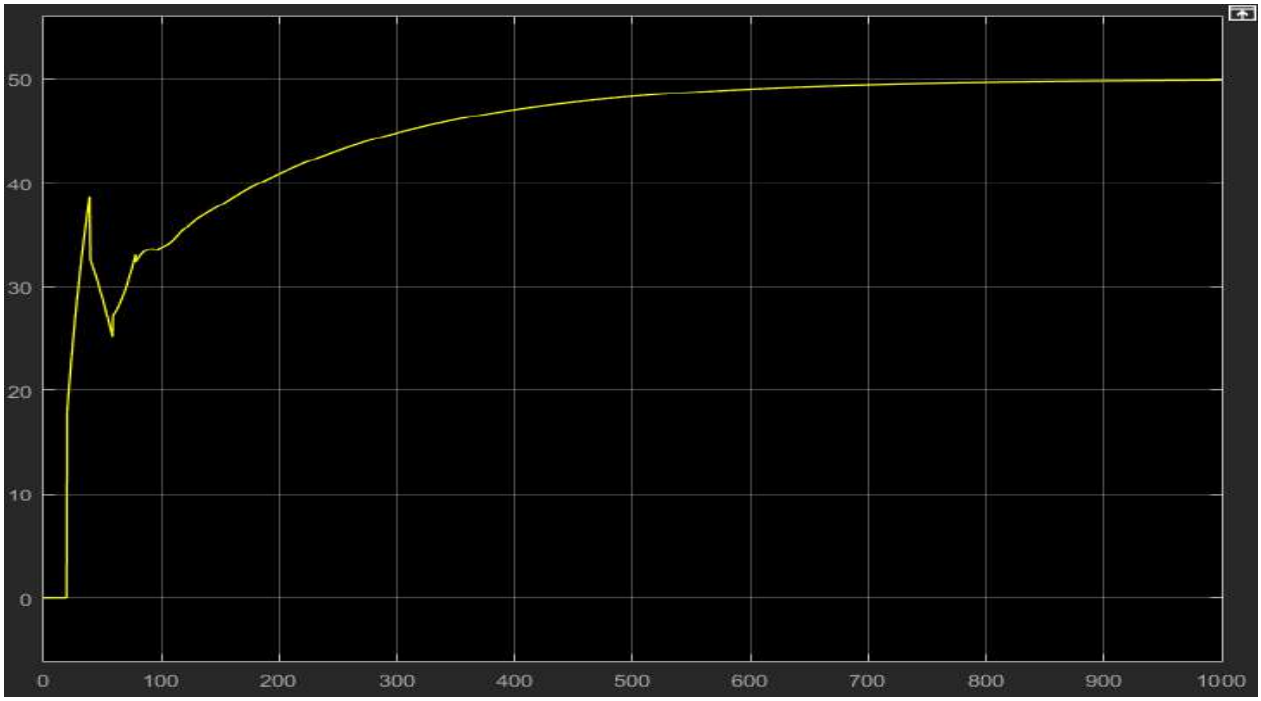

Figure: Close loop response for ZN

Load change response of a process for PID controller is shown is figure and given below and it evidently states how quick the IMC-PID, ZN-PID and TL-PID reacts to disturbance. Given below

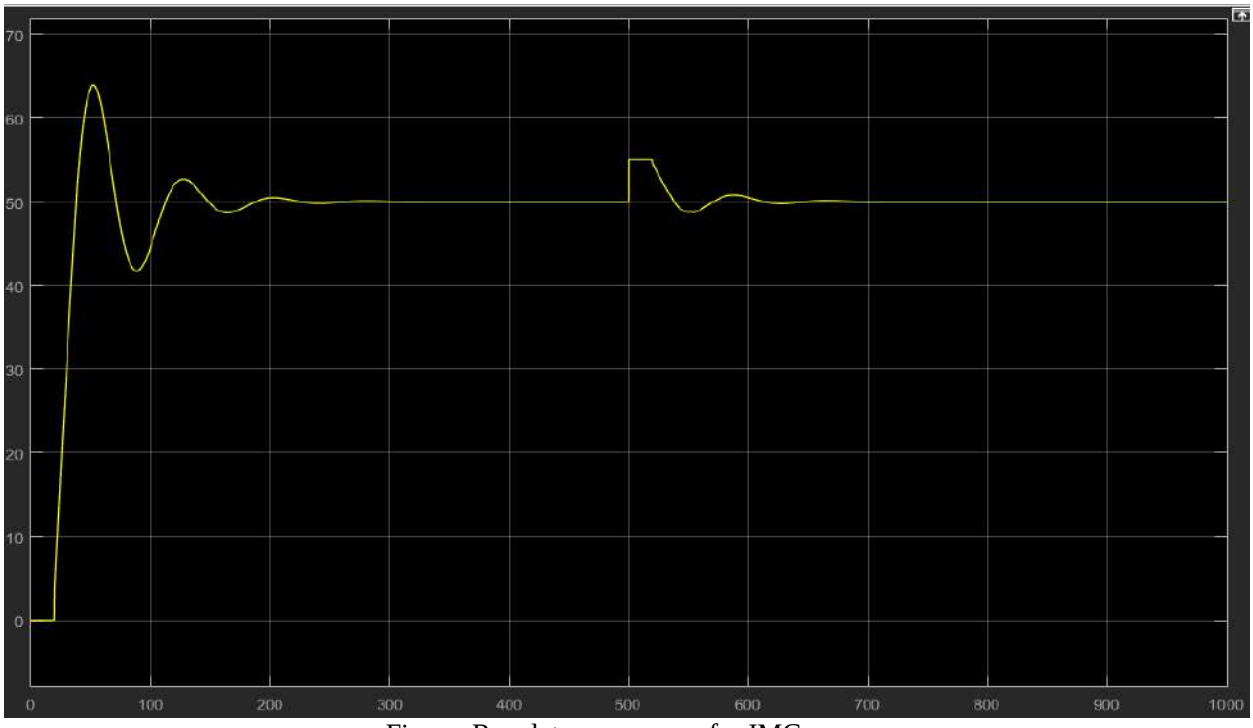

Figure: Regulatory response for IMC

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003001

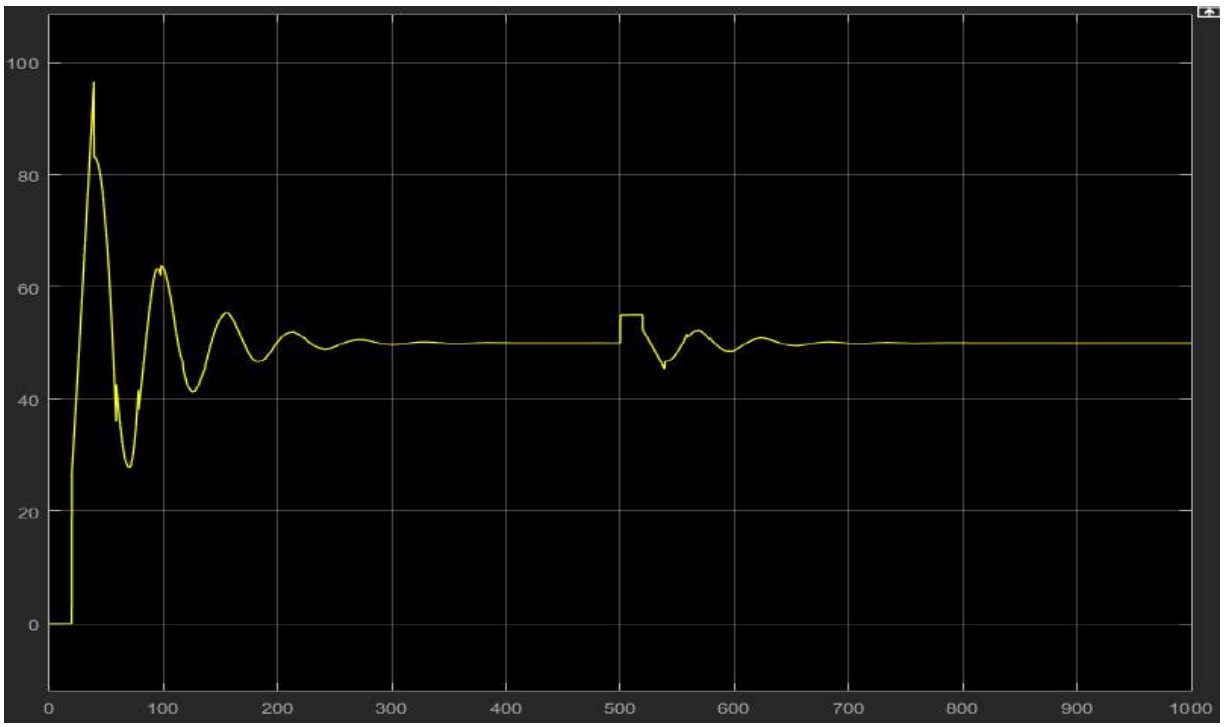

Figure: Regulatory response for ZN

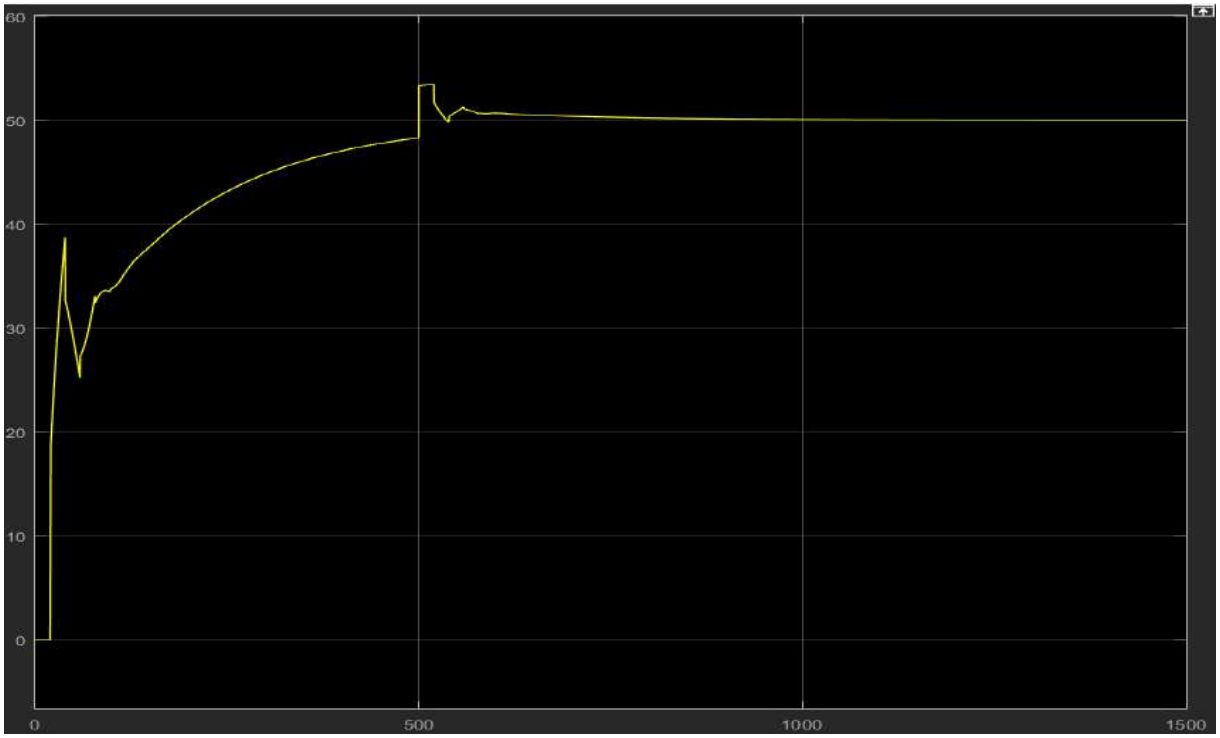

Figure: Regulatory response for ZN

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

|| Volume 10, Issue 3, March 2021 ||

DOI:10.15662/IJAREEIE.2021.1003001

CONCLUSION

An IMC, Z-N and T-L are implemented to control the outlet temperature of water tank. The mathematical model has been presented in this study and compared with experimental results. Performance IMC tuning method is compared with Z-N and T-L by using (MSE) and (ISE). The results show that performance of the IMC tuning method is better than Z-N and T-L for the temperature control system.

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IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9318

Automated Scavenging System with Hybrid Bins and Filters

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Abstract: India is considered to be the second – largest in terms of population and one of the countries in mass production of waste. Even though many steps were taken to manage waste but none provide a solution to manual scavenging and segregation. Moreover, ditch line cleaning is a major part of sanitation work. Manual scavenging is a potential health threat to sanitation workers 69% of street sweepers & scavengers suffers from multiple health problems. Manual scavenging is not only harmful it is physically exhaustive too. Manual scavenging is harmful and disrespectful practice but it is required to keep our city clean. Another major threat is global warming and climate change. The most suitable way to recover our mother earth is to increase in growth of trees and plants at a massive rate. Management of saplings in cites is one of the major drawbacks and cost is arithmetically higher in rate. Thus we intend to provide a more appropriate solution to manual scavenging, ditch sludge clearance and sapling management in roadsides with hybrid bins. An automated vehicle is used to collect and segregate the solid waste in the roadside with the help of mechanical structures, actuators, and a vacuum pump. A movable filter is used in ditch lines to collect sludge, slurries, plastic waste and other floating matters. A hybrid bin is constructed in such a way where it allows spacing to plant a sapling and an electronic stick is embedded in it to manage the growth of the saplings in all aspects. Thus through our innovation, we provide scavenging at a faster rate, increase the dignity of workers, reduce they're prone to health hazard, reconstruct the climate change and make a better place to live in.

Keywords: Scavenging, Waste Collection, Urban Forest.

I. INTRODUCTION

India is the second most populated country in the world after China. The population of India is projected close to 1.37 billion or 1,369 million in 2019, compare to 1.354 billion in 2018. The population growth rate for 2019 is projected at 1.08%. India will add 1.49 crore in 2019. According to the Press Information Bureau, India generates 62 million tonnes of waste every year, of which less than 60% is collected and around 15% processed. With landfills ranking third in terms of greenhouse gas emissions in India, and increasing pressure from the public, the Government of India revised the Solid Waste Management after 16 years. The generated waste can be divided into three major categories: Organic (all kinds of biodegradable waste), dry (or recyclable waste) and biomedical (or sanitary and hazardous waste).

Every Indian town has at least one specific area earmarked as a landfill area. The collection process begins with contractors employed by government bodies performing door - to - door collection services covering all households, scourging for any recyclables that may fetch a market price and later transporting all remaining waste to landfills. Each truck typically waits in line for two to three hours for its turn to weigh the amount of waste collected that day and then typically waits for some more time to dump the waste into the landfill.

[6]The US Public Health Service has identified 22 human diseases that are linked to improper solid waste management (MIT Urban Development Sector Unit 1999). Several studies have been published that link asthma, heart attack, and emphysema to burning garbage. Human fecal matter is also frequently found in municipal waste. This, along with unmanaged decomposed garbage, attracts other rodents that further lead to a spread of diseases such as dengue and malaria (Biswas 2012).

As shown in Figure 1,[6] less than 60% of waste is collected from households and only 15% of urban India's waste is processed in a country 12 times as dense as that of the United States (US) (PIB 2016).

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IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

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DOI 10.17148/IJIREEICE.2021.9318

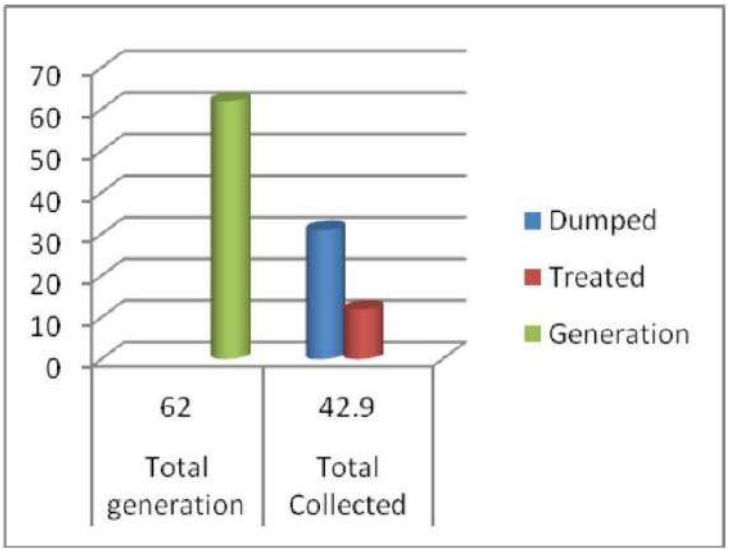

Fig 1: Collection vs. Dumped Statistics (numbers in million MT per annum) (Source: PIB, Government of India)

[9]Global warming, caused by greenhouse gas pollution, is causing immediate and direct changes to the planet. The Earth's temperature had already warmed by 1°C compared to pre-industrial levels. This temperature rise may appear small, but small rises in temperature translate into big changes for the world's climate. This is because the amount of extra energy needed to increase the world's temperature, even by a little, is vast. This extra energy is like force-feeding the global climate system.2016 was the hottest year on record, the previous record was broken in 2015, and 2020 is expected to set a new record for the third year in a row. In the past few years, records have been broken for the longest heat waves and the Bureau of Meteorology has added purple and magenta to the forecast map for temperatures up to 54° C. Increased Ocean temperatures are melting glaciers and ice caps all over the world. Melted ice increases the volume of water in our oceans. Warmer temperatures also result in the expansion of the water's mass, which causes sea levels to rise, threatening low-lying islands and coastal cities. Extreme weather events like bushfires, cyclones, droughts, and floods are becoming more frequent and more intense as a result of global warming The oceans have absorbed most of the extra heat and carbon dioxide (CO2) so far - more than the air - making the seas both warmer and more acidic. Warming waters are bleaching coral reefs and driving stronger storms. Rising ocean acidity threatens shellfish, including the tiny crustaceans without which marine food chains would collapse. [10]Figure 2 shows the history of the global temperature since 1880.

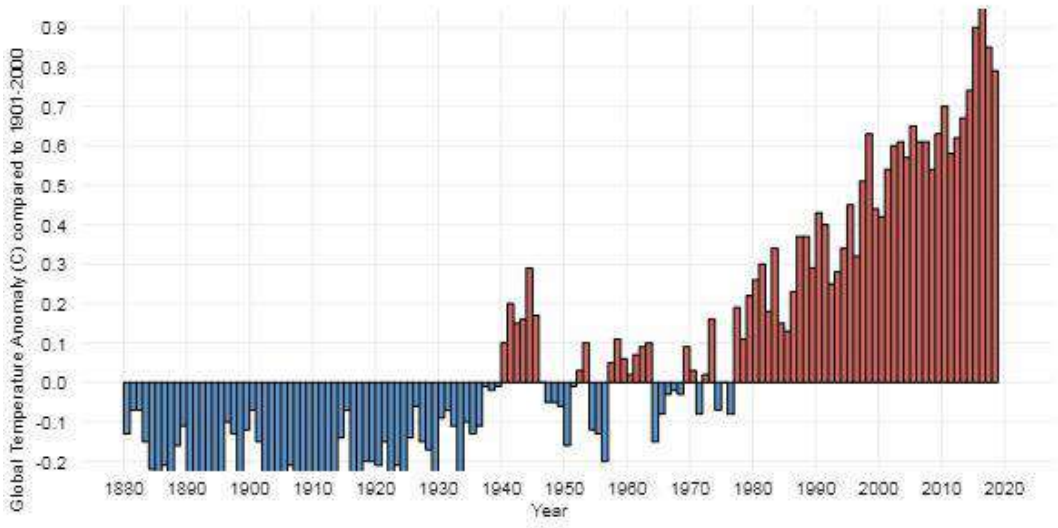

Fig 2: Graph of Global Temperature

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9318

II. LITERATURE REVIEW

Street Sweepers: [1]The corporation sweeper suffers from severe back pain and often has breathing difficulty. A study by Madras Medical College (MMC) found that nearly 69% of the city sweepers suffer from multiple health problems. It includes disorders related to bones, joints and muscles, lungs, eyes, and skin. The researchers observed these health issues were due to prolonged exposure to dust, lack of periodic health screening and customized cleaning equipment like broomsticks and poor awareness and negligence in using safety gear. Among the 73 workers, including 49 women, profiled, women sweepers were found more prone to musculoskeletal problems, back pain is the most common complaint among the workers (70%). Improper working posture, usage of short and damaged broom and inadequate supply of brooms were the cause for an increase in the prevalence of musculoskeletal problems.

The biological materials in the dust are capable of causing allergic diseases in humans such as the runny nose, watery eyes, and sneezing by large-sized particles, as well as swelling of lung tissue and asthma by fine particles, the study said.

[7] According to a National Institute for Occupational Safety and Health study in 2008, work-related respiratory diseases account for about 70% of all occupation-related death worldwide. According to International Labour Organization, street sweepers have more than one incidence of illness with common issues being flu, cough, eye irritation, rash, skin irritation, diarrhea, stomach upset, chronic cough and eye disease. Many studies have detected morbidities among sweepers like hypertension, respiratory tract infection and chronic bronchitis.

Ditch Clogging: A clogged drain can be a serious problem. Often, people choose to ignore clogged drains, hoping that they will clear out on their own. However, ignoring a clog often leads to it becoming severe and even blocking the drain completely. A clogged drain can be inconvenient, it causes improper flow of water in roadsides ditches. It is one of the major reasons for flooding and mosquito breeding. Here are some of the effects of a clogged drain is poor drainage, dirty water, bad odours, health risks, leaks, etc.

Arboriculture in Cities: [4]Sustainable arboriculture is broad-based and complex due to the diverse and dynamic character of urban green areas and their environment owing to the impact the people and their activities have on an urban tree- e.g., planting, removal, pruning, land development, plant injury. Wide- range activities of people are among the major forces for change in the health and character of the urban forest and ultimately determine its sustainability, more so than any other forest resource. In this scenario, sustainable tree care and maintenance represent the preservation of the long term efficiency of the urban ecosystem in an environmentally conversing and safe manner coupled with economic viability, social justice and equality for the citizens. Although urban green areas have been acknowledged globally to be of utmost importance, the term “Sustainable Arboriculture" is often loosely and in a general manner as a label, brand or icon to make it acceptable to all types of stakeholders and under various environments. In the coming decades, arboriculture and urban forestry will have face many challenges as population increases and demographic changes, flinching per capita natural resources, environmental degradation, climate change, and globalization. At the international level, urban green areas are more and more perceived as vital spaces for the development of important functions as the strictly economic- environmental and the social and economic ones. Also, in many urban areas, lack of proper tending and maintenance results in much higher tree mortality rates that cannot be sustained over the long term. In this paper, we will be seeing the hybrid bins and an electronic stick to maintaining the sustainable growth of urban forest.

III. AUTOMATED SCAVENGING VEHICLE

Automated Scavenging Vehicle:

It is a system that eliminates manual scavenging in road and ditch lines with help of automated scavenging vehicle and movable hybrid filters. The scavenging vehicle is of the type of lawnmower. The vehicle is moved manually. The vehicle is constructed in a way where it collects all the solids like derbies, plastic materials, filthy materials, etc.

Structural Frame: The structural frame of the vehicle is made up of 1mm hollow square mild steel tubes with a length of 3.5 ft, width 1.5 ft and height of 3 ft. A handle is placed for the movement and control of the vehicle. The frame is made up of temporary joints using nuts and bolts. Two pairs of universal wheels are placed for the locomotion of the vehicle.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

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DOI 10.17148/IJIREEICE.2021.9318

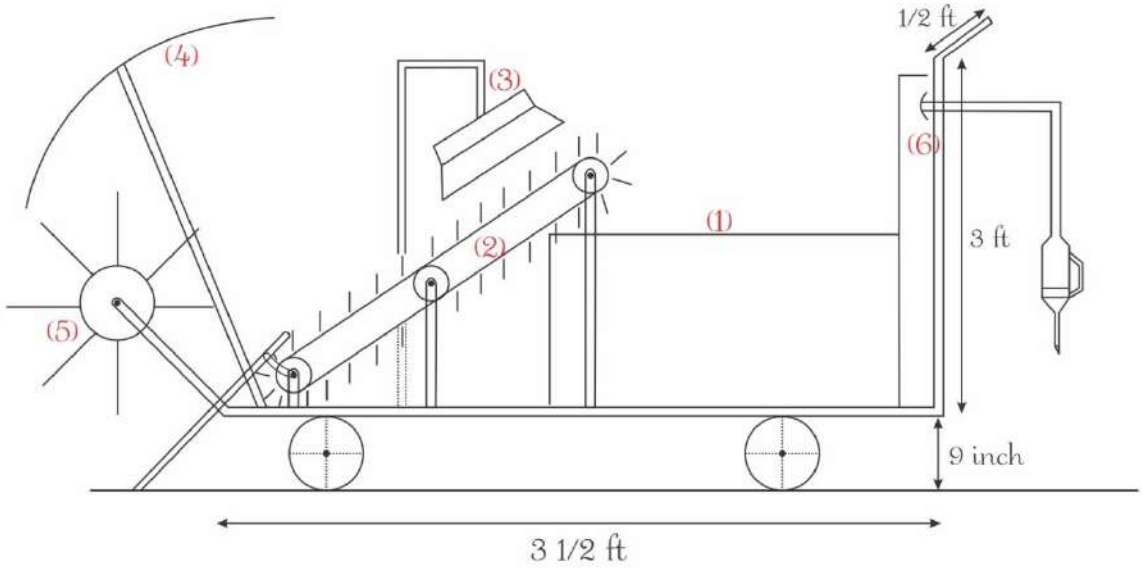

Fig 3: Schematic Sketch of Automated Scavenging Vehicle

3.1 Removable Bins Setup: A removable bin is made up of stainless steel plates. This is in the dimension of 2*1.5*2.5. It is of the length of 2 ft, the width of 1.5 ft and the height of 2.5 ft. The total volume of the bin is 7.5 cubic feet and has the capacity to hold the garbage of 212 litres. The sliding friction of the bin is relatively less thus it is easy to discharge the garbage in dump yards.

3.2 Conveyor Setup: The garbage fills which are collected in the ramp is transferred to the removable bins with the help of conveyor belts. The conveyor is made up of the stepper belt and driven by the DC motor. The motors are clamped to the structural frame with the inclination of 25 degrees. The length of the conveyor is 2 ft and a width of 1.5 ft. The conveyor belt has a capacity of carrying the load of 5 - 7 kg.

3.3 Segregation Setup: [8]An electromagnet is connected above the conveyor. This is used to separate metallic and non - metallic waste moving through the conveyor. An electromagnet is clamped to the structural frame to balance the load on it. It has the capacity to hold 6 kg of metallic waste. It is energized by 12 v rechargeable lithium batteries and controlled via switches.

3.4 Pneumatic Actuator Setup: A pneumatic actuator is connected to the structural frame. An arc - shaped sheet is mounted to the pneumatic cylinder. The angular movement of the actuator is controlled via a DC stepper motor. During the elongation of the actuator, the arm is set free at a 0-degree angle as the compression takes place thus garbage is collected and moved towards the ramp, and then the angle of the bar is set to rest position at 110 degrees. These pneumatic actuators increase efficiency by increasing the rate of garbage collection.

3.5 Ramp Setup: [3]A ramp is connected in the front section of the vehicle with the inclination of 35 degrees with a length of 6.5 inches. A rotating circular cylinder is connected with the12 v dc motor which drives the rotating cylinder. [5]The rotating cylinder is mounted on the ramp straight right angle to the center to the length of the ramp. Spikes and collecting plates are embedded in the rotating cylinder which increases the efficiency of the vehicle by collecting the garbage fills without manual interventions.

3.6 Vacuum Setup: The vacuum system is an auxiliary function part of the automated scavenging vehicle. It mainly assists in improving efficiency by collecting paper bits, micro plastics, dust, sand, and fine particles, etc. The vacuum system used an electric motor (775-12 v DC motor) to drive the fan blades to rotate at a high speed by, and negative pressure was formed in the sealed casing to absorb external dust. Therefore, there are certain requirements for the curvature and size of the blade. In this way, the fan air volume can be guaranteed to have a certain vacuuming capacity. Known wind volume calculation as in (1).

IJIREEICE
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Electrical, Electronics, Instrumentation and Control Engineering
Vol. 9, Issue 3, March 2021
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$$Q=VF \quad (1)$$

Where V is the Wind speed, it can be accurately measured with an anemometer; Q is the air volume; F is an air duct cross-sectional area. According to the design requirements, the maximum air volume is not less than 3000m3/h.

$$Q_{max} \geq 3000m3/h \quad (2)$$

Completion of fan blade design calculation according to formula (1) and (2). [5]The outer diameter of the fan is 23.5 mm. As shown in Figure 3. The vacuum structure is made out of PVC material. It has a detachable part were the waste can be discharged and attached to the vacuuming system. It is powered by lithium batteries and controlled by switches. Figure 3 shows the schematic sketch of the vacuum blade.

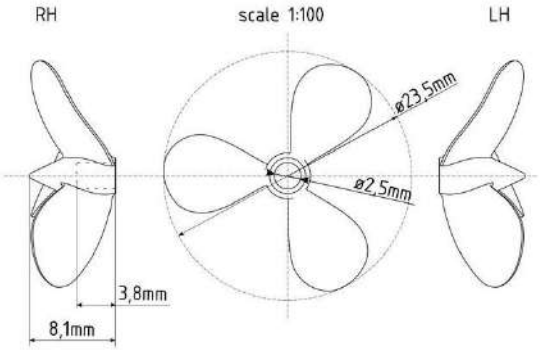

Fig 4: Vacuum Blade

Scavenging vehicle is driven manually in the streets. When there is a need to collect the garbage fills on the roadsides, the vehicle is moved towards the garbage, the roller setup collects the garbage's automatically. In addition, actuators are used to collect garbage's efficiently. The collected garbage is transferred to the removable bins via conveyor. During the line of transfer, the metallic particles are segregated with the help of an electromagnet. A vacuum is used to suck the micro plastics, dust, sand, paper bits, etc.

Thus the vehicle is constructed in an efficient manner and eliminates manual scavenging. It provides a feasible solution to the scavengers and street sweepers by reducing their workload and health hazard.

IV. HYBRID FILTERS

Hybrid filters are used to remove the sludge, slurries, floating materials, etc in the ditch lines and open drainages. It works in the rotational motion to remove debris in ditches.

The hybrid filter is placed in the ditch lines which are of in the width of 3 - 5 ft. An L-shaped mild steel mesh is fabricated in accordance with the width of the ditch lines. The base of the L - shaped is equal to the size of the removal bin which is placed behind the L - shaped filter. The filter and the bin are connected through a sheet of rubber to eliminate the leakage of debris during its rotational movement. The L - shaped filter is placed in accordance with the flow of the water in ditch lines. One end of the L - shaped filter is connected to the shaft of the AC motor.

The control of the rotation movement of the motor is placed in the scavenging vehicle with the help of RF controllers. The power supply to the hybrid filters is given through the AC supply from the street light poles. When the scavenging vehicle nears to the location of hybrid filters the signal is received from the transmitter of the scavenging vehicle of a certain frequency.

By the control action in the scavenging vehicle, hybrid filters are rotated to discharge the debris collected in the ditch lines to the removable bins the hybrid filters. Thus the ditch lines automatically scavenged without manual interventions in a feasible and efficient manner. Figure 5 shows the block diagram of the hybrid filter.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9318

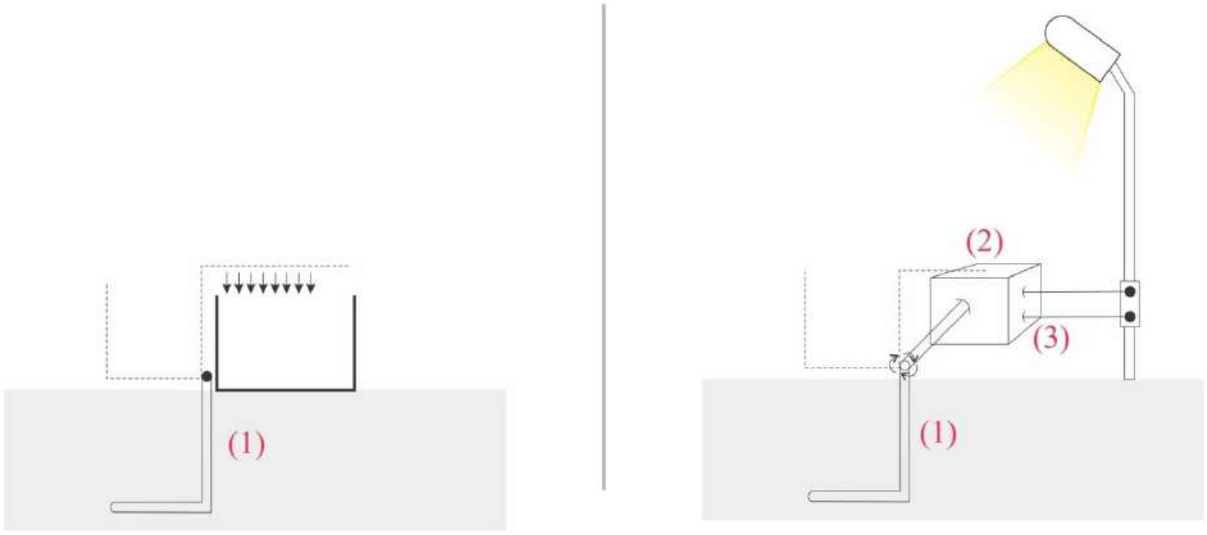

Fig 5: Schematic Sketch of Hybrid Filters

V. SMART BINS

Smart Bins are employed to increase urban forest (arboriculture) Smart bins are placed to increase urban forest. It plays major roles in collecting biodegradable and non-biodegradable waste and also gives a protective space for saplings growth. It is made up of two PVC bins of a diameter of 1.5 ft. A diameter of 2 ft of space is given in between the two bins and it is covered by a circular mesh. The bins are attached to any two sides of the circular mesh with a supporting stand. Thus it provides a hybrid feature by protecting the sampling from external damages and serves the path in waste disposal in cities. Figure 6 shows the block diagram of the smart bins.

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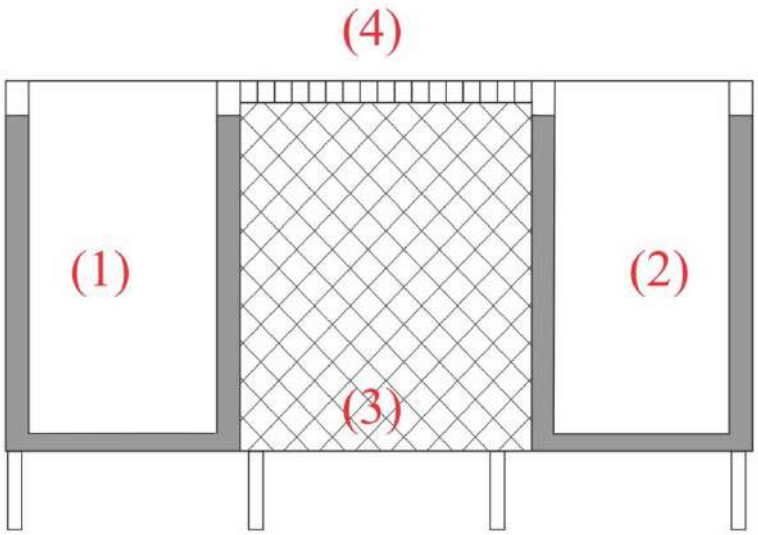

Fig 6: Schematic Sketch of Smart Bins

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9318

VI. ELECTRONIC STICK

[2]Though arboriculture is implemented in cities the management of it serves as a tougher task. Management of sampling is a major part of arboriculture. An electronic stick is placed in the smart bins for maintenance of the sampling. It is made of PVC material. A hopper shaped tubing structure is employed where the upper section is in the diameter of 3.5 inches and gradually reduces in the size of 1.5 inches with the help of reducers. The lowermost part is carved into an inverted conical structure as it provides a path to penetrate the ground to give stability for the stick and also for the saplings. It is a hollow structure that enables water and nutrients to store for a period of time. A soil moisture sensor is embedded in the inverted conical structure which measures the moisture content in the soil. When the moisture content is below level a control signal is given to the pump which is connected to the NODMCU controller.

When the water level in the hollow structure is low, it is indicated by a level sensor through the NODMCU controller to the arboriculture managing forum in the cities (IOT concepts) to refill the stick with nutrients and water. The overall stick is powered by the solar panels mounted in the smart bins.

The solar panels give a potential difference of 12 v and 2.4 A which is sufficient to recharge the mini batteries in the electronic stick. Thus it paves a way to increase the urban forest in cities by protecting and maintaining feasibly and efficiently. Figure 8 shows the block diagram of the electronic stick.

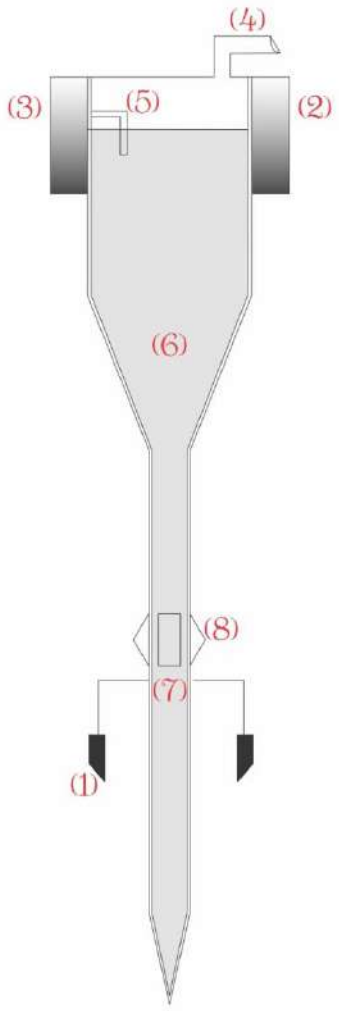

Fig 7: Schematic Sketch of Electronic Stick.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9318

VII. REAL TIME PROJECT RESULTS

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 3, March 2021

DOI 10.17148/IJIREEICE.2021.9318

VIII. CONCLUSION

Though various technologies like IoT (Internet of Things), image processing, pick and place and computer vision are employed in the scavenging process, none provide a feasible output. Even though it provides a feasible outcome, the cost is relatively high. The practical implementation of these technologies is complex. The system which is explained in this paper breakthrough all the gateways in automating scavenging system. It is cost-efficient. It eliminates all practical issues in the field and provides a long term maintenance-free system.

Thus the professional dignity of the scavengers are recovered which has been a major issue for decades. Their social status is increased, health issues and their workload is decreased. This system provides a sustainable future for the upcoming generation by eliminating carbon footprints, reducing global warming and restores climate change of mother earth.

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BIOGRAPHY

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IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Volume 10, Issue 3, March 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.122

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 3, March 2021||

DOI:10.15662/IJAREEIE.2021.1003025

Scavenging Vehicle with RF Controlled Filters and Smart bins with IoT stick using LabVIEW

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ABSTRACT: India is considered to be the second – largest in terms of population and one of the countries in mass production of waste. Even though many steps were taken to manage waste but none provide a solution to manual scavenging and segregation. Moreover, ditch line cleaning is a major part of sanitation work. Manual scavenging is a potential health threat to sanitation workers 69% of street sweepers & scavengers suffers from multiple health problems. Manual scavenging is not only harmful it is physically exhaustive too. Manual scavenging is harmful and disrespectful practice but it is required to keep our city clean. Another major threat is global warming and climate change. The most suitable way to recover our mother earth is to increase in growth of trees and plants at a massive rate. Management of saplings in cites is one of the major drawbacks and cost is arithmetically higher in rate. Thus we intend to provide a more appropriate solution to manual scavenging, ditch sludge clearance and sapling management in roadsides with hybrid bins. An automated vehicle is used to collect and segregate the solid waste in the roadside with the help of mechanical structures, actuators, and a vacuum pump. A movable filter is used in ditch lines to collect sludge, slurries, plastic waste and other floating matters. A hybrid bin is constructed in such a way where it allows spacing to plant a sapling and an IoT Stick is embedded in it to manage the growth of the saplings in all aspects. Thus through our innovation, we provide scavenging at a faster rate, increase the dignity of workers, reduce they're prone to health hazard, reconstruct the climate change and make a better place to live in.

KEYWORDS: Urban Forest, Waste Collection, Scavenging.

I. INTRODUCTION

India is the second most populated country in the world after China. The population of India is projected close to 1.37 billion or 1,369 million in 2019, compare to 1.354 billion in 2018. The population growth rate for 2019 is projected at 1.08%. India will add 1.49 crore in 2019. According to the Press Information Bureau, India generates 62 million tonnes of waste every year, of which less than 60% is collected and around 15% processed. With landfills ranking third in terms of greenhouse gas emissions in India, and increasing pressure from the public, the Government of India revised the Solid Waste Management after 16 years. The generated waste can be divided into three major categories: Organic (all kinds of biodegradable waste), dry (or recyclable waste) and biomedical (or sanitary and hazardous waste).

Every Indian town has at least one specific area earmarked as a landfill area. The collection process begins with contractors employed by government bodies performing door - to - door collection services covering all households, scourging for any recyclables that may fetch a market price and later transporting all remaining waste to landfills. Each truck typically waits in line for two to three hours for its turn to weigh the amount of waste collected that day and then typically waits for some more time to dump the waste into the landfill.

The US Public Health Service has identified 22 human diseases that are linked to improper solid waste management (MIT Urban Development Sector Unit 1999). Several studies have been published that link asthma, heart attack, and emphysema to burning garbage. Human fecal matter is also frequently found in municipal waste. This, along with unmanaged decomposed garbage, attracts other rodents that further lead to a spread of diseases such as dengue and malaria (Biswas 2012).

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As shown in Figure 1,less than 60% of waste is collected from households and only 15% of urban India's waste is processed in a country 12 times as dense as that of the United States (US) (PIB 2016).

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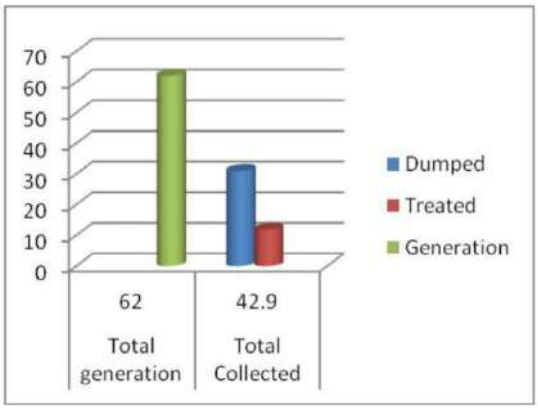

Fig 1: Collection vs. Dumped Statistics (numbers in million MT perannum) (Source: PIB, Government of India)

Global warming, caused by greenhouse gas pollution, is causing immediate and direct changes to the planet. The Earth's temperature had already warmed by 1°C compared to pre-industrial levels. This temperature rise may appear small, but small rises in temperature translate into big changes for the world's climate. This is because the amount of extra energy needed to increase the world's temperature, even by a little, is vast. This extra energy is like force-feeding the global climate system.2016 was the hottest year on record, the previous record was broken in 2015, and 2020 is expected to set a new record for the third year in a row. In the past few years, records have been broken for the longest heat waves and the Bureau of Meteorology has added purple and magenta to the forecast map for temperatures up to 54° C. Increased Ocean temperatures are melting glaciers and ice caps all over the world. Melted ice increases the volume of water in our oceans. Warmer temperatures also result in the expansion of the water's mass, which causes sea levels to rise, threatening low-lying islands and coastal cities. Extreme weather events like bush-fires, cyclones, droughts, and floods are becoming more frequent and more intense as a result of global warming The oceans have absorbed most of the extra heat and carbon dioxide (CO2) so far - more than the air - making the seas both warmer and more acidic. Warming waters are bleaching coral reefs and driving stronger storms. Rising ocean acidity threatens shellfish, including the tiny crustaceans without which marine food chains would collapse. [10]Figure 2 shows the history of the global temperature since 1880.

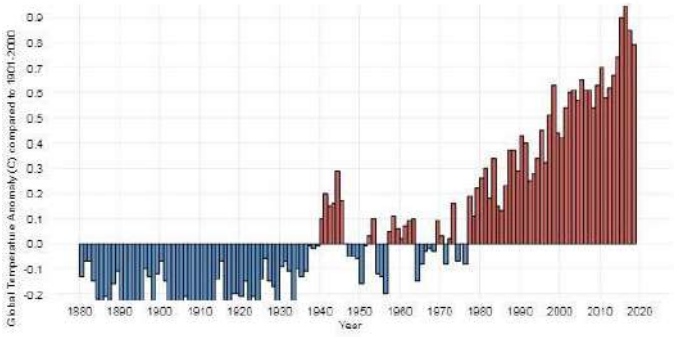

Fig 2: Global Temperature Graph

II. LITERATURE REVIEW

Street Sweepers: [1]The corporation sweeper suffers from severe back pain and often has breathing difficulty. A study by Madras Medical College (MMC) found that nearly 69% of the city sweepers suffer from multiple health problems. It includes disorders related to bones, joints and muscles, lungs, eyes, and skin. The researchers observed these health issues were due to prolonged exposure to dust, lack of periodic health screening and customized cleaning equipment like broomsticks and poor awareness and negligence in using safety gear. Among the 73 workers, including 49 women,

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profiled, women sweepers were found more prone to musculoskeletal problems, back pain is the most common complaint among the workers (70%). Improper working posture, usage of short and damaged broom and inadequate supply of brooms were the cause for an increase in the prevalence of musculoskeletal problems.

The biological materials in the dust are capable of causing allergic diseases in humans such as the runny nose, watery eyes, and sneezing by large-sized particles, as well as swelling of lung tissue and asthma by fine particles, the study said.

[7] According to a National Institute for Occupational Safety and Health study in 2008, work-related respiratory diseases account for about 70% of all occupation-related death worldwide. According to International Labour Organization, street sweepers have more than one incidence of illness with common issues being flu, cough, eye irritation, rash, skin irritation, diarrhea, stomach upset, chronic cough and eye disease. Many studies have detected morbidities among sweepers like hypertension, respiratory tract infection and chronic bronchitis.

Ditch Clogging: A clogged drain can be a serious problem. Often, people choose to ignore clogged drains, hoping that they will clear out on their own. However, ignoring a clog often leads to it becoming severe and even blocking the drain completely. A clogged drain can be inconvenient, it causes improper flow of water in roadsides ditches. It is one of the major reasons for flooding and mosquito breeding. Here are some of the effects of a clogged drain is poor drainage, dirty water, bad odours, health risks, leaks, etc.

Arboriculture in Cities: Sustainable arboriculture is broad-based and complex due to the diverse and dynamic character of urban green areas and their environment owing to the impact the people and their activities have on an urban tree- e.g., planting, removal, pruning, land development, plant injury. Wide- range activities of people are among the major forces for change in the health and character of the urban forest and ultimately determine its sustainability, more so than any other forest resource. In this scenario, sustainable tree care and maintenance represent the preservation of the long term efficiency of the urban ecosystem in an environmentally conversing and safe manner coupled with economic viability, social justice and equality for the citizens. Although urban green areas have been acknowledged globally to be of utmost importance, the term “Sustainable Arboriculture" is often loosely and in a general manner as a label, brand or icon to make it acceptable to all types of stakeholders and under various environments. In the coming decades, arboriculture and urban forestry will have face many challenges as population increases and demographic changes, flinching per capita natural resources, environmental degradation, climate change, and globalization. At the international level, urban green areas are more and more perceived as vital spaces for the development of important functions as the strictly economic- environmental and the social and economic ones. Also, in many urban areas, lack of proper tending and maintenance results in much higher tree mortality rates that cannot be sustained over the long term. In this paper, we will be seeing the hybrid bins and an IoT Stick to maintaining the sustainable growth of urban forest.

III. SCAVENGING VEHICLE

Scavenging Vehicle:

It is a system that eliminates manual scavenging in road and ditch lines with help of Scavenging Vehicle and movable RF Controlled Filters. The scavenging vehicle is of the type of lawnmower. The vehicle is moved manually. The vehicle is constructed in a way where it collects all the solids like derbies, plastic materials, filthy materials, etc.

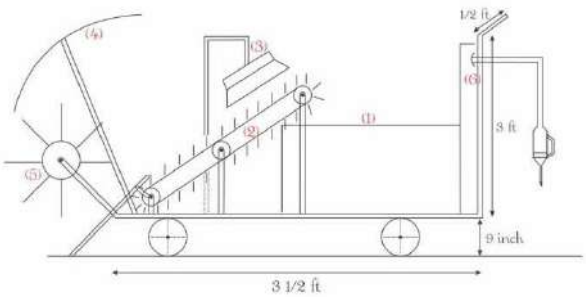

Fig 3: Schematic Sketch ofScavenging Vehicle

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

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Structural Frame: The structural frame of the vehicle is made up of 1mm hollow square mild steel tubes with a length of 3.5 ft, width 1.5 ft and height of 3 ft. A handle is placed for the movement and control of the vehicle. The frame is made up of temporary joints using nuts and bolts. Two pairs of universal wheels are placed for the locomotion of the vehicle.

3.1 Removable Bins Setup: A removable bin is made up of stainless steel plates. This is in the dimension of 2*1.5*2.5. It is of the length of 2 ft, the width of 1.5 ft and the height of 2.5 ft. The total volume of the bin is 7.5 cubic feet and has the capacity to hold the garbage of 212 litres. The sliding friction of the bin is relatively less thus it is easy to discharge the garbage in dump yards.

3.2 Conveyor Setup: The garbage fills which are collected in the ramp is transferred to the removable bins with the help of conveyor belts. The conveyor is made up of the stepper belt and driven by the DC motor. The motors are clamped to the structural frame with the inclination of 25 degrees. The length of the conveyor is 2 ft and a width of 1.5 ft. The conveyor belt has a capacity of carrying the load of 5 - 7 kg.

3.3 Segregation Setup:[8]An electromagnet is connected above the conveyor. This is used to separate metallic and non - metallic waste moving through the conveyor. An electromagnet is clamped to the structural frame to balance the load on it. It has the capacity to hold 6 kg of metallic waste. It is energized by 12 v rechargeable lithium batteries and controlled via switches.

3.4 Pneumatic Actuator Setup: A pneumatic actuator is connected to the structural frame. An arc - shaped sheet is mounted to the pneumatic cylinder. The angular movement of the actuator is controlled via a DC stepper motor. During the elongation of the actuator, the arm is set free at a 0-degree angle as the compression takes place thus garbage is collected and moved towards the ramp, and then the angle of the bar is set to rest position at 110 degrees. These pneumatic actuators increase efficiency by increasing the rate of garbage collection.

3.5 Ramp Setup: [3]A ramp is connected in the front section of the vehicle with the inclination of 35 degrees with a length of 6.5 inches. A rotating circular cylinder is connected with the12 v dc motor which drives the rotating cylinder. [5]The rotating cylinder is mounted on the ramp straight right angle to the center to the length of the ramp. Spikes and collecting plates are embedded in the rotating cylinder which increases the efficiency of the vehicle by collecting the garbage fills without manual interventions.

3.6 Vacuum Setup: The vacuum system is an auxiliary function part of the Scavenging Vehicle. It mainly assists in improving efficiency by collecting paper bits, micro plastics, dust, sand, and fine particles, etc. The vacuum system used an electric motor (775-12 v DC motor) to drive the fan blades to rotate at a high speed by, and negative pressure was formed in the sealed casing to absorb external dust. Therefore, there are certain requirements for the curvature and size of the blade. In this way, the fan air volume can be guaranteed to have a certain vacuuming capacity.Known wind volume calculation as in (1).

$$Q=VF \tag{1}$$

Where V is the Wind speed, it can be accurately measured with an anemometer; Q is the air volume; F is an air duct cross-sectional area. According to the design requirements, the maximum air volume is not less than 3000m3/h.

$$Q_{max} \geq 3000m3/h \tag{2}$$

Completion of fan blade design calculation according to formula (1) and (2). [5]The outer diameter of the fan is 23.5 mm. As shown in Figure 3. The vacuum structure is made out of PVC material. It has a detachable part were the waste can be discharged and attached to the vacuuming system. It is powered by lithium batteries and controlled by switches. Figure 3 shows the schematic sketch of the vacuum blade.

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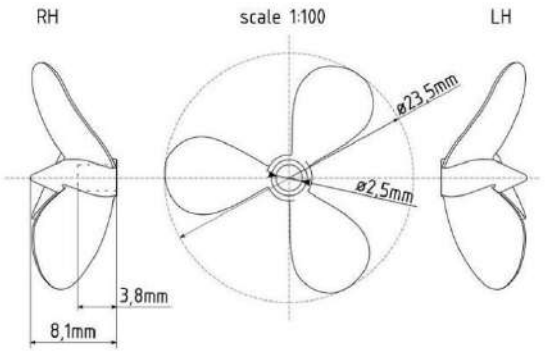

Fig 4: Vacuum Blade

Scavenging vehicle is driven manually in the streets. When there is a need to collect the garbage fills on the roadsides, the vehicle is moved towards the garbage, the roller setup collects the garbage's automatically. In addition, actuators are used to collect garbage's efficiently. The collected garbage is transferred to the removable bins via conveyor. During the line of transfer, the metallic particles are segregated with the help of an electromagnet. A vacuum is used to suck the micro plastics, dust, sand, paper bits, etc.

Thus the vehicle is constructed in an efficient manner and eliminates manual scavenging. It provides a feasible solution to the scavengers and street sweepers by reducing their workload and health hazard.

IV. RF CONTROLLED FILTERS

RF Controlled Filters are used to remove the sludge, slurries, floating materials, etc in the ditch lines and open drainages. It works in the rotational motion to remove debris in ditches.

The hybrid filter is placed in the ditch lines which are of in the width of 3 - 5 ft. An L-shaped mild steel mesh is fabricated in accordance with the width of the ditch lines. The base of the L - shaped is equal to the size of the removal bin which is placed behind the L - shaped filter. The filter and the bin are connected through a sheet of rubber to eliminate the leakage of debris during its rotational movement. The L - shaped filter is placed in accordance with the flow of the water in ditch lines. One end of the L - shaped filter is connected to the shaft of the AC motor.

The control of the rotation movement of the motor is placed in the scavenging vehicle with the help of RF controllers. The power supply to the RF Controlled Filters is given through the AC supply from the street light poles. When the scavenging vehicle nears to the location of RF Controlled Filters the signal is received from the transmitter of the scavenging vehicle of a certain frequency.

By the control action in the scavenging vehicle, RF Controlled Filters are rotated to discharge the debris collected in the ditch lines to the removable bins the RF Controlled Filters. Thus the ditch lines automatically scavenged without manual interventions in a feasible and efficient manner. Figure 5 shows the block diagram of the hybrid filter.

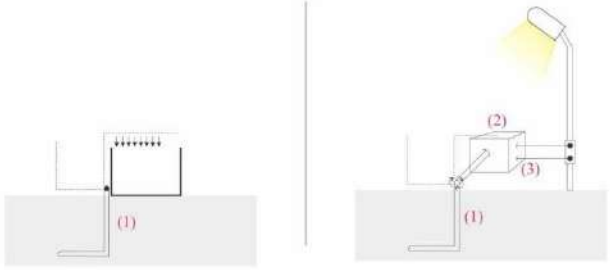

Fig 5: Schematic Sketch of RF Controlled Filters

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

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V. SMART BINS

Smart Bins are employed to increase urban forest (arboriculture) Smart bins are placed to increase urban forest. It plays major roles in collecting biodegradable and non-biodegradable waste and also gives a protective space for saplings growth. It is made up of two PVC bins of a diameter of 1.5 ft. A diameter of 2 ft of space is given in between the two bins and it is covered by a circular mesh. The bins are attached to any two sides of the circular mesh with a supporting stand. Thus it provides a hybrid feature by protecting the sampling from external damages and serves the path in waste disposal in cities. Figure 6 shows the block diagram of the smart bins.

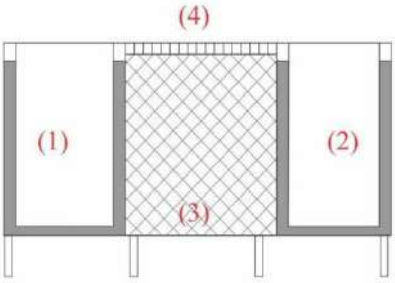

Fig 6: Schematic Sketch of Smart Bins

VI. IOTSTICK

[2]Though arboriculture is implemented in cities the management of it serves as a tougher task. Management of sampling is a major part of arboriculture. An IoT Stick is placed in the smart bins for maintenance of the sampling. It is made of PVC material. A hopper shaped tubing structure is employed where the upper section is in the diameter of 3.5 inches and gradually reduces in the size of 1.5 inches with the help of reducers. The lowermost part is carved into an inverted conical structure as it provides a path to penetrate the ground to give stability for the stick and also for the saplings. It is a hollow structure that enables water and nutrients to store for a period of time. A soil moisture sensor is embedded in the inverted conical structure which measures the moisture content in the soil. When the moisture content is below level a control signal is given to the pump which is connected to the NodeMCU controller.

When the water level in the hollow structure is low, it is indicated by a level sensor through the NodeMCU controller to the arboriculture managing forum in the cities (IoT concepts) to refill the stick with nutrients and water. The overall stick is powered by the solar panels mounted in the smart bins.

The solar panels give a potential difference of 12 v and 2.4 A which is sufficient to recharge the mini batteries in the IoT Stick. Therefore, the overall system is controlled using LabVIEW. Thus it paves a way to increase the urban forest in cities by protecting and maintaining feasibly and efficiently. Figure 8 shows the block diagram of the IoT Stick.

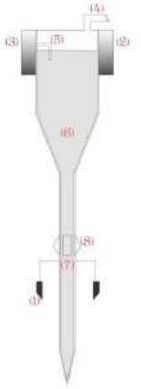

Fig 7: Schematic Sketch of IoT Stick.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

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VII. REAL TIME PROJECT RESULTS

VIII. CONCLUSION

Though various technologies like IoT (Internet of Things), image processing, pick and place and computer vision are employed in the scavenging process, none provide a feasible output. Even though it provides a feasible outcome, the cost is relatively high. The practical implementation of these technologies is complex. The system which is explained in this paper breakthrough all the gateways in automating scavenging system. It is cost-efficient. It eliminates all practical issues in the field and provides a long term maintenance-free system.

Thus the professional dignity of the scavengers are recovered which has been a major issue for decades. Their social status is increased, health issues and their workload is decreased. This system provides a sustainable future for the upcoming generation by eliminating carbon footprints, reducing global warming and restores climate change of mother earth.

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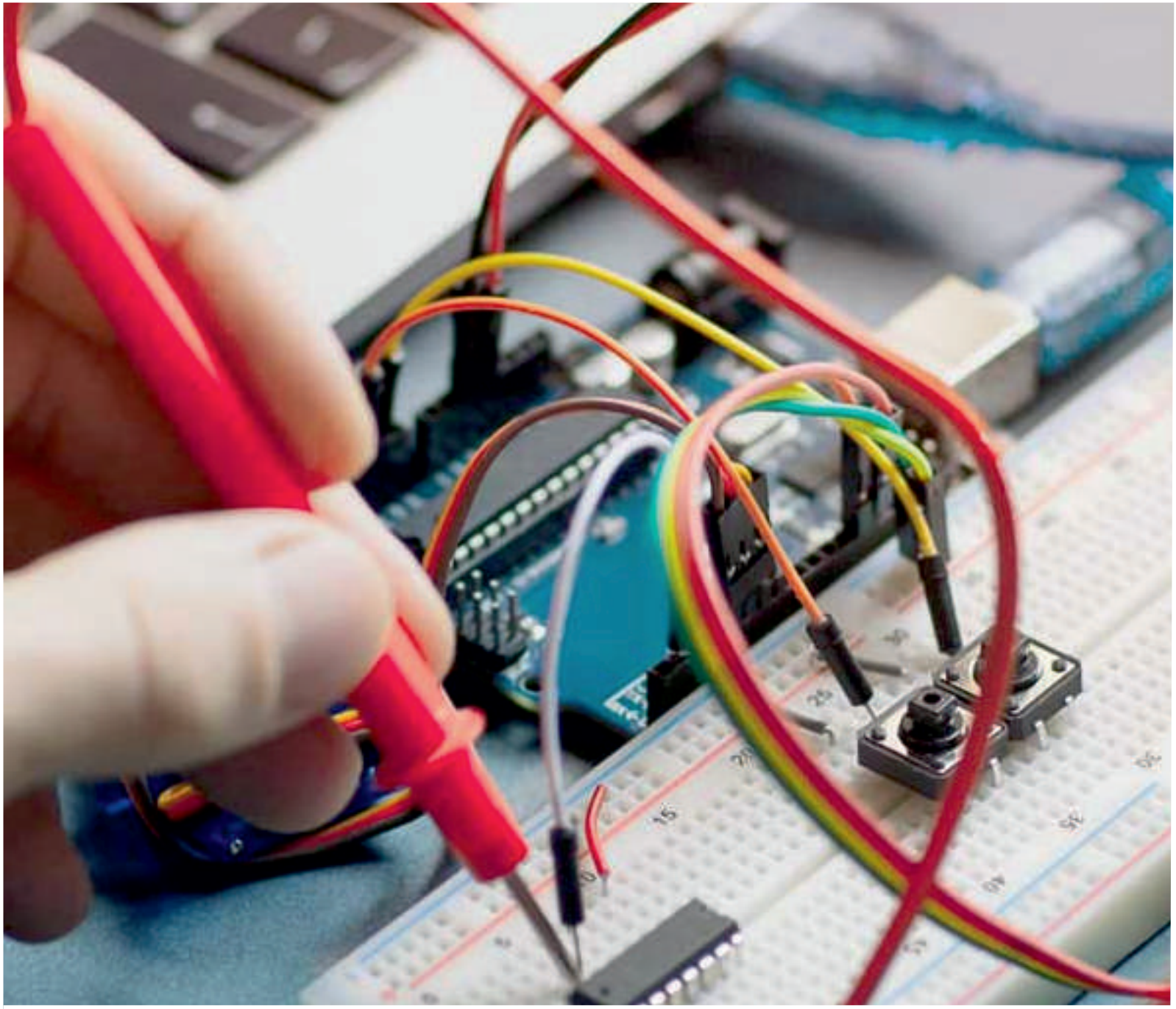

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