
SARANATHAN COLLEGE OF ENGINEERING
PANJAPUR,TRICHY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
proudly presents
WIZARDZZ 2K15

FROM THE HOD DESK

I am very happy that our ECE department is relasing our "department e-magazine version.6 named "WIZARDZZ V.6 for the even semester of 2014-2015.Department of ECE has been releasing e-magazine once per semester since November,2012

This e-magazine is surely a channel to prove the hidden talents of both our faculty members and our students not only in technical but also in literature.Our ECE Department aims at keeping students abreast of the current technological trends and due consideration is also paid to enhance their skills in communication,fine arts,etc. I hope this e-magazine provides an opportunity to the students and staff members to lend free expression to their pioneering and imaginative thoughts.This e-magazine plays an active role in gaining latest developments in the field of Engineering and also presents the acheivements of the Department.This e-magazine would surely help in building our promising Engineers to become expertise in the field of Electronics and Communication Engineering .

I congratulate the team of staff coordinators and the students of "WIZARDZZ V.6"for their radiant and novel efforts.I wish them All the Best for their upcoming deeds

Dr.M.Shanthi
HOD/ECE

From the EDITOR's desk

It's been a great pleasure in launching the sixth issue of the e-magazine, which creates a platform for exchanging all aspects of electronics and communication technology.Forthcoming versions of this magazine will be published in each semester

At the commencement,we express our gratitude to our HOD Dr.M.Santhi for giving us this oppurtunity and Dr.S.A.Arunmozhi for guiding us in this venture.The students came up with many informative articles on the recent trends which has made wizardzz 2k15,an issue on contemporary ideas

Editorial
&
Design team

Our Vision

To become a leading department of Higher Learning and a Research Center of Excellence in Electronics and Communication Engineering.

Our Mission :-

- ✓ To enable budding engineers to obtain technical exposure in various areas of Electronics and Communication Engineering.
- ✓ To nurture career improvement
- ✓ To initiate and sustain research activities in the department in cutting edge areas of Electronics and Communication Engineering
- ✓ To develop professional and ethical attitude in the students.

PROGRAMME EDUCATIONAL OBJECTIVES

The Graduates of Electronics and Communication Engineering will

- **have a strong foundation in the required sciences in order to pursue studies in Electronics and Communication Engineering.**
- **have a broad exposure to the students in various topics related to Electronics and Communication Engineering fields, to enable them to excel in their professional career/higher studies.**
- **possess innovative skills in order to solve the technical problems which will arise in their professional life.**
- **have professional and ethical attitude and an ability to visualize the engineering issues in a broader social context.**

PROGRAMME OUTCOMES

Engineering Graduates will be able to:

- **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

- **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.

- **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

- **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

- **Communication:** Communicate effectively on complex engineering activities with the **engineering** community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

- **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

- **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES

Graduates of Electronics and Communication Engineering will be able to:

- Comprehend and demonstrate the principles and concepts of Semiconductor theory, Signal Processing & Embedded systems in the fields of Consumer Electronics, Medical Electronics and Defense Electronics

- Apply emerging Information and Communication Engineering Techniques to solve real time problems

CONTENTS

FACULTY ACHIEVEMENTS

Mr.S.Hariprasath
Assistant professor of ECE department along with his crew, has won a "special prize" in the e-YANTRA Robotics Teacher Competition (eYRTC) conducted at BIT campus, Trichy by IIT, Bombay

Dr.S.A.Arunmozhi
Associate professor of ECE department had completed her Ph.D by March 2015 on "Securing Mobile Adhoc Network against Distributed Denial of Service Attack "

Dr.P.Shanmuga Priya
Associate professor of ECE department had completed her Ph.D by March 2015 on"Development of efficient speaker verification system using optimal feature selection"

DEPARTMENTAL ACTIVITIES

A Guest lecture on "FREE SPACE OPTICS" was given to final year students by Dr.D. Sriram Kumar, HOD, ECE, NIT,Trichy on 5/2/2015

A Guest lecture on "CELLULAR CONCEPT IN WIRELESS COMMUNICATION" was given to Pre-final year students by Dr.P. Muthu Sidhambaranadhan, NIT, Trichy on 28/1/2015

A Guest lecture on "DSP concepts in industries" was given to Pre-final year students by Dr.P. Madhanmohan, Project leader in Jasmin Info-tech, Chennai on 28/2/2015

A "National conference on Advanced communication systems" - NCACOM'15 was organised by our Department on 18/3/2015 in which about 22 papers are scrutinised from 30 papers and 4 prizes were given for 3 different sessions

ACHIEVEMENTS

TECXPLO'15-A technical symposium was held on 2/4/2015 in MOOKAMBIGAI COLLEGE OF ENGINEERING.Our department students along with CSE students has won the overall rolling shield

Project exhibition for final year students was conducted on 26/3/15

BEST PROJECT AWARD was given to the title "RECOGNITION OF VISION BASED SIGN LANGUAGE INTO SPEECH USING NEURAL NETWORK" by

Ms.S.Pushpalatha
Ms.K.Ramya
Ms.R.Ramita
Ms.R.Ramya

STUDENTS TRIUMPH

S.No	Year	Name of the Student	Contest and Venue	Position
1	III	K.Sowmithri	Paper presentation in tecuthsav at Thyagaraja College of engineering, Madurai	3
2	III	K.Sowmithri & J.Sriabinaya	Uc vedas micro controller coding, at tecuthsav, Thyagaraja College of engineering, Madurai.	1
3	III	I.Shirley Reena	ELCOMMFEST-2014-15-SCE	I
4	III	K.Sowmithri & J.Sriabinaya	Matlab mantras at tecuthsav, Thyagaraja college of engineering,Madurai.	2
5	III	P.Siva & M.Ramkumar	Matlab mantras at tecuthsav, Thyagaraja College of engineering, Madurai	1
6	III	P.Siva & M.Ramkumar	Uc vedas micro controller coding,at tecuthsav ,Thyagaraja college of engineering,Madurai	2
7	III	K.Sowmithri	Paper presentation, ELCOMMFEST-2014-15-SCE	1
8	III	K.Sowmithri,S.Vidhya	Circuit debugging, ELCOMMFEST-2014-15-SCE	2
9	III	J.Sriabinaya,U.Shangareshwari	Technicalquiz, ELCOMMFEST-2014-15-SCE	2
10	III	V.Vignesh,A.L.Subramanian	Maruthi, at tecuthsav ,Thyagaraja college of engineering,Madurai	3
11	III	N.Preetha,P.Niranjana	Paper presentation,kurinji college of engineering.	1
12	III	N.Preetha,P.Niranjana	Circuit debugging,Kurinji college of Engineering.	2
13	III	R.Sreeja	50 mts,open sight rifle prone junior women.	Gold medalist - State level
14	III	R.Sreeja	50 mts,open sight 3 position junior women.	Gold medalist - State level
15	III	V.Rathna guru,E.Adithyan	Roborace, Kurinji college of Engineering.	1
16	III	S.Kanmani,P.L.Akila	Paper presentation, ELCOMMFEST-2014-15-SCE	2
17	III	M.Jenifer monisha	Paperpresentation,Bharathidasan institute of technology(BIT).	1
18	III	P.L.Akila,J.Gajapriya	Paper presentation,anna universtiy,Trichy campus.	1
19	III	B.Banuganga,B.Hemalatha	Paper presentation,KSR college of engineering,Trichengode	2
20	III	B.Banuganga,B.Hemalatha	Technical quiz,Anna university,BIT campus	2
21	III	J.P Nandhini,P.Noyalaa mercy	Technical quiz, ELCOMMFEST-2014-15-SCE	1
22	III	S.Ramnaresh	Cricket Tournament	State level;bronze medal
23	IV	S.Steffi	Macro Module,J.J college of engineering.	1
24	III	R.Dhileepan	Table tennis-(Zonal level)	1

III	Subha cathrine C, Sreeja R, Mallika P	Circuitrix, Currents-15, NIT, Trichy.	1
III	Chandralekha R, Mallika P, Vidhya S	Lab Rat Race, Probe-15, NIT, Trichy.	2
III	Serena louis, Sherine Immaculate E	Paper presentation, Dhanalakshmi srinivasan college of engineering, trichy.	2
III	Serena louis, Sherine Immaculate E	Technical quiz, Dhanalakshmi srinivasan college of engineering, trichy.	1
III	Parameswari M, Pavithra P	Paper presentation, Anjalai Ammal engineering college, Trichy.	1
III	Kalai Priya D, Foujiya Begam A	Paper presentation, MAM College of Engineering, Trichy.	1
II	Jotheeswaran M, Kishore Kumar D P	Oscilloscope drawing, Shaastra-15, IIT, Madras.	2
II	Edith Rominta M	Title event, Pragyan-15, NIT, Trichy.	"THE ULTIMATE MANAGER."
II	Steve Arul U, Princy Sheeba R.	Paper presentation, ACISTECH,ACCET, Karaikudi.	1
II	Steve Arul U	Linked In, ACISTECH,ACCET, Karaikudi.	2
II	Sai Vaishnavi B R, Sreenidhi B	ADZAP, ACISTECH,ACCET, Karaikudi.	1
III	Jayamathangi S	Singing competition, WOMANIA'15, Saranathan college of engineering, Trichy.	2

II	Jotheeswaran M, Kishore Kumar D P	Oscilloscope drawing, Shaastra-15, IIT, Madras.	2
II	Edith Rominta M	Title event, Pragyan-15, NIT, Trichy.	"THE ULTIMATE MANAGER."
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III	R.sreeja	50 mts,open sight rifle prone junior women.	Gold medalist - State level
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IV	S.Steffi	Macro Module,J.J college of engineering.	1
III	R.Dhileepan	Table tennis-(Zonal level)	1

PUBLICATIONS

S.NO	NAME	TITLE	COLLEGE	CONFERENCE	JOURNAL
1	Nandhini.I, Mr.V.Mohan	Hybridization of fuzzy e-means and competitive Agglomeration for Image Segmentation	Karpagam College of engineering, Coimbatore	IEEE sponsored 2nd International conference on Innovations in information, Embedded & communication systems(ICIIECS'15)	ARPN-(Anna university, Annexure-II,S.No:1765)
2	Akila.N, Ms.M.Padmaa	Secured communication using JPEG compresion of Steganography	Latha Madhavan Engineering college,Madurai	International conference on evolving trends in Engineering &Technology (ICETET 2015)	IJETCSE-International journal of Emerging trends in computer Science &Electronics
3	Abirami.G, Dr.M.Shanthi	Capacity Analysis of MIMO-OFDM system using EEOPA, waterfilling and EPA algorithms	Muthayammal engineering college,Namakkal	International conference on Engineering technology and science.	International journal of Applied Engineering Research(IJAER)
4	Sowmya Poorani.R, Dr.C.Vennila	Congestion Control in Healthcare wireless sensor Networks for Non-Stationary Nodes	Muthayammal engineering college,Namakkal	International conference on Engineering technology and science.	International journal of Applied Engineering Research(IJAER)
5	Akshaya. S, Mr.K.Malaisamy	Analysis on Prolonging the network lifetime for nodes in wireless sensor networks	Muthayammal engineering college, Namakkal	International conference on Engineering technology and science.	International journal of Applied Engineering Research(IJAER)
6	Sumaiya Thabassum.M, Mr.S.Hariprasath	Object detection with enhanced scale invariant transform without training.	Muthayammal engineering college, Namakkal	International conference on Engineering technology and science.	International journal of Applied Engineering Research(IJAER)
7	Abarna.T, Ms.M.Baritha begum	Text detection and Recognition from Stone inscription	Muthayammal engineering college, Namakkal	International conference on Engineering technology and science.	International journal of Applied Engineering Research(IJAER)
8	Priyadharshini M, Ms.V.Kavitha	Retinal Artery Vein Classification to Key out the Abnormalities	Muthayammal engineering college, Namakkal	International conference on Engineering technology and science.	International journal of Applied Engineering Research(IJAER)
9	Preethi. P, Ms.P.Sivagamasundari	Random Work Model based Kalman filter for fast fading Channel in MIMO-OFDM System	Muthayammal engineering college ,Namakkal	International conference on Engineering technology and science.	International journal of Applied Engineering Research(IJAER)
10	Shalee vinola. A, Mr.G.Sivakannu	Realistic mobility model for vanets	Karpagam college of Engineering, Coimbatore.	IEEE sponsored 2nd International conference on Innovations in information, Embedded & communication systems(ICIIECS'15)	International journal of Applied Engineering Research(IJAER)
11	Anitha T, Mr.A.Varatharajan	Breast cancer detection in telemedicine to reduce the risk of false positive identification.	Karpagam college of Engineering, Coimbatore.	IEEE sponsored 2nd International conference on Innovations in information, Embedded & communication systems(ICIIECS'15)	International journal of Applied Engineering Research(IJAER)

PUBLICATIONS

12	Sharmila H, Ms.A.Shamimbanu	Enhanced image stenography using DCT and DWT	Karpagam college of Engineering, Coimbatore.	IEEE sponsored 2nd International conference on Innovations in information, Embedded & communication systems(ICIIECS'15)	International journal of Applied Engineering Research(IJAER)

NANURE NAN(O FUT)URE(ELECTRONICS)

Nanotechnology can be defined as the science and engineering involved in the design, synthesis, characterization, and application of materials and devices whose smallest functional organization, in at least one dimension, is on the nanometer scale or one billionth of a meter. At these scales, consideration of individual molecules and interacting groups allow control over the macroscopic chemical and physical applications in medicine and this article outlines some such applications.

Today,the applications of Nanotechnology are at experimental stage except few applications which are commercialized like applications in Solar cells, drug delivery system, etc. This is mainly because of the possible difficulties in manufacturing at commercial scale.

Nanotechnology in the next decade:

Even though nanotechnology is in the research level, it will be commercialized and available for everyone to utilize its fruits, in the next few years.

Architecture

In the recent advancements in architecture, erecting of many floored buildings is not an tough job (Ex: Burj Dhubai). But cleaning the windows and maintaining temperature inside the buildings is very tough. Here comes the influence of nanotechnology where the invention self cleaning and insulating windows will solve the issue very easily. Even antimicrobial coatings are to be used for toilets to avoid the spreading of microorganism.

Medicine

The targeted drug delivery system which is new and helpful,is found to be less side effective system to deliver the drug directly to the affected organ, by the advancement of nanotechnology. The advancement in nanotechnology includes the antimicrobial medical instruments to be used during operations etc.

Electronics

Moore's law (number of transistors in a chip doubles every 24 months) is valid only if nanotechnology persists. The scaling of transistors are possible because of the advancement of the nanotechnology. Currently we are using the 48 nm sized transistor. But researches are going on for the 24nm or less sized transistors. If this becomes possible then the processor size can be reduced along with the increase of the speed and reliability. Recently NASA has tried the Vacuum (helium) to replace the insulator in the MOSFET as an example of this.

The touch screen, scratch guard, water proof electronic devices are few examples of the nanotechnology in the electronics.

Sensor:

Recently many accidents are taking place in the mining industry, gas manufacturers, ice industry etc. due to lack of sensors to detect the harmful gasses in working environment. But nano-sensors which are small in size and effective in detection can be useful in doing this job.

Memory devices:

The miniaturization of the devices has also shown its effects on the memory devices where the Terabyte memory device will be in the size of the head of a match stick.

Nano-generators(tribo-electric generators):

The biggest problem our youngsters are facing today is the power support given by their smart phones. This can be solved only by the tribo electric generators which can produce power on its own.

Nanure (nano future):

Even though this technology in is the laboratory level, this field has a sustainable growth because of its ease, simplicity, cost etc. As the necessity of man increases the development of nanotechnology will eventually be there.The future is going to be governed by the nanotechnology. Because of its adverse development, it is going to spread its wings in a variety of fields.

By
C.Priyadharshini & M.Roopashree
Second Year

VIRTUAL SOLUTION COULD SPELL THE END FOR ANTENNAS

The fast pace of evolution of the wireless industry puts familiar time-to-market pressure on the engineering of every new mobile device. Being in the heart of every mobile product, the design of the RF front-end and, in particular, the antenna, becomes especially cumbersome - every product currently requires a fully customised antenna.

This antenna needs to meet many challenges including: new technologies like LTE and MIMO emerging; more antennas required; more frequency bands; constraints of size, weight and power; and the use of more discrete RF front-end components such as matching networks.

Beyond this, antenna design has traditional been constrained by an accepted correlation between physical size and performance. A well-known fundamental principle in antenna design is that an antenna must keep a minimum size relative to the longest operating wavelength to radiate efficiently. Beyond a certain size limit, a further antenna reduction results in a rapidly decreasing bandwidth and efficiency. An antenna enters into the 'small antenna' regime when its overall size is smaller than ? (wavelength)/ p. In a mobile system and considering a longest operating wavelength at a frequency of 824 MHz (the start of the frequency band of the US mobile networks), such a limit is around 120mm, about twice the top edge of a mobile phone where the antenna is usually located.

This means that most modern mobile phone antenna, even those integrated in current large smartphones, operate within the small antenna regime, so to reduce size means overcoming a fundamental wall that has constrained antenna evolution for decades.

Meeting all these needs without slowing down the time to market is clearly a problem, but one that Fractus believes it has solved with its Virtual Antenna technology. The Fractus solution is based on the mXTEND antenna booster that is capable of replacing conventional handset antennas of large dimensions by miniature and off-the-shelf, standard mobile antenna components. The solution can be effectively standardised across multiple handsets sharing the same platform while featuring different form factors.

Typically, mobile antenna solutions are designed in such a way that a single antenna element is intended to provide multiband performance. It means that multiple operating wavelengths must be packed into this single element, thus leading to complex antenna geometries and large dimensions. The Fractus' antenna booster, featuring a size which is typically x10 times smaller than a customised antenna, can replace current technology. The Virtual Antenna technology is based on the excitation of the ground plane inherently present in any handset platform. When using this technology the radiation is mainly provided by this ground plane. By properly selecting the arrangement and form factor of the element with respect to this ground plane, the ground plane radiation can be optimised. This fact allows minimising considerably the size of the element in an order of magnitude with respect to other handset antenna solutions.

Another key enabling technology is the radiofrequency system, i.e. the matching network. Current handset antenna solutions are commonly connected to a Front End Module (FEM) through a single input/output port. This fact increases the matching network and FEM complexity. In particular, more sophisticated matching networks, filtering, and power amplifier stages are required to split and process each frequency band separately, which increases the complexity, losses, and costs of the overall system. Fractus Virtual Antenna technology combines one or more mXTEND antenna boosters with one or more specifically designed matching network to provide multi-port or single port antenna front-end that matches the RF circuitry of the mobile front-end. The matching network must still be customised according to each application, although the FEM can be the same as that used in commercially available handset solutions.

The electromagnetic performance of the solution is tested regarding an evaluation board having the typical dimensions to those associated to current smart phones (120 mm length and 60 mm width). Two mXTEND Antenna Boosters are respectively placed at the corners of a transversal edge of the evaluation board. Each booster is intended to provide operation in a particular frequency region. In this sense, each booster is connected to a matching network specifically designed to cover, on one hand, the low frequency region (824-960MHz) comprising the communication standards (GSM850 and GSM900), and on the other hand, the high frequency region (1710-2690MHz) including the communication standards (GSM1800/DCS, GSM1900/PCS, UMTS, LTE2100, LTE2300, and LTE2500). The solution is capable of providing hepta-band operation through miniature elements occupying a volume of 250 mm3.

The matching network for the low frequency region comprises a series inductor, a broadband mechanism comprising a parallel resonator, and a fine tuning stage formed by a series capacitor. The matching network for the high frequency region consists in a "T" matching network comprising a series inductor, a shunt inductor, and a series capacitor. In this case, the evaluation board further includes two UFL3cables to connect each mXTEND Antenna Booster to each SMA connector, giving a two port solution.

One of the parameters that antenna engineers will be familiar with is Voltage Standing Wave Ratio (VSWR), which relates to the fraction of power that is actually delivered to the radiating system. Usually, in mobile communication a VSWR equal to or lower than 3 or 4 is required to ensure proper performance.

The performance in terms of VSWR of the Virtual Antenna solution is similar to that provided by other traditional solutions but with the advantage of the reduced size and the standardisation - the same mXTEND antenna booster can be used in different handset platforms, thus the solution avoids the need of integrating customised antenna solutions.

The Virtual Antenna solution completely replaces the conventional antenna. The presence of a ground plane to be boosted is required but as this is inherently present in any handset platform it does not mean any extra elements need to be introduced.

So, for a fully featured, globally used smartphone, Fractus says only two mXTEND antenna boosters are currently required, one for the low frequency region and the other one for the high frequency region. Other configurations can be further used to include the new LTE standards.

By
R.Prasanth
Third year

ETHERNET FINDS USE IN THE AUTOMOTIVE INDUSTRY

The automotive industry is turning to Ethernet to address high-bandwidth applications emerging within the car. But it is Ethernet with a twist, tailored to meet the stringent requirements of the car. And while automotive Ethernet is taking to the road, the technology has yet to achieve widespread industry backing.

Several networking technologies have been adopted to link the electronic control units (ecus) within vehicles, which number from a dozen in simpler vehicles to as many as 150 in high end cars.

The most common in vehicle network is the CAN bus, with rates up to 2Mbit/s. The Local Interconnect Network (LIN) is a lower speed serial bus used for applications such as seat, mirror and sun roof control. FlexRay, at 10Mbit/s, is the next step up, while the Media Oriented Systems Transport (MOST) is a 150Mbit/s ring bus used for applications such as multimedia.

"Ethernet could replace MOST and has the potential to replace FlexRay, but not CAN; at least not in the near future," said Robert Schweiger, director technology solutions, automotive, EMEA at Cadence. "CAN owns the most network nodes in the car among all the network protocols."

A CAN bus interface is also used for diagnostics and to update ecu software held in flash memory. "The CAN bus is a bottleneck for flashing, updating the ecus," said Peter Hank, NXP's system architect for in-vehicle networking. "There are architectural ideas – and some implementations – where certain big ecus are interconnected with standard Ethernet to speed the [flash] updating." BMW is one car maker that has been using Ethernet for this purpose since 2008.

But it is emerging applications – car sensor systems using radar and multiple cameras to aid driving and parking, as well as in-car entertainment systems – that are sparking interest in automotive Ethernet.

Current radar systems receive sensor data and process it locally, sending the result to a central unit. "In future, we will see raw sensor data being sent to a central unit, where many different inputs will be processed and a conclusion drawn as to what is happening around the vehicle," said Toni Versluijs, general manager of in vehicle networking at NXP.

Traffic flows to and from the car will also ramp once LTE is added, linking the car to the cloud using broadband cellular. This will provide data to assist the driver while providing car makers with valuable data about the driver's habits. Ethernet will be needed to link the car's ecus to the LTE module, Versluijs added.

"Inside the car, you have multiple network islands," said Ali Abaye, senior director of automotive at Broadcom. "But car vendors want a car network; they don't want islands anymore."

Broadcom has developed a PHY to support 100Mbit/s Ethernet, dubbed BroadR-Reach, using a single unshielded twisted pair. "We can't use Cat 5 cable – four unshielded twisted pairs – it is not automotive friendly, has too many wires and is expensive and heavy," said Abaye.

Operating at 100Mbit/s over a wire pair in a harsh, electrically noisy environment requires advanced digital signal processing. BroadR-Reach has already been adopted in the BMW X5, while Hyundai has also adopted the technology.

Broadcom helped set up of the OPEN Alliance special interest group to promote BroadR-Reach as a de facto automotive Ethernet standard and the Alliance now numbers more than 200 members.

NXP has licensed the BroadR-Reach patent and is developing its TJA1100 100Mbit/s PHY. It has already demonstrated a sample PHY interoperating with Broadcom's BCM89810, but not all 100Mbit/s Ethernet PHYs are compatible. Micrel and Marvell, for example, have their own 100Mbit/s phys that are interoperable, but neither is a member of the OPEN Alliance.

The IEEE has started the Reduced Twisted Pair Gigabit Ethernet (RTPGE) working group to develop a 1Gbit/s automotive Ethernet PHY. The resulting design will be an IEEE standard, avoiding the interoperability issue at 100Mbit/s.

Unlike MOST, where the 150Mbit/s bandwidth is shared over a networking ring, automotive Ethernet allows 100Mbit/s ports to be added and scaled using Ethernet switching. But the Ethernet traffic needs additional mechanisms to ensure the car's control systems' networking requirements are met. To this aim, automotive Ethernet uses the Audio/Video Bridging (AVB) standard for Ethernet. The AVnu Alliance, with also covers professional audio and video and consumer electronics, has defined the AVB standard to enabled synchronised high bandwidth data transmission.

Cars now have as many as five cameras to assist the driver. The image and video streams from the cameras need to be synchronised to align the time sensitive views. Here, the IEEE 802.1as time synchronisation standard is used (see box). Other mechanisms include quality of service, latency control and bandwidth reservation for the traffic flows.

Broadcom offers the BCM89500 Ethernet switch that support automotive Ethernet. The seven port device has four integrated 100Mbit/s PHYs.

NXP is partnering with TTTech, known for its timed triggered Ethernet expertise, where data is sent deterministically in predefined time slots.

However, NXP is working with TTTech for its general Ethernet switch expertise. The two companies are working on a five port switch with two standard 1Gbit/s Ethernet ports and three 100Mbit/s automotive Ethernet ones, samples of which are expected by the end of 2014.

Cadence offers an Ethernet media access controller (MAC) as IP for automotive mcu, SoC and Ethernet switch designs. The MAC implements the various IEEE standards that make up automotive Ethernet. Cadence's MAC is used in Xilinx' Zynq SoC fpga. "There is an Ethernet interface on that fpga and it is our MAC," said Schweiger. Xilinx is promoting the fpga for applications that include automotive.

But challenges remain, despite the emergence of automotive Ethernet ics from several suppliers. "The biggest challenge for companies is to make a decision to introduce Ethernet, even for a subsystem," said Schweiger. "Companies are in 'observation mode' to see where the market is headed and whether there are sufficient suppliers."

NXP agrees, but points to the momentum developing around automotive Ethernet. NXP is seeing far greater interest in the technology than for FlexRay and CAN, which it also provides. "And then I see all these bandwidth requirements and new applications and driver systems, and this gives us confidence that this is the logical way to go," said Hank.

Developing a next generation 1Gbit/s PHY that will work over a twisted pair is another significant challenge. "We believe it can be done. We have done a feasibility study, we have simulations and, based on measured data from cables, we believe it is solvable," said Abaye.

Given the long development cycles of the automotive industry, a 1Gbit PHY will not be needed for several years. "A lot of applications are going to be 100Mbit/s, but there are applications – such as sending uncompressed video – that will need 1Gbit/s," said Abaye. "We don't see too many of those nodes, but the numbers will grow."

Automotive Ethernet mechanisms

Several IEEE standards make up Ethernet Audio/ Video Bridging used for automotive Ethernet. The IEEE 802.1as time synchronisation adds precise timing mechanisms to traffic, useful for image streams and in car entertainment.

The 802.1Qat stream reservation provides a way to reserve bandwidth, while the 802.1Qav queuing and forwarding performs traffic shaping and latency control. There is also the IEEE 1722 transport protocol that defines how an AVB packet is encapsulated within the Ethernet data field.

By
Jayashree & Indumathy
Second Year

HOW DIGITAL INNOVATIONS ARE SHAPING THE FUTURE OF RETAIL

Beacons beckon

For many years, Near Field Communication (NFC) was considered to be the technology of choice for enhancing the shopping experience. However, with NFC having reached certain limits, beacons are now poised to be the next step in delivering on this valuable promise.
Essentially, beacons are a type of low cost, micro-location based technology that use Bluetooth Low Energy (BLE 4.0) for communicating with beacon enabled devices, such as smartphones and tablets. In order for them to work effectively, smartphone users must have Bluetooth switched on and must allow for location tracking. They also need to have the store's app on their device.

When a customer with an enabled smartphone app is within 50m of the mannequin, the beacon sends a signal providing them with details about the clothes and accessories the mannequin is wearing, the price and where the items can be found within the store. It can also provide them with links to purchase the items directly from the retailer's website.

The digital changing room

Digital signage solutions and virtual reality technologies are making a big splash among retailers. The former is proving particularly popular among fast food restaurants, which are starting to replace static signs with digital menu boards and to use displays for point of sale (POS) data integration. In the fashion world, firms such as Magic Mirror are developing virtual mirrors that allow people to try on clothes via a projected image of themselves on screen. Body sensors map their shape and virtual clothes can be added via a touchscreen.

When it comes to augmented reality, the technology is less established than digital signage, but is expected to make a much bigger impact. The notion of a virtual store has long been a technology promise and companies like Lego are experimenting with kiosks that, when a shopper holds up a box, would display the completed model as if it were in their hands.

By
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ThirdYear

SENSE AND AVOID

'Sense and avoid' drones is a Flying robots to check power lines or deliver emergency aid Unmanned aerial vehicles, or drones, have become an important and controversial part of military capacity in recent years. They are also used in agriculture, for filming and multiple other applications that require cheap and extensive aerial surveillance. But so far all these drones have had human pilots; the difference is that their pilots are on the ground and fly the aircraft remotely.

The next step with drone technology is to develop machines that fly themselves, opening them up to a wider range of applications. For this to happen, drones must be able to sense and respond to their local environment, altering their height and flying trajectory in order to avoid colliding with other objects in their path. In nature, birds, fish and insects can all congregate in swarms, each animal responding to its neighbour almost instantaneously to allow the swarm to fly or swim as a single unit. Drones can emulate this.

With reliable autonomy and collision avoidance, drones can begin to take on tasks too dangerous or remote for humans to carry out: checking electric power lines, for example, or delivering medical supplies in an emergency. Drone delivery machines will be able to find the best route to their destination, and take into account other flying vehicles and obstacles. In agriculture, autonomous drones can collect and process vast amounts of visual data from the air, allowing precise and efficient use of inputs such as fertilizer and irrigation.

In January 2014, Intel and Ascending Technologies showcased prototype multi-copter drones that could navigate an on-stage obstacle course and automatically avoid people who walked into their path. The machines use Intel's RealSense camera module, which weighs just 8g and is less than 4mm thick. This level of collision avoidance will usher in a future of shared airspace, with many drones flying in proximity to humans and operating in and near the built environment to perform a multitude of tasks. Drones are essentially robots operating in three, rather than two, dimensions; advances in next-generation robotics technology will accelerate this trend.

Flying vehicles will never be risk-free, whether operated by humans or as intelligent machines. For widespread adoption, sense and avoid drones must be able to operate reliably in the most difficult conditions: at night, in blizzards or dust storms.

Unlike our current digital mobile devices (which are actually immobile, since we have to carry them around), drones will be transformational as they are self-mobile and have the capacity of flying in the three-dimensional world that is beyond our direct human reach. Once ubiquitous, they will vastly expand our presence, productivity and human experience.

By
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Third Year

CMOS TECHNOLOGY IS SET TO ENABLE A NEW RANGE OF SENSOR DEVICES

CMOS became the dominant fabrication technology for the VLSI era, with billions – probably trillions – of chips produced using it. But most of these have been processors. Now, we are on the verge of a new CMOS era, but one in which CMOS ICs are increasingly being developed for something quite different – sensing. CMOS sensor chips has already been a major success story in imaging, with millions of digital cameras now using them. But CMOS sensors are increasingly being seen as ideal devices for many other sensing applications.

At the heart of CCS' products is MEMS based micro hotplate technology, which makes it possible to produce sensors for applications ranging from environmental and automotive to consumer and healthcare. The micro hotplate allows an area on the device to be heated to as much as 1000°C in less than 25ms. Originally, this was used to create a source of IR light. But, by using the same One such application CCS is targeting is putting a CMOS gas sensor into smartphones or tablets, even wearables, with products possibly appearing in 2015. This would enable the user to monitor indoor air quality, for instance, with an alarm warning them of too high a level of carbon monoxide. Another possibility for a wearable gas sensor would be to detect acetone levels on an individual's breath, important in monitoring their breakdown of fat. The IoT (Internet of Things) market is also seen as a potentially huge opportunity for CMOS sensors.

Key to the whole concept is that the micro hotplate is made using a standard CMOS process, which not only makes it eminently scalable for high volume production, it also means the sensing process can be repeated many times. It also makes for low cost, which makes it economically practical to build arrays of sensors. Other advantages – hallmarks of all CMOS sensors – include low power consumption, embedded intelligence and an ultra small form factor.

One application for these devices could be multipurpose sensors that can monitor indoor and outdoor air quality. CCS is currently working on a four sensor array, which could also have a built-in digital interface for connection to many different platforms.

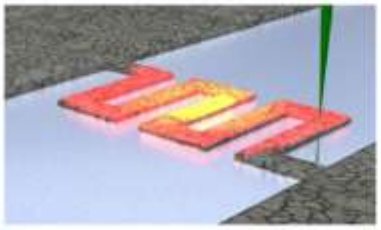
One potentially major field is low cost CMOS biosensors in biology and medicine. Tony Graham, a researcher at Bath University's Department of Electronic and Electrical Engineering, has examined the commercial potential for CMOS in the biosensor field, especially in neuroscience. It will be a major market, but there are hurdles.

By
Hema Surabi
Third Year

TECHNIQUE DEVISED FOR MAPPING TEMPERATURE IN TINY ELECTRONIC DEVICES

Overheating is a major problem for the microprocessors that run our smart phones and computers. But a team of Univ. of California, Los Angeles (UCLA) and Univ. of Southern California (USC) scientists has made a breakthrough that should enable engineers to design microprocessors that minimize that problem: They have developed a thermal imaging technique that can "see" how the temperature changes from point to point inside the smallest electronic circuits.

The technique, called Plasmon energy expansion thermometry, or PEET, allows temperatures to be mapped in units as small as a nanometer, a unit of measure equal to one-billionth of a meter. This shatters the previous record for thermal imaging resolution, and it could eventually lead to faster and more capable electronics.



THREE DIMENSIONAL PRINTING

Inventors Max Bogue and Peter Dilworth have invented a unique pen that draws in the air.

A colorful spool of plastic thread is fed into the pen. The thread is then extruded as heated plastic that cools and solidifies instantly as it exits the tip. This allows solid 3D structures to be drawn on any surface or from any surface into the air.

The pen, called a 3Doodler, weights approximately 7 ounces (198 g) and is 7 inches (17.7 cm) long. It requires no technical knowledge or software and plugs into an electrical outlet.

Max and Peter have received over 2.2 million dollars worth of advanced orders for their three dimensional printing pen. They expect to fulfill those orders and launch the product in the fall of this year.

The co-inventors met while working for Wow Wee, a company based in Hong Kong that develops consumer technologies.

Peter consulted Wow Wee as an independent inventor. He had previously worked on robotics at MIT and contributed to a number of innovations including the infamous Uno Dicycle motorcycle.Max was an R&D project manager with Wow Wee and has extensive experience in bringing products to market.

By
Pragadeshwaran
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PROJECT ERA

Project Ara is the codename for an initiative by Google that aims to develop an open hardware[citation needed] platform for creating highly modular smartphones. The platform will include a structural frame (endoskeleton that holds smartphone modules of the owner's choice), such as a display, camera or an extra battery. It would allow users to swap out malfunctioning modules or upgrade individual modules as innovations emerge, providing longer lifetime cycles for the handset, and potentially reducing electronic waste. Project Ara smartphone will begin pilot testing in Puerto Rico later 2015 with a target bill of materials cost of $50 for a basic grey phone. The project was originally headed by the Advanced Technologies and Projects team within Motorola Mobility while it was a subsidiary of Google. Although Google had sold Motorola to Lenovo, it is retaining the project team who will work under the direction of the Android division.

Project goals

Google says the phone is designed to be used by "six billion people", including the one billion smartphone users and the five billion feature phone users. Google intends to sell a starter kit where the bill of materials is US$50 and includes a frame, display, battery, low-end CPU and WiFi.

Google wants Project Ara to lower the entry barrier for phone hardware manufacturers so there could be "hundreds of thousands of developers" instead of the current handful of big manufacturers. This would be similar to how the Google Play Store is structured.

Structure and features

Ara Smartphones are built using modules inserted into metal endoskeletal frames known as "endos". The frame will be the only component in an Ara Smartphone made by Google. It acts as the switch to the on-device network linking all the modules together.-Frames have slots on the front for the display and other modules. On the back are additional slots for modules. Each frame is expected to cost around US$25.The data from the modules can be transferred at up to 10gigabits/sec per connection. The 2x2 modules have two connections and will allow up to 20gigabits/sec. This is to defer its obsolescence as long as possible.

Modules can provide common smartphone features, such as cameras and speakers, but can also provide more specialized features, such as medical devices, receipt printers, laser pointers, pico projectors, night vision sensors, or game controller buttons. Each slot on the frame will accept any module of the correct size. The front slots are of various heights and take up the whole width of the frame. The rear slots come in standard sizes of 1x1, 1x2 and 2x2.Modules can be hot-swapped without turning the phone off. The frame also includes a small backup battery so the main battery can be hot-swapped. Modules are secured with electropermanent magnets. The enclosures of the modules were planned to be 3D-printed, but due to the lack of development in the technology Google opted instead for a customizable molded case.

Development

Prior to its acquisition of Motorola Mobility in 2011, Google had previously acquired some patents related to modular mobile phones from Modu. Initial exploration of this concept began in 2012 and work started on April 1, 2013.Dutch designer Dave Hakkens announced the Phonebloks modular phone concept independently in September 2013. Motorola publicly announced Project Ara on October 29, 2013 and said they will be working collaboratively with Phonebloks. Motorola went on a 5-month road trip throughout the United States in 2013 called "MAKEwithMOTO" to gauge consumer interest in customized phones. Interested developers, testers, or users can sign up to be Ara Scouts.

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success isn't just about what you accomplish in your life it's about what you inspire others to do
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