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ASIA PACIFIC UNIVERSITY
OF TECHNOLOGY & INNOVATION
SCHOOL OF ENGINEERING

ENGINEERS INSIGHT

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'Engineers Insight' is a quarterly issue by the School of Engineering for the reading pleasure of the staff and students allowing for knowledge sharing and capturing of events for the benefit of engineering education

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The Influence of Robotics Engineering



DaVinci Surgical Robots



ABB Car Manufacturing Robotics

As we embark on a technology and innovation based future, robotics is very common nowadays not only in fields such as manufacturing and education but it is moving quite rapidly towards home appliances' development and in the medical sector. However, there is not a single sector in any industry that doesn't apply robotics in implementing technical processes. Robotic systems perform flawless work with high efficiency and extensively contribute to various factors such as time, quality, and safety. Robotic systems have the strength of meliorating the quality of work output. Large industrial manufacturing giants have robotic systems that work 24/7. Such systems can even do the work of approximately 100 or more human workers at a time. Car and electronic manufacturing companies mostly make use of such automated robotics systems. They employ robotic systems in several testing and assembling procedures which would be difficult and time-consuming for human workers. Robotic arms/manipulators are a simple example of such technologies. They also may be utilized for robotic painting and welding jobs. Robotic packaging machinery is used in companies which manufacture daily-use products. Robotic systems have also proven to play a very vital role in the medicinal and surgical sector, be it in manufacturing of medicines/drugs or carrying out simplistic surgeries. However, robots don't always perform the whole procedure in surgeries, but certainly assist the surgeons to perform the task accurately. A surgeon may use a 'robotics surgery coordinator' to perform surgery without making big incisions, and also in timely fashion. The use of robotics in nursing has developed tremendously due to the shortage of efficient manpower. Recently, robots that can perform house duties are also being manufactured. However, the technology of house robots is not being used commercially. Some examples include robotic pool cleaners and robotic vacuum cleaners. Robotics programming is a way of feeding information into the robots regarding what tasks are to be performed and how based on a set of parameters. After more development in this field, the use of robots in households may be common. Scientists are working on technologies that can be incorporated in future robotic pets, which can enable the pets to better mingle with families, and also provide care and protection. The advantages of robotics are certainly predicted to grow in several other fields over time and the engineering of the robotics system will have to be more detailed towards the consumer application and the requirements of the industrial sector. □

By Dr. Vinesh Thiruchelvam

Go Green

Going green is generally about creating products with the least possible negative effects on the environment. Sustainable development is the core element of going green or using green technology.

Start the simple practise of go green at home in your daily life by reducing the wastage of water and electricity. These simple go green practice of wastage reduction are nowadays widely being applied in wide industrial stream such as product design, manufacturing, renewable energy, construction, farming, fishery and many more.

There are many ways that we could apply go green concepts in engineering which are common practice in industries nowadays. Manufacturing industries practice Design for Environment method which covers processes such as recycle, reuse and remanufacturing. These industries also practice techniques such Design for Manufacturing and Assembly, Design for Assembly and Disassembly, Lean manufacturing system etc. These techniques help the industries to become sustainable.

Design for Manufacturing and Assembly is one of the best techniques to practise go green concepts and sustainability in manufacturing industries. Figure 1 shows a traditional design approach in manufacturing and Figure 2 shows the same product redesigned by applying Design for Manufacturing and Assembly (DFMA). These figures clearly demonstrate the reduction in material wastage and reduction in the usage of fasteners which eventually reduces the cost of material and the product. In conclusion, reducing wastage and cost is about creating products with the least possible negative effect on the environment, which in other words means creating a sustainable product. □



Figure 1 Traditional Design Approach
(11 Parts)



Figure 2 DFMA Approach
(Single Part)

(PRLog (Press Release) - Jan. 22, 2011 - SSA Technologies)

By Ms. Vickneswari





Seminars & Workshops

Industrial Talk by DAZZTECH Solutions Sdn. Bhd.

A series of technical talks on CAD/CAM was presented by engineers of Dazztech Solutions Sdn. Bhd. on January 17, 2013. The talk comprised of 4 sessions including the introductory session about Dazztech. The second session was on “Applications of Flow 3D Computational Fluid Dynamics” by Mr. R Kanesan. The third session was on “All in One ZW3D CAD/CAM” by Gan Teck Wan and the final session was on “Vehicle Dynamics/Automotive in Simulation” by Mr. Nik Ahmed Shahmin. 58 students and 10 academic staff attended the talk.



Malaysian International Robot Competition – MiRoC 2013

Robotics technology has grown tremendously in the past few decades. The advancements and the significance of robotics is felt in every field of engineering. An introduction talk on the “Malaysian International Robot Competition (MiRoC)” was given by Mr. Hazrulneezam Bin Hussain, Director, H & S Scientech Resources, Malaysia on January 18, 2013. 40 students and 15 staff have attended the session.



Go Kart Structure Engineering & Design



There has been a high increase in automotive designs and with the Shell Eco challenge coming up, SoE students have requested for a workshop on design methods. To prepare the students for the challenge, a workshop on “Go Kart Structure Engineering & Design” was conducted by SoE’s Mr. Yap Chee Wei Alvin, on January 18, 2013. 10 students who have registered for Shell Eco-Marathon challenge and 2 academic staff attended the session. The workshop was well received by the students as the workshop was based on practical engineering approaches.



Seminars & Workshops

Schneider Electric – Go Green in the City Competition

Energy has become scarce, expensive and is undergoing a technology revolution. Increasing needs for electrical power must be balanced with social progress and environmental protection. As a global specialist in energy management, Schneider Electric makes the most of energy innovation opportunities. For the first time, university students from Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand and Vietnam will have the opportunity to challenge in the Go Green in the City - East Asia competition and the global competition. Schneider presented an introduction talk on the competition and energy conservation methods on January 23, 2013 at Auditorium 2, TPM. 68 students and 12 academic staff attended the session.

Go Green | East Asia
in the City | May 2013



Bayer Young Environmental Envoy

The Bayer Young Environmental Envoy Program is a global environment education program for the youth organized by Bayer and the United Nations Environment Programme with the aim of developing young environmental leaders and boosting the level of environmental awareness among the youth. Ten to twelve deserving students from Malaysia will be selected to be Bayer Young Environmental Envoys. They will be invited to join a youth environmental camp in Malaysia, and required to implement their individual project ideas. The top two Bayer Young Environmental Envoys will join youth delegates from 18 other countries on a week-long, all-expense paid study trip to Germany in November 2013. On February 26, 2013 Ms. Karen Koh of Bayer, Malaysia presented an introductory inspiring talk to the students of APU towards the participation in the Bayer Young Environmental Envoy. 50 students and 10 academic staff attended the session.





Seminars & Workshops

RFID and its Applications

On Thursday February 28, 2013, SoE, APU hosted Mr. Kong from Ecosensa Technologies who gave a mind opening speech on RFID (Radio Frequency Identification). Coming from a company actively participating in the design and implementation of RFID technologies in Malaysia, Mr Kong shed light to even the faintest of ideas on RFID. Starting from the history, all through the development to the latest versions of RFID, a complete overview of RFID and its exciting applications was covered. The different frequencies used in the RFID readers in different parts of the world could not go without being mentioned. An example of the applications is in Prince Court Medical Centre, Kuala Lumpur, where baby tags are made with RFID tags to keep track of the babies. A different type of tag is put in the “Touch N’ Go” cards that are popular on highway tolls, LRT, buses, etc. The difference between the ordinary “Touch N’ Go” cards and the “SmartTag” for highway tolls was explained in full detail. Mr. Kong is one of the many professional speakers invited by ESIG to speak to students. The sole purpose is to enlighten and spark off an imagination that can be used to invent and or innovate greater technology. 20 students and 6 academic staff attended the session.



Processing and Properties of Natural Fibre Reinforced Polymer Composites

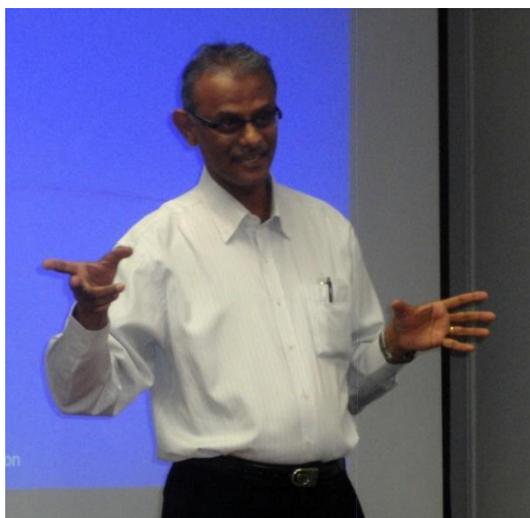
On Monday, March 04, 2013, Professor Robert K Y Li, Associate Dean, College of Science and Engineering, City University of Hong Kong, presented an interesting talk on “Processing and Properties of Natural Fibre Reinforced Polymer Composites”. The research-oriented talk was attended by the academic staff of School of Engineering and 4 students.





Seminars & Workshops

Consulting Services in Malaysia



On Monday March 11, 2013, Ir. Rajashekar Thevaraj from Shanu Consulting Sdn. Bhd. (Perunding Shanu Sdn. Bhd.) presented a talk on "Engineering Consulting Services in Malaysia". The session motivated the young aspiring engineers towards their goals and responsibilities as engineers. 11 students and 6 academic staff attended the session. Shanu Consulting is a prominent consulting firm in the infrastructure industry.



Application of Robotics

Sam Wayne, Lecturer, Staffordshire University (SU) presented on "Applications of Robotics" on Wednesday, March 13, 2013. 25 student and 3 academic staff attended the lecture. Sam is the award tutor for the degree in Robotics Engineering and Robotics Technology at SU. He is responsible for monitoring the cohesion of all of the modules (eight in each of the three years), the students taking the degree, specifying and purchasing of new equipment, and development of the robot laboratories at SU. In addition, Sam is the principle control lecturer, responsible for all of the teaching of control, creating lecture material and exams to engineers studying for M.Sc. programmes.



Staff Motivation



On Wednesday, March 13, 2013, SoE hosted Peter Barnes from Staffordshire University (SU), who gave a talk on "Staff Motivation" which was exclusive for all academic staff of SoE. Staff motivation is always required to boost morale and upon request Peter who was visiting APU as part of the external examiner team from SU, shared his thoughts on motivation in general and its application in educational field. These were discussed in a very positive manner much to the delight of the staff that attended the session. SoE thanks Peter for his interactive session – carrots or sticks anyone?



Seminars & Workshops

Practical Aspects of Electrical Machines

Hands-on training and a workshop on Electrical Machines was conducted by Mr. Ravi Lakshmanan on Friday, March 15, 2013. 12 students attended the workshop and had a practical experience of handling DC/AC, shunt/series motors and generators.

An Overview of Electrical Engineering in Oil and Gas Industry

On Monday March 18, 2013, Ir. Wong Choong Onn, Head, Engineering Facilities & Ir. Tan Kin Wah, Manager, Electrical Department of Technip Geoproduction (M) Sdn. Bhd. presented a talk on "An Overview of Electrical Engineering in Oil and Gas Industry". 13 students and 20 academic staff attended the session.



Neural Network Fundamentals with MATLAB

Matlab is a high level computation language. It has its own landmark on every stream of engineering. A workshop and hands-on training on "Neural Network Fundamentals" with Matlab was presented by Dr. Thang Ka Fei on Saturday March 23, 2013. 30 students and 1 academic staff attended the session. The workshop has paved way to the students to get most out of the Matlab neural network toolbox to model and solve problems related to artificial intelligence and Neural Networks





Seminars & Workshops

Micro-Controller Programming and Interfacing

Hands-on training and a workshop on “Micro-Controller Programming and Interfacing” was conducted by Mr. Veeraiyah Thangasamy on Saturday, March 23, 2013. 30 students and 1 academic staff attended the workshop.



Intelligent Monitoring Systems for Thermal Power Plant Trips

On Friday, March 29, 2013, Dr. Firas B Ismail presented a talk on “Intelligent Monitoring Systems for Thermal Power Plant Trips”. 41 students and 5 academic staff attended the session. The seminar highlighted the significance of power plant trip monitoring towards uninterrupted power production.



Introduction to Power System Analysis

On Friday, March 29, 2013, SoE's Mr. Ravi Lakshmanan gave a talk on “Introduction to Power System Analysis”. 41 Students and 5 academic staff attended the session. It was very related to the local power distribution necessities.





Industrial Visits

Sector Focused Career Fair SFCUTP 2013



The Sector Focused Career Fair aims to educate students on the choices of career path available in the 11 sectors namely - Oil & Gas, Electronics & Electrical, IT, Telecommunication, Biotechnology, Finance, Accounting, Healthcare, Tourism, Fast Moving Consumer Goods (FMCG) & Education. Talent Corporation in collaboration with Universiti Teknologi Petronas (UTP) organised the Sector Focused Career Fair at Mid Valley Megamall on January 26, 2013. Showcasing the vast variety of oil and gas companies operating in Malaysia, the Midvalley Oil and Gas Career Fair was vibrant. It was more of an “ employer meets potential employee” setup. Maybe that is what explained all the excitement in the hall. 50 APU engineering students were able to attend the sector focused career fair on oil and gas energy and engineering related sectors in Hall 3 at Midvalley Megamall. Leaving TPM at 9:30am and heading to Midvalley in transport provided by APU, students were able to look for future employers. Many companies, like Shell, had walk in interviews right in the hall. After asking about the company and its benefits to their career, students submitted their CVs and college internship letters for those looking for level 3 engineering internship. Others even queued up for the walk in seminars. Digi, Shell, Petronas, Proton and many more companies provided stalls giving not only information, but opportunities to people looking for internship as well as postgraduate employment.

MEASAT Satellite Systems Sdn. Bhd.



Since 1996, MEASAT has been providing premium satellite solutions to customers across the Asia-Pacific region, and now has a reach that covers over 150 countries across Asia, Africa, Europe, the Middle East and Australia, representing 80% of the world's population. Located in Cyberjaya and with a substation in Bukit Jalil, MEASAT is able to provide services like transponder leasing, broadcasting solutions (even in High Definition) and Telecommunications Solutions, MEASAT holds ground with various high power satellites to provide unequalled quality. APU engineering students had a once in a lifetime opportunity to see this happen live. Friday, 22 February, 2013 was the day MEASAT hosted 38 students from APU SoE giving an inside scope of how satellite industry functions in providing a better service.



Industrial Visits

Starting with an introductory briefing, the history of satellites and how Russia won the “race to space” all the way to calculating which direction to set your satellite if you want to receive a particular signal, MEASAT covered all theory. Explaining with illustrations, the Boeing satellites came alive in the imaginations of students. As the speaker went ahead to explain how the satellites are launched and how they are transformed to hang in space, uplink and downlink connection, life time of particular satellites and all priceless information. Kind hosts as they were, gifting students information brochures and a quick tea break, the MEASAT staff continued to give a general tour of their premises. Showing off their data control room and their media monitoring room was only the beginning. They also endured the blazing sun and students had the opportunity to see the MEASAT collection of earth satellites in Cyberjaya. Along with a thorough explanation of how the system is interconnected and working, the guides pointed out the pros and dangers of the satellites.



Malaysian Technology Expo 2013



The 12th Malaysia Technology Expo 2013 was held at Putra World Trade Centre (PWTC), from 21 - 23 February 2013. Being the biggest Malaysia technology expo, hundreds of inventors came out to showcase their imagination developed as far as prototypes. From small scale to large scale, software to hardware, all sorts of inventions and innovation were displayed in Putra World Trade Centre. 35 APU students accompanied by academic staff were among other students, investors and on-lookers who were captivated by the inventors' and their expo. The wide variety encapsulated in the hall included telecommunications, electrical, civil, mechatronic and software engineering. ESIG was able to facilitate not only engineering students from APU but also IT and business students who have an interest in technology. The talk was about touch screen multifunction and multi-port oscilloscope and the usage of visible light as a medium of data transfer. Details on developing super capacitor from palm oil shells was also explained. Did you know it is possible to measure the mass of an object in space by counting the number of oscillations it makes?. The list is endless.



Industrial Visits

IEM Seminar, Wisma IEM

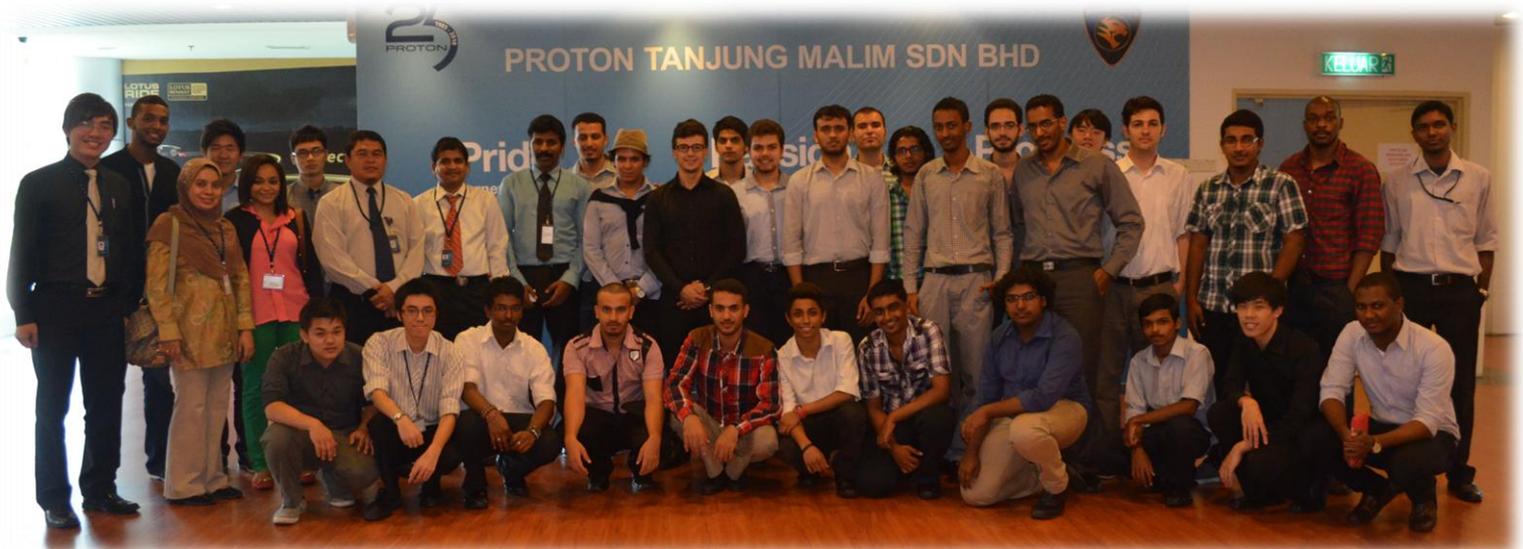


7 APU students and 3 lecturers (Mr. Lioe, Ir. Dr. Dakshani & Dr. Vinesh) attended the lecture on "High Impact Research - World Competitiveness, Value Creation, and High - End Education" by Professor Tan Sri Dr. Ghauth Jasmon at Wisma IEM (01-Auditorium Tan Sri Prof. Chin Fung Kee, Third Floor) on Saturday, March 02, 2013. The talk explained how research has impact in teaching as well as industry-academia relations. Examples of efforts currently undertaken by University of Malaya and how this benefited undergraduates and postgraduates was presented. The talk also related to some of the efforts currently under way globally - from China to Scandinavian countries to Latin America. It highlighted the level of aggressiveness displayed by these institutions and why Malaysia must rise to the challenge. This talk is one of a series of activities by IEM in which APU community can engage to and benefits from.

Proton Tanjung Malim Sdn. Bhd.

The Tanjung Malim plant of Proton which is one of the largest automotive assembling units is situated in the northern state of Perak. The plant is 60 percent fully automated allowing man machine interaction in an efficient and safe manner. The production of automobiles in the plant comprises of five stages Engine & Transmission (ETM), Stamping, Body Assembly, Painting and Trim & Final Assembly. The process is assisted with Automatic Line Control to assist human to achieve efficient production and enhance the quality.

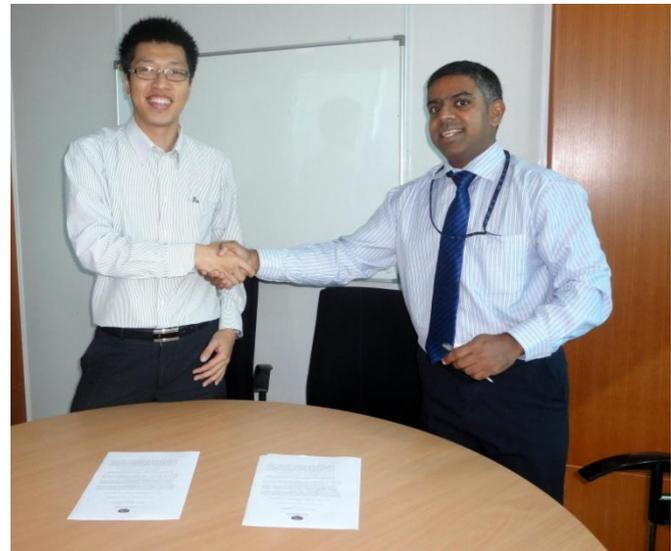
On March 21, 2013, 40 students and 5 academic staff of SoE had an opportunity to witness the production of proton cars at Tanjung Malim plant. It was a great learning experience to visualize the conversion of fine blank metal sheets to beautiful proton cars, namely Persona, Gen2 and Prevé. It was inspiring to the students especially those from mechatronic engineering, to see industrial robots playing a major role on the production line. Nearly 200 robots were involved in the production sequence and the process control was fed to them by a central control unit. The presentation session followed by the visit was quite informative in terms of the quantity and quality of the cars produced. It was quite interesting to hear that proton produces nearly 350,000 cars per year and exports to 60 nations.



SoE Collaborations

ECOSENSA

ECOSENSA is a registered member of EPC global active in EPC global Malaysia for technical contribution and awareness program in promoting RFID adoption in the region. The company specializes in some of the newest technology like Radio Frequency Identification (RFID), Ubiquitous Wireless Sensor Network (WSN), Real Time Location System (RTLS), Location Base System (LBS) and many more. ECOSENSA provides all sorts of RFIDs and Wireless Sensors Products. Examples are RFID Reader, RFID Mobile Handheld, RFID Metal Tags, RFID Inlay, RFID Labels, RFID Printer, RFID Middleware, RFID Software. The company also provides Consulting services for RFID Best Practices, RFID implementations, RFID Adoption, RFID Seminar and RFID Lectures. On the 28th of February 2013, the MoA between APU SoE and Ecosensa Technology Sdn. Bhd. on academic support for telecommunication projects and student internship was signed off. Ecosensa was represented by Mr. Kong (CEO) and SoE APU by Dr. Vinesh.



Barcode



RFID



Solution Engineering

March 06, 2013 was a day to be proud of as Solution Engineering Sdn. Bhd. (SESB) who have been very supportive of APU's engineering internship program, cemented the relationship with the signing of the MoA with SoE APU. SoE's Dr. Thang Ka Fei was at the manufacturing facility to execute the sign off with Ms. Lim Chiou Kim (COO) representing SESB.

SESB specializes in the design and development of teaching equipment for engineering education (SOLTEQ) such as chemical, mechanical, electrical and control engineering. Their products are utilized in public and private universities, university colleges, polytechnics, skilled training centers, advanced technical institutions and colleges. Solution Engineering has pioneered a range of teaching equipment that are not only comparable to established brands in terms of technical capability and quality but also enhanced with computer interface for reliable and accurate experimental results.

SOLUTION



SoE Collaborations

Unipower Intelligent



March 15, 2013 saw another signing ceremony for the SoE as this time around it was with Unipower Intelligent Sdn. Bhd. Unipower strive as a dynamic and professional energy saving team, specializing in combustion optimization system and environmental control development based in Malaysia. As a company they are committed in providing a wide range of energy efficiency improvement services suitable large scale utility boilers, cement plants and waste to energy. They are highly skilled and experienced with an integrated team of combustion specialists, innovative and creative engineering system designers, software development engineers, established programmers and marketing professionals. On the day of signing, Unipower was represented by Prof. Ir. Dr. Hj. Kamsani Abdul Majid and Cik Norziana Kamsani while SoE APU were represented by Dr. Vinesh and Dr. Firas Ismail.



Signing of MoU Session with Unipower



Current Power Plant Refurb Works on Sultan Azlan Shah Plant

Universiti Malaysia Pahang



Signing of MoU Session with UMP

On March 12, 2013, a Memorandum of Understanding was signed between Universiti Malaysia Pahang (UMP) and SoE Asia Pacific University on the following;

1. Research supervisor sharing;
2. Student exchange;
3. Knowledge sharing;
4. Research publications

UMP was represented by Assoc. Prof. Hayder Bahari and APU by Deputy Vice Chancellor En. Kamal Nawawi witnessed by APU's Dr. Vinesh, En. Tajuddin and Dr. Firas Ismail. The MoU opens an avenue for academic development utilizing UMP's experience and capacities in engineering education particularly in high level resources for project supervision and knowledge exchange in the development of research publications.

SoE Collaborations

IEEE International Conference on Circuits and Systems

The IEEE International Conference on Circuits and Systems (ICCAS) is the foremost global forum for specialist presentations and interactions in the current and emerging areas of electronic circuits and systems. The meeting provided opportunities for the dissemination of information about the latest technology to users, manufacturers, academics, and students working in the key area of circuits and systems. The conference offers technical papers and educational events related to integrated circuits, including analog, digital, mixed signals, systems on a chip, data converters, memory, RF, communications, imagers, medical and MEMS and NEMS ICs.

The 2012 IEEE International Conference on Circuits and Circuits was held in ParkRoyal Hotel, Kuala Lumpur on 3rd to 4th October 2012. APU was part of the conference as a co-organizer and Mr. Lioe De Xing served as one of the organizing committee. The conference provided the opportunity for networking and to have discussions and knowledge sharing with other participants including students, academics and industries. Two papers from APU were accepted and presented in ICCAS2012, titled “Front End of Low Power Transmitter for Wireless Capsule Endoscope” by Mr. Lioe De Xing and “Design Perspective of Multi-Channel Data Acquisition and Logger System for CPV Technology” by Mr. Shankar Duraikannan. Both papers are now indexed in IEEE Xplore.



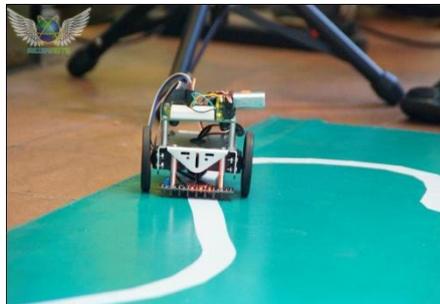
APU is again part of the conference as a co-organizer this year with Mr. Lioe as the secretary. The conference will be held on 18th – 19th September 2013 in Kuala Lumpur. Lecturers and students are encouraged to submit technical papers to the conference this year. More information can be obtained from the conference website <http://cas.ieeemy.org/iccas2013/>.

SoE Competitions

APRoC

The 1st APROC (Asia Pacific Robotic Competition) was held on 15th March 2013. This initiative was undertaken by SoE under the guidance of Dr. Vinesh (HoS) and the supervision of Mr. Suresh Gobee. Robotics has always been a front runner among the engineering students' passion in terms of competitions. This is the first time such a competition involving robots was held in APU and it was themed APROC.

The competition was divided into 3 categories, which were Maze solving and fire-fighting, line following and sumo robot competitions. There was also prize given for the best design. The maze solving/fire fighting is where the robot behaves like a fireman or fire-engine but in this case the robot autonomously has to find its way around the maze and locate the fire and put out the fire. In the process the robot had to rescue the victims in the fire which are represented by ping pong balls. In the line following competition the speed and the accuracy of the robot is tested. The fastest robot on the track wins the competition. The track was modeled after Malaysia's Sepang International F1 circuit. The sumo robot competition is a competition that tests the strength and agility of the robot. The objective is to push the opponent robot from the sumo platform without falling out of the platform itself.



Each competition had 3 teams competing which involved 2 to 5 students in each team. Overall the competition allowed SoE APU students to showcase their robotics engineering skills. The skills are not only confined to building the robots but also to programming the robots. The competition was judged by SoE lecturers Mr. Arun, Ms. Yvette and Ms. Shamini. The event was also supported by Ms. Vickneswari in the organizing with additional preparation support from the APU admin/logistics staff and the ESIG team.

Industrial/technical talks were given regarding the latest developments in robotics' applications in industry and also in the medical field during the event in the auditorium at Level 4. There were also demonstrations of humanoid robots using Masimo and the Boiloid Robots. In conjunction with the robot day there were also displays/exhibitions from 3 manufacturers/vendors for the the Humanoid robot Masimo (Emlabz Sdn. Bhd.) with Boiloid robot (HongQin Sdn. Bhd.) and mobile robots and battle robots from (MyRobotz). The vendor displays were a crowd puller as the Humanoid robots were programmed to dance to music and also to perform acrobatics. SoE would like to thank the manufacturers/vendors who came and gave their presentations in addition to displaying their equipment and robots.



SoE Competitions

Speak Out for Engineering



On December 08, 2012, our SoE student, Bilal Ahmed Khan participated in the "Speak out for Engineering" competition hosted by IMechE, Malaysian Chapter at UiTM, Shah Alam and was rewarded with a certificate for his efforts.

Fun Corner

4 Pics 1 Word



Trace your Answers in the Newsletter

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Engineers Jokes

Engineers: Wife or Mistress?

An architect, artist and engineer were discussing whether it was better to spend time with their wives or mistresses. The architect said "I like spending time with my wife building a firm foundation of a marriage." The artist said "I enjoy the time I spend with my mistress because of all the passion and energy." The engineer said "I enjoy both. If you have a wife and a mistress, both women think you are with the other so you can go to work get more done"

Engineer Priorities

An engineering major sees a classmate riding on a new bike and asks when he got it. "I was walking back from the computer lab when the most beautiful woman I had ever seen rode up on this bike, stopped, took all her clothes off and said to me 'Take what you want!'" "Good choice," the friend replies. "The clothes probably wouldn't have fit you."

Mechanical Engineers, Civil Engineers and Chemical Engineers

What are the difference between Mechanical, Civil and Chemical Engineers? Mechanical Engineers build weapons; Civil Engineers build targets. Chemical Engineers are engineers that build targets that explode really well.

SoE FYP Projects



Final Year Project Presentations
– Month of Jan, Feb & Mar 2013

SoE Marketing

Iraqi Embassy Visit

On January 09, 2013, SoE represented APU on a brief session with the Iraqi Embassy. The discussion included methods to increase Iraqi student intake and spreading of engineering education awareness to potential Iraqi engineering students. Currently there is a solid group of Iraqi students and the objective is to increase the numbers. The session was well received by the Iraqi embassy officials, Ms. Manal and Prof. Dr. Hassan al-Shara. SoE APU was represented by Dr. Vinesh Thiruchelvam and Dr. Firas Ismail.



Session with Officials from the Iraqi Embassy

Education Fairs

KLCC, March 16-17, 2013 – At Facon Education, it was the first time SoE showcased both the Go-Kart and Shell Eco team's vehicles which were crowd pullers during the exhibition with many students and parents showing interest in the students' developments and giving praise on to our engineering achievements.



KLCC Educations fair – SoE Staff & Students with the Engineered Cars

SoE Marketing

Seminar at Universitas Muhammadiyah Yogyakarta

Jogyakarta was awakened by the flow of engineering sustainability from APU on January 28, 2013. Universitas Muhammadiyah Yogyakarta (UMY) had invited SoE APU to conduct a seminar on sustainable development and the topic which was presented by Dr. Vinesh, "Green Resilient Building Design" had opened the eyes of the students from UMY. The 174 students and 8 lecturers who attended the session were intrigued by the knowledge and design practices which were presented. The seminar was presented in both languages, English and Bahasa Malaysia with a twist of Bahasa Indonesia. The day prior to the seminar, a meeting was conducted between UMY and SoE on possibilities of R&D collaborations and supervision of project students. The meeting was chaired by Dr. Sudarisman (Dean of the Faculty of Engineering). The others in attendance were Dr. Agus Setyo Muntahar (Head of Soil Engineering), Dr. Indira Prabasari (Director of Cooperation Bureau), Dr. Jazaul Ikhsan (Head of Department – Civil Engineering), Mr. Sudarja (Director of Vocational School), Mr. Helmi Zainuri (Head of Department – Information Technology), Mr. Rahmad Alhasibi (Electrical Engineering) and Mr. Tunjung Sulaksono (Director of Public Relation). In depth areas focused in the discussion were;

- 1) Short course exchange
- 2) Credit transfer
- 3) Joint supervision
- 4) Research and Development Collaboration
- 5) Project Bank
- 6) Joint Publication
- 7) Joint international conference
- 8) Seat-in program

Future plans following the visit will be to establish a MoU between APU and UMY with also a UMY engineering student group visit to Malaysia by July 2013.



Solar power is a type of renewable energy harvested through solar panels to generate electricity. The electricity generated is used to run appliances at homes which are not powered by the national grid such as rural areas. Besides that, it is also used in some buildings such as apartments in cities to promote green living.

One important parameter for standalone solar power systems is power generation because standalone systems do not have a connection to the national grid network and the systems rely fully on the size of the battery banks installed. Therefore, it is important to improve on the amount of solar power generated.

In this article, two methods to improve on the amount of solar power generated will be discussed which are (1) Optimum tilt angle of the solar panels and (2) Solar panel cooling. The methods discussed are simple to implement, low cost and involves minimal modifications made to the existing systems.

Method 1: Optimum tilt angle

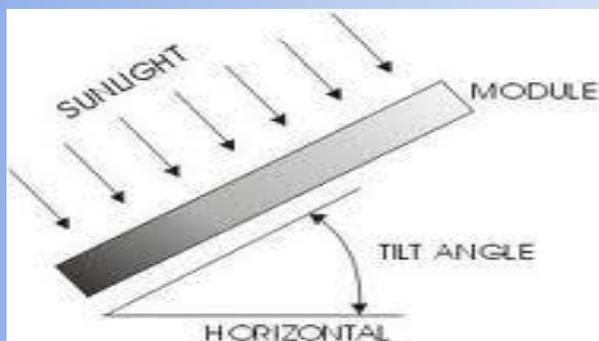


Figure 1: Tilt angle for a solar panel from ground.

As the solar panels are exposed to sunlight for long hours, the solar panels tend to get heated and its operating efficiency decreases. An experiment done in the UK shows a drop of 1.1% in peak power for every 1° C when the solar panel's temperature reaches 42° C. (REUK).

This shows there is a need to implement cooling system for the solar panels to maintain its operating efficiency. For systems based in Kuala Lumpur, water can be used to cool the solar panels as it is easily available and low cost as rain water can be used. The rain water is run through the surface of the solar panels and is then recollected as hot water for domestic household use. With one system, both power and hot water can be produced.

Method 2: Solar panel cooling



Figure 2: A simple water cooling system using sprinkler system.

The definition of optimum tilt angle is the angle which generates the maximum power. [Yang et al, 2009]. The figure above shows the tilt angle for a solar panel. As the tilt angle increases, more surface will absorb the sunlight and this can help to increase the power generated by the panels. With the use of optimum tilt angle, the total radiation received by a solar panel can increase by 19-24% compared to fixed horizontal solar panels.

In real world applications, the sun's position changes throughout the year and therefore the optimum tilt angle needs to be adjusted twice a year mainly in the beginning of summer and winter [Chiras, 2009].

Selection of the optimum tilt angle for a system depends on the site's latitude. Different places around the world have different latitudes. With the latitude value obtained, the optimum tilt angle can be calculated.

For cities situated near the equator like Kuala Lumpur, the optimum tilt angle is the latitude of the city and according to the values given by Timeanddate.com, the latitude coordinate for Kuala Lumpur is 3° 08' north. So for any systems based in Kuala Lumpur, the solar panel's optimum tilt angle is 3° from horizontal (ground). □

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Lithography on a semiconductor wafer

Mr. Lim Chee Cheow TP019807

Have you ever wondered how electronics components such as transistors and resistors are fabricated in an Integrated Circuit (IC)? This is done via a process called *photolithography*.

The first step of photolithography is to apply a layer of photoresist on a wafer by spinning it at several thousand revolutions per minute to allow even dispersion of photoresist. Photoresist is an organic chemical which is sensitive to ultraviolet (UV) light.

Next, a photomask containing the image layout is used to selectively expose the area of photoresist to UV light while shielding the remainder. This process is called *printing*. If positive photoresist is used, the image layout is made to be opaque to UV light, and exposed area is to be removed. The removal of photoresist is done by immersing the entire wafer into a developer solution at 80 °C. The etching process begins by using RF generated plasma or hydrofluoric (HF) acids to cut out the exposed area [1]. Finally, the remaining photoresist is removed with acetone without harming the underlying structures. The overall process is illustrated in Figure 1.

In fact, the size of transistors has been shrinking to nanometer ranges that it are impossible to produce by photolithography with UV wavelength, ranging from 0.4 μm to 0.1 μm .

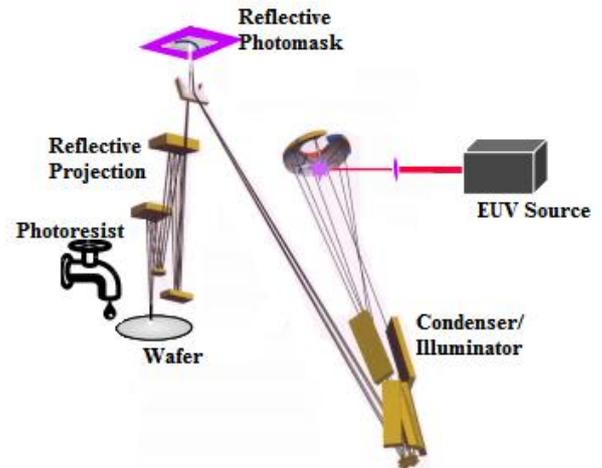


Figure 2: Illustration of EUVL process [4].

Thereafter, extreme UV lithography (EUVL) makes use of a 13.5 nm extreme UV (EUV) wavelength ranging from 120 nm to 10 nm revolutionized the conventional lithography method. Instead of using a refractive lens, this technique involves reflecting the image on the photomask onto the wafer by 13.5 nm EUV using mirrors, as illustrated in Figure 2. Generation of 13.5 nm UV requires a powerful plasma source that needs to be heated up to 200,000 °C [3]. 13.5 nm EUV has two special characteristics: (a) it can be absorbed by all matter (solids, liquids and gas) efficiently; (b) it has poor refractive index. Hence, EUVL needs to be done in vacuum.

Electron-beam lithography (EBL) is an alternative for chip manufacturing. Instead of using UV light, a beam of electrons is bombarded to the resist coated wafer to form the circuit patterns controlled digitally by computers without passing through a mask. Although this technique yields very high resolutions due to the shorter wavelength of electrons emitted, this process is much slower than photolithography [5]. Research is on-going to speed up the process of EBL which is critical for mass production of nano-scaled chips [5]. □

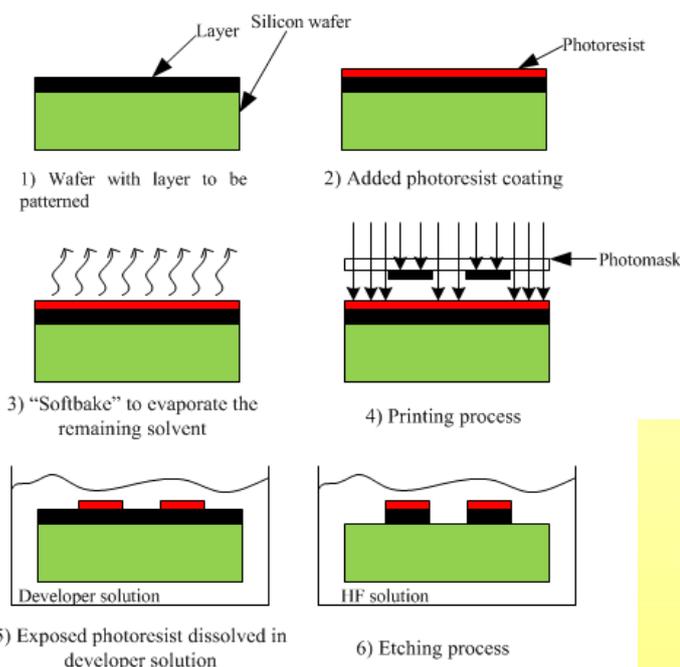


Figure 1: Basic photolithography steps [2].

References:

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- [4] K. David, "Intel's EUV Lithography," July 2004. [Online], [Accessed 22 March 2013].
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Development of active RFID system for power efficiency

Dr. Raed Abdulla

Introduction

RFID is an automatic identification method that uses radio frequencies between RFID readers and tags. The RFID system consists of the RFID tags (a microchip with a coiled antenna), the RFID readers, and the computer network.

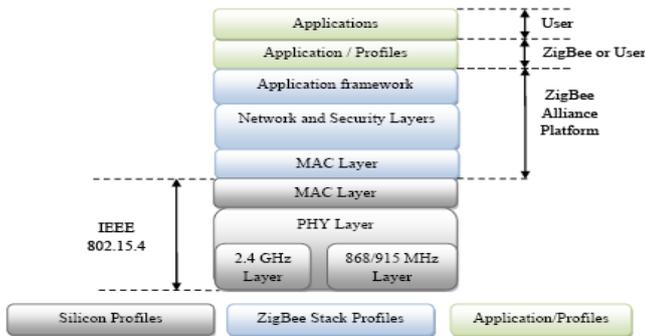


Figure 1: The ZigBee Standard and IEEE 802.15.4.

Design a 2.4GHz active RFID Tag

The long life battery-operated active RFID tag is designed to communicate with the active RFID reader in the vicinity, and thus the method of storing and retrieving data to the RFID reader with high accuracy is a critical part of the tag design.

Design Consideration

$$I_{Total}^{Tag} = I_{TX}^{Tag} + I_{RX}^{Tag} + I_{Listen}^{Tag} + I_{Sleep}^{Tag}$$

Testing and Performance Evaluation

Table 1: Power consumption in the RF system

State	Condition	Max	Unite
Tx	@3.3 V	40	mA
Rx	@3.3 V	40	mA
Standby	@3.3 V	1	μA
Sleep	@3.3 V	0	A

$$(1.5 \text{ Hours} \times 60 \text{ minutes} \times 60 \text{ seconds}) \div (3.33\text{ms}) = 16216622 \text{Tx/Rx slots}$$

$$1621622 \text{Tx} / \text{Rx slots} \quad 3 \text{ per broadcast} = 540541 \text{ Tx/Rx broadcast slots}$$

ZigBee-Enabled Active RFID System

Active tags can be automatically located and tracked based on the particular need of a user. With the ability to operate under harsh conditions for years at a time without human interference, these sophisticated wireless devices can communicate data at a long range.

Implementation of ZigBee in Active RFID Tag Layer

ZigBee-based mesh networks enable the equipment to be monitored in a finer way than what was originally possible.

System Overview

The RFID reader of the present work is deployed in an exemplary environment that comprises of a plurality of RFID tags, a plurality of transceivers that are networked to form a self-healing communications network and a host computer deployed within a building infrastructure such as a manufacturing facility or warehousing facility.

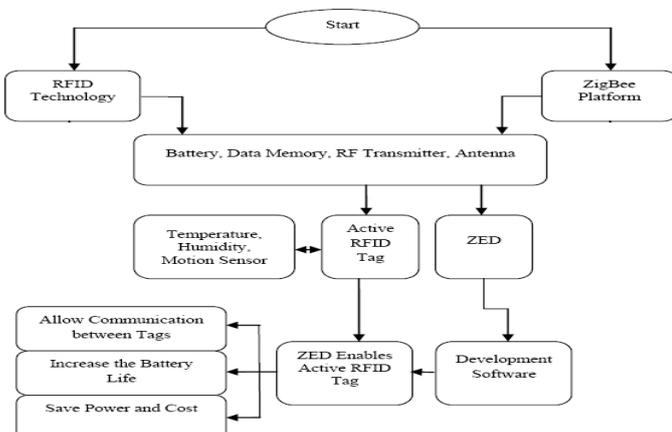


Figure 2: ZigBee enables active RFID system.

Conclusion

ZigBee has a dominant role over RFID in several aspects. In this paper, ZigBee was analyzed to be the most suitable underlying system for active RFID tag deployments. In our application prototype, the ZigBee module was successfully employed and enabled inherent configuration. High identification rates, a reliable energy budget, and standard compliance with the IEEE802.15.4 are some of the system features. □

References:

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Capsule Endoscope

Mr. Lioe De Xing

The advancement of technology has led to modern and effective application of medical instrument. One of the useful applications is the process of endoscopy for diagnosing and examining gastrointestinal tract of the patients. This process is conducted by inserting a tube through the mouth (gastroscopy) or through rectum (colonoscopy), a camera is mounted at one end and the images are sent and shown on a monitor. Even though this process is effective, it causes pain and is uncomfortable to the patients. Apart from the discomfort, conventional endoscopes have its' limitations, where it is not able to fully evaluate the disorder in the small intestine. This is due to the small intestine being very long and convoluted, as shown in Figure 1, therefore no available scopes are able to traverse the entire length of small intestine, resulting in some small intestine diseases to be not being diagnosed. Therefore, evolution of endoscopy started, where a wireless capsule endoscope was implemented.

A patient with possible gastrointestinal tract problems can now swallow a capsule sized camera device which takes images in the body so to allow later evaluation by a physician. Other than a camera, the device consists of a light source, transmitter circuitry and batteries as shown in Figure 2. This process is known as capsule endoscopy, a painless and non-invasive method compared to conventional endoscopy. When the scope travels through the body, it takes photographs rapidly. The images are sent to the receiver which the patient wears around the waist by the radio transmitter. The capsule endoscope is disposable and is passed by the patient into the toilet and flushed away. Capsule endoscopy is essential for discovering certain disorders such as Angiodysplasias, focal bleeding, tumours, Meckil's diverticulum, jejunitis, small bowel ulcers and Crohn's disease.

How does it work?

The camera captures an image and output it as electrical signals. The signals are then mixed with oscillator

signal and transmitted over an antenna. These processes require integrated circuit design of either analogue and/or digital, such as oscillator, mixer, modulator, bandgap reference etc. Apart from transmitting raw image data to the receiver, the image can be compressed. The compression reduces the data rate needed for

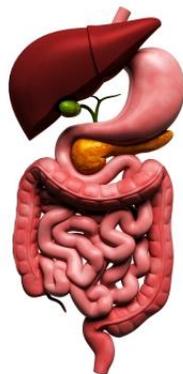


Image courtesy of dream designs / FreeDigitalPhotos.net

Figure 1: Small Intestine in human body.

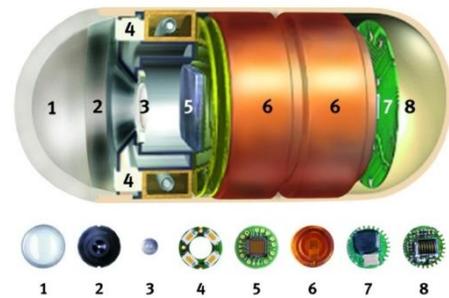


Figure 2: The structure of the first Capsule Endoscope "Pillcam" by Given Imaging. (1. Optical dome 2. Lens holder 3. Lens 4. LEDs 5. Image sensor 6. Battery 7. Integrated Circuits 8. Antenna)

transmission as the data size is reduced, but requires more complicated circuit design of an image compression VLSI circuit. Low power is always the priority in the design as it is a power operated device. However, wireless power transmission which requires extensive knowledge of electromagnetic field is another possible way to supply power to the capsule in the body. This knowledge are available through electronics engineering.

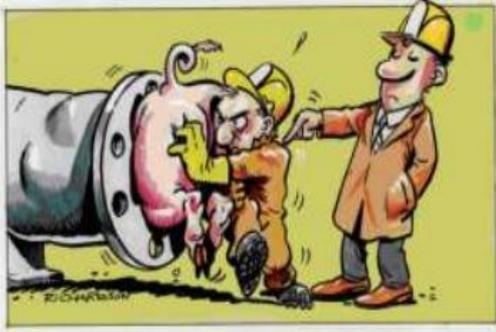
Looking from the telecommunication point of view, wireless signal transmission from the capsule needs modulation to communicate with the receiver. Appropriate modulation such as Binary Phase Shift Keying (BPSK), Binary Frequency Shift Keying (BFSK), On-Off Keying (OOK) etc needs to be identified first before designing the modulator. Thorough study of the advantages and disadvantages of each modulation is needed. Once modulated, the signal will pass through antenna for transmission. The design of antenna needs to be optimized; parameters such as resonance characteristics and radiation patterns need to be evaluated in order to obtain an efficient and practical antenna working in the human body.

The above mentioned are the basic functions of a passive diagnosis capsule endoscope, which captures and transmits images. Research has been done on getting the capsule to work on active diagnosis, where locomotive and stopping mechanism, stopping mechanism and microactuators for microbiopsy have been proposed. Real-time monitoring and control of the capsule is of interest to further enhance the functionality. Together with the advancement of microelectromechanical systems (MEMS), today's capsule endoscope is envisioned to be a robot capsule in the near future where drug delivery, biopsy, parameter sensors, microsurgery etc can be performed. These require mechanical knowledge.

Looking at the working principles of a capsule endoscope, engineering programmes by School of Engineering of APU cover them all. Perhaps we can develop our own one day, can we? □

Pipeline PIGing Process

Mr. Ali Ahmadian



Pigs have been used in the pipeline industry for almost a century. The very first pigs were made out of straw or wood and wrapped tightly with barbed wire and traveled through the pipeline with the pressure of the fluid motion to do a cleaning job inside the pipe. This scabrous tool made a squealing sound as it passed inside the pipeline and that is where it was named "pig". Another theory is that PIG stands for Pipeline Intervention Gadget. The next generation of pigs had leather driving disks and spring steel scraper blades, and some had spurs to chip off harder material and scale. They worked fine until during World War II when gas pipeline diameters got much bigger. They were not able to withstand the higher forces resulting from the larger diameter pipelines; hence, new designs were necessary.

The leather disks were replaced with rubber cups, and the spring steel scrapers were replaced with wire brushes arranged in a circular configuration, which resulted in a very robust design. Modern pigs have come a long way from those first primitive ones. Although pigs were originally developed to remove deposits, which could obstruct or retard flow through a pipeline, today pigs are used during all phases in the life of a pipeline for many different reasons.

During pipeline construction, pigging is used for debris removing, gauging, cleaning, flooding, and dewatering. During fluid production operations, pigging is utilized for removing wax in oil pipelines, removing liquids in gas pipelines, and meter proving. Pigging is widely employed for pipeline inspection purposes such as wall thickness measurement and detection of spanning and burial. Pigging is also run for coating the inside surface of pipeline with inhibitor and providing pressure resistance during other pipeline maintenance operations. □

Back propagation artificial neural network and its application in fault detection of condenser failure in thermo plant

Dr. Firas B. Ismail & Dr. Vinesh Thiruchelvam

A Steam condenser represents the main equipment in the power plant. Some condenser trips may lead to an entire shutdown of the plant, which is economically burdensome. An early detection and diagnosis of the condenser trips is crucial to maintain normal and safe operational conditions of the plant. A number of methodologies have been proposed in the literature for fault diagnosis of power plants. However, rapid deployment of these methodologies is difficult to be achieved due to certain inherent limitations such as system inability to learn or a dynamically improve the system performance and the brittleness of the system beyond its domain of expertise. As a potential solution to these problems, artificially intelligent monitoring systems specialized in condenser circulating water temperature decrease trip have been proposed and coded within the MATLAB environment in the present work. The training and validation of the developed system have been performed using real operational data which was captured from the plant integrated acquisition system of MNJ coal-fired power plant. An integrated plant data preparation framework for condenser circulating water temperature decrease trip with related operational variables has been proposed for the training and validation of the artificial intelligent system.

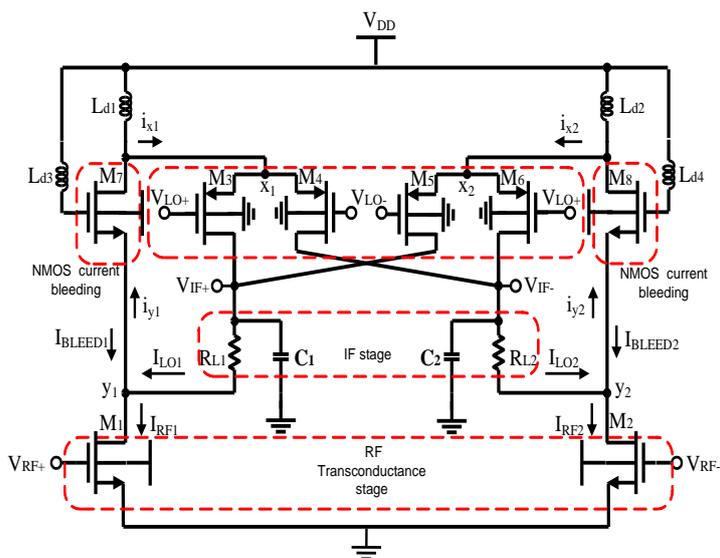
The feed-forward neural network methodology has been adopted as a major computational intelligent tool in the developed system. The root mean square error has been widely used as a performance indicator of the proposed systems. The intelligent monitoring system represents the use of the pure artificial neural network system for condenser circulating water temperature decrease trip detection. The final architecture for this system has been explored after investigation of various main neural network topology combinations which include one and two hidden layers, one to ten neurons for each hidden layer, three types of activation function, and four types of multidimensional minimization training algorithms. It has been found that there as general neural network topology combination that can be applied for all condenser trips. The condenser trip under consideration had been detected by the proposed systems before or at the same time as the plant control system. The proposed artificially intelligent system could be adopted on-line as a reliable controller of the thermal power plant condenser. □

Ultra-low voltage and low power CMOS current bleeding mixer

Mr. Tan Gim Heng

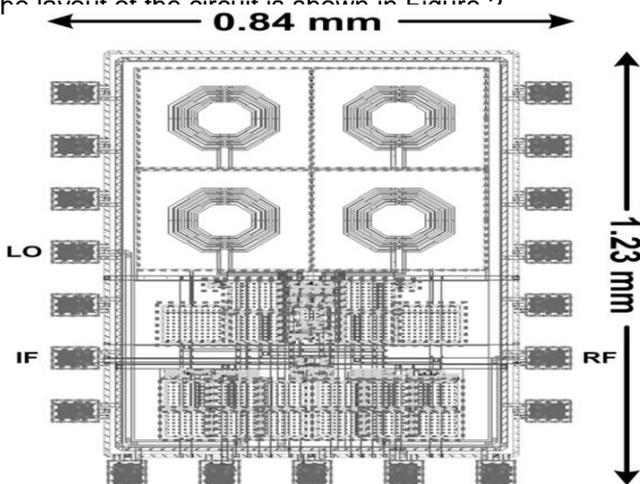
Intelligent Lifting mechanism for pepper harvester

Dr. Firas B. Ismail, Dr. Vinesh Thiruchelvam & Mr. Wilson You Wei Lim



A low voltage circuit with low power consumption is a critical need for portable devices. A low voltage circuit demands higher biasing current to increase the dynamic range of the circuit which results in an increase of power consumption.

Figure 1 shows an ultra-low voltage and low power current bleeding CMOS double balanced mixer targeted for ZigBee application in a 2.4GHz operating frequency band. This mixer uses a modified CMOS current bleeding mixer topology adapting the forward body bias design technique integrated with a NMOS based current bleeding transistor, PMOS based local oscillator (LO) switching stage and on-chip inductors to achieve ultra-low voltage headroom operation down to 0.35V. The conversion gain is further enhanced by integrating an inductor at the gate of the bleeding transistor to reduce RF current leakage. This architecture is simulated and verified in 0.13 μ m standard CMOS technology. The RC extracted simulation result shows a high conversion gain (CG) of 16dB, 1dB compression point (P1dB) at -17.65dBm, third-order intercept point (IIP3) of -7.45dBm and a noise figure (NF) of 18dB is achieved with a power consumption of 526 μ W. The layout of the circuit is shown in Figure 2.



Before any process and any design is processed, the very first thing to do is to identify the customer needs. From our customer, he says that the pepper plant might grow from 3m-4m in height. Hence, he needs something to lift up and down his labourers on a platform to provide safe harvesting. From the statement, we as an engineer need to specify, and precisely spell out the measurable detail of what the product has to do in order to translate customer language to engineer language. The focus of this work will be on selecting a suitable lifting mechanism for the harvester vehicle. Concept generation are done internally by individuals and externally in a group in order to provide more appropriate ideas for the system. Advantages and disadvantages of the concepts are discussed then only the best is selected.

After the selection of a suitable concept, developing it will be the next stage. In this stage, sketching plays an important role to show a correct path to continue with. This is followed by the selection of product material. When we talk about material selection, a few different factors need to be considered such as material properties, cost and availability. During the selection, different types of materials will be analyzed so that the most suitable material can be chosen. This can be done by having material simulation analysis of SolidWork software to check the effects of displacement deflection on different materials.

Apart from that, finite element stress and strength analysis will be performed to study the stresses, forces and deflection displacement of the complex scissor lifting structure to determine the suitable structure dimension. Trial and error method can be used as well as if the dimension does not meet the criteria. Next, design drawing will be performed. Specifications of part design needs to be determined in this stage for example the scissor lifting stroke, height and linkage length. 3D part drawings are produced to check whether the parts fit each other without a real modeling construction that costs time and money.

In the actuator selection stage, types of actuator need to be determined among electric, fluid pressure and pneumatic pressure actuator. A pneumatic actuator is selected and the specifications are defined. Then, different types of fasteners are chosen to join the parts and the details of the fasteners are defined in the fasteners design stage. The final stage will focus on cost calculation which consists of raw of material cost, manufacturing cost, profit and also payback period. From the calculation, the payback period calculated is 2.09 years and proved that this work is worthy to be invested in.

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