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VIRTUAL REALITY

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an individual.

2 are friends.

3 is company.

more than 3 makes a society. The arrangement of these elements makes the letter 'C' connoting 'Computer Society of India'.

the space inside the letter 'C' connotes an arrow - the feeding-in of information or receiving information from a computer.

CSI Headquarter :
Samruddhi Venture Park, Unit No. 3,
4th Floor, MIDC, Andheri (E),
Mumbai-400093, Maharashtra, India
Phone : 91-22-29261700
Fax : 91-22-28302133
Email : hq@csi-india.org

CSI Education Directorate :
CIT Campus, 4th Cross Road, Taramani,
Chennai-600 113, Tamilnadu, India
Phone : 91-44-22541102
Fax : 91-44-22541103 : 91-44-22542874
Email : director.edu@csi-india.org

CSI Registered Office :
302, Archana Arcade, 10-3-190,
St. Johns Road,
Secunderabad-500025,
Telengana, India
Phone : 91-40-27821998

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Editorial

Dear Fellow CSI Members,

Virtual Reality is to immerse a user within a computer-generated, virtual environment that should be visually identical to the real one. The basic concept is to block out the sensory input from the outside world and use the visual and auditory cues to give a feeling of reality to the virtual world. "Virtual Reality" term was first explored in Stanley G. Weinbaum's science fiction "Pygmalion's Spectacles" in 1935. It describes a virtual reality system with holographic recording of fictional experiences including smell and touch.

New methods to navigate and interact with virtual objects are constantly being developed. Virtual Reality interaction is constantly evolving new hardware, software, interaction techniques, and the research is in progress in the area of interaction technologies.

Virtual Reality has its applications in a large spectrum of fields such as entertainment, education, architectural design, medical treatments and media.

Keeping in mind the importance of Virtual Reality in today's context, the publication committee of Computer Society of India, selected the theme of CSI Communications (The Knowledge Digest for IT Community) August 2016 issue as "Virtual Reality".

Cover Story contains first article "Visual Simulation: An Overview" by P. K. Jha that explains the basics of visual simulation. In next cover story "Synthetic Perception: New Era of Virtual Reality in Mental Health Care", N. Sharma, M. H. Kolekar and S. Chandra have described the usage of virtual reality in healthcare. Cover story "Virtual Reality: A Computer Simulated World" by S. K. Panda, S. Mishra and B. K. Mishra gives an overview of virtual reality.

Research Front category contains an article "Genetic Algorithms: How do they mimic Natural Evolution?" by A. Mishra and A. Shukla that describes the usefulness of genetic algorithms in optimization of problem solving.

In Articles category, the first article "Software Project Risk Assessment: Application of Boehm Metrics" by D. B. Hanchate and R. S. Bichkar has given application of Boehm metrics that will help a project manager in deciding which task has to do with priority. Next article "Essence of Management Skills in Technical Education" by B. L. Gunjal describes the importance of management skills in building highly dynamic, mentally robust and morally strong engineers and technocrats.

Article "Sustainable Computing: A beginning..." by P. K. Gupta and M. Singh explains various aspects of sustainable computing.

In series Innovations in IT, we have included an article "Responsive Web Design: One size no longer fits all" by N. Vijaya, S. Kukreja, P. Sakhardande and R. Thanawala that gives a concept of providing flexibility of ubiquitous internet connectivity across devices in developing websites for better end user experience.

Security Corner contains "A Quick Look at Data Redaction in Oracle RDBMS" by J. Doshi and B. Trivedi, that provides an introduction to data redaction concept in databases to enhance security.

This issue also contains Crossword, Book Review, CSI activity reports from chapters, student branches and Calendar of events.

I am thankful to Prof. A. K. Sanini, Chair-Publication Committee and entire ExecCom, in particular to Prof. A. K. Nayak and Prof. M. N. Hoda for their continuous support in bringing this issue successfully.

On behalf of publication committee, I wish to express my sincere gratitude to all authors and reviewers for their contributions and support to this issue.

I hope this issue will be successful in providing various aspects of Virtual Reality to IT community. The next issue of CSI Communications will be on the theme "Medical Image Processing". We invite the contributions from CSI members who are working in the area of Medical Image Processing.

Finally, we look forward to receive the feedback, contribution, criticism, suggestions from our esteemed members and readers at csic@csi-india.org.

Wishing you a very happy Independence day,

Dr. Vipin Tyagi
Editor

Dr. Vipin Tyagi, Jaypee University of Engineering and Technology, Guna - MP, dr.vipin.typagi@gmail.com

President's Message

01 August 2016

Dear CSI members,

The Members must have noticed the improvement in CSIC, both in print quality and in contents. This is because of the efforts of ExecCom primarily of the Vice President Mr. Sanjay Mohapatra who took the lead in changing the printer. Dr. Vipin Tyagi has been spending lot of efforts in improving the quality of the contents by soliciting articles on a variety of topics and publishing after careful scrutiny. We have been all along been giving importance on improving the quality of publications and we are expecting to restart the publication of Journal of Computing soon and working on attracting submissions for CSI Digital Library.

CSI must involve our members in different activities and in giving more benefits to our members. We have a large number of members with a variety of expertise who are ready to contribute. Consequent to my meeting in BIS (Bureau of Indian Standards) at Delhi, we notified on the requirement of experts who can contribute in different standardization activities. We have received very encouraging response and a number of applications have been forwarded to BIS for further processing from their end.

Selection of CSI nominees for SEARCC International Awards has been completed and the names communicated to the appropriate authorities. Congratulations to all who have been selected. We are going to announce the CSI- IEEE CS Education Award soon and I am sure we will get a large number of applications. The Awards Committee is working on the different awards of CSI including CSI Fellowship.

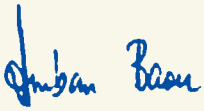
We have notified about the selection of representatives for different Technical Committees of IFIP (International Federation for Information Processing). IFIP is leading multinational, apolitical organization in Information & Communications Technologies and Sciences, recognized by United Nations and other world bodies and represents IT Societies from 56 countries/regions, covering five continents with a total membership of over half a million. Computer Society of India is the only member from India and we are planning to have CSI representatives in different Working Groups in the thirteen Technical Committees. We have received very good response to our notification although the last date is still few days away. We will constitute a selection committee for processing the applications.

The list of Distinguished Speakers and Distinguished Consultants has been put up. Hope the Chapters will make use of the list and contact the members for different activities.

Our efforts to improve CSI Web portal is going on. The online membership is operational and efforts are on to improve the processing of student membership etc. in the most efficient way.

As President of CSI, I have made it a point to interact with our Members and visit different Chapters and Student Branches. I visited Hyderabad Chapter and Student Branches in Hyderabad and Vizag, inaugurated an International Conference on Innovations in Computer Science and Engineering (ICICSE- 2016) at GNIT, Hyderabad and inaugurated a CSI Chapter in Gunupur. While some chapters are doing lot of activities, CSI Chapters located in IT Hubs and large metros needs to do more to attract IT professionals to CSI.

With best wishes for Happy Independence Day!



Dr. Anirban Basu
President, CSI

Dr. Anirban Basu, Bangalore, president@csi-india.org

Vice President's Desk

Dear CSIians,

We have successfully completed 2nd CSI EXECCOM meeting on July 9th and 10th at Chennai-ED. Starting with the confirmation minutes of 5th ExecCom Meeting held on April 2, 2016 and 1st ExecCom meeting held on April 3, 2016 a fruitful discussion happened highlighting each and every aspect of advancements and bottlenecks. Region-wise developments and issues were elaborated by Regional Vice Presidents from all the regions.

A detail review was taken by OB's regarding present membership status (both Institutional & Individual) and discussed regarding growth aspects along with the immediate action plan to raise the count of SB's. Matters related to finance budget, allocation of funds to Div. chairs & RVPs, status of the audit and present fund position were presented by Hon. Treasurer.

CSI Annual Convention has been planned in December 8-10, 2016 in Coimbatore and hosted by Coimbatore chapter. Imm. Past Hony. Treasurer and Convener of CSI 2016, Dr. Ranga Rajgopal presented an excellent programme schedule with pre tutorial (7th December 2016) of Convention.

Hon Secretary Dr. A. K. Nayak updated regarding latest issue of CSI-Adhyayan, CSI Journal for Computing and requested ExecCom for fund raising activity via advertisement for the above publications. Automation of Student membership is under process and online membership facility is going on.

Renewal of MOU's with other similar professional societies (British Computer Society, Singapore Computer Society etc.) are in process. Planning is done to tie up with Industry for various certification programs at both region and chapter level. Other aspects like Digital Library, Research Initiatives, fund allocation for R&D, SIG's have been discussed and their planning and implementation was finalized.

We, the members of CSI fraternity, believe that the best way to bring a change is to initiate it. With this belief, we have continually engaged over more than 51 years in a relentless endeavor to grow and develop into a pioneer IT Association in the field of Information Technology.

I would like to conclude with the below slokha -

Indriyaanaam hi charataam yanmano anuvidhiiyate |
tadasya harati pragyaam vaayarnaavamivaambhasi ||

(The mind, which follows in the wake of the wandering senses, carries away a man's discrimination just as a gale tosses a ship on the high seas.)

For feedback & suggestions please write to - vp@csi-india.org.

With kind regards

Sanjay Mohapatra
Vice President, CSI

From CSI Regional Vice President Desk

We have lost our reading habits considerably. We have given much more time than ever before to different forms of entertainment hitherto unpremeditated. Social networking mechanisms and groups are galore, to form groups with varied objectives. I have deliberately touched on this point to find something out of it. One of these is to involve the students so that they can read the various types of articles published by CSI on a continuing basis. Rationale for the formation and effective functioning of Student Branches of CSI, inter alia, also depend on this.

Regional activities surely have some different chapter programmes, even philosophies, because of certain identified diversities or peculiarities on their own, with less or more emphasis, but, at the same time, there are cases where regional imbalances are to be addressed and cleared up on an urgent basis, like what we, at times, apply in the case of national interests. These differences, if any, are to be sorted out at the chapter level, on the consideration to treat the chapter as the atomic level.

New business avenues are being thought of or emphasized. I had attended one on Business-IT Conclave organized by Bengal Chamber of Commerce & Industry on 17 June 2016 with special emphasis on Cyber Security. People from different walks of life stressed the need of Cyber Security and as a business proposition, as well. Another Seminar on ICT Solution digital and Smart West Bengal will be organized by Indian Chamber of Commerce on 25 July 2016. I expect our members in the existing Chapters Kolkata, Patna, Siliguri to organize similar events on a larger scale. I also take this opportunity to the erstwhile members of Durgapur, Guwahati and fairly old Asansol Chapters to assemble together, to organize events of their interests and then to revive the Chapters.

Devaprasanna Sinha
RVP-II

Visual Simulation: An Overview

Pramod Kumar Jha
Scientist - E, CAS-DRDO, Hyderabad

Introduction

Visual simulation is a basic form of virtual reality that uses 3-D images and models of real world objects to create a synthetic immersive environment. A user can explore such environments interactively and conduct experiments to study such systems as it may not be always possible or even feasible to conduct experiments on real system. Visual simulation is extensively being used in the areas of Flight Simulator, war-gaming and even in fun games. It has even got many practical applications like oil & gas exploration, mining, virtual training, automobile and aerospace vehicle design, to name a few. With the availability of faster graphical processors, 3D modeling tools and seamless immersive display technology, virtual reality has made a significant inroads in to many multi-disciplinary fields. Modern developments in the field of virtual reality has made man-machine interactions swifter and facilitated the collaborative system analysis and design. This article gives an overview of steps involved in the establishment of a Visual Simulation facility.

Visual Simulation Setup:

A typical visual simulation setup consists of a display screen with its projection system, an Image generator and 3D modeling tools and accessories like active or passive eyewear. Selection of these system is very vital and utmost care should be observed while selecting each of them. All pros and cons of each system should be compared final selection should be made such that the system should be able to meet its required objectives and that too within the specified budget constraint. For example, the designer in concurrence with users has to make choices of rear projection system or front projection system, active or passive display system and even active or passive eyewear. Each system has got its own advantages and disadvantages associated with it. Like, rear projection system consumes much space but provides significant collaborative interactions where a user can go very near the screen and feel the system. Active eye-wears are heavy and are battery operated and becomes quite irritating during long hours of usage. It is also prone to maintenance. On the other hand passive eye-wears are light weight and are mostly maintenance free. It can also be used for long durations as being light weight it leads to less fatigue.

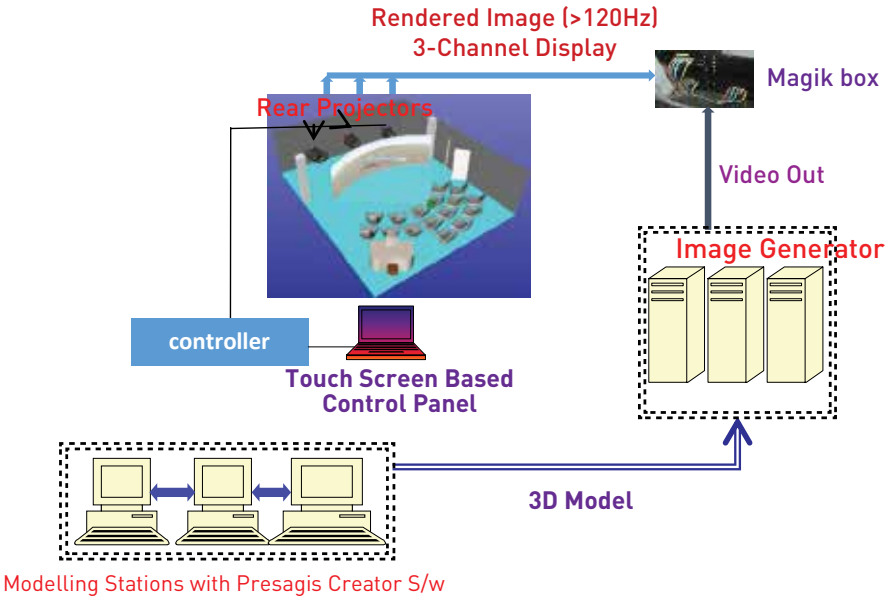


Fig. 1: a typical visual simulation setup.

One cannot even ignore the significance of image generator as this is the system which does all number crunching and rendering job. One can choose GPU based processors or multi-GPU cards which does the image rendering together. Selection of display screen is dictated by required Filed of View (FOV), which in turn dictates the level of immersion. Higher FOV leads to higher immersion and one feels fully immersed in the synthetic environment. The Fig.1 below shows a typical Visual Simulation setup.

3D Modelling & Visual Simulation:

Visual simulation places more weight on more rendering and driving of 3D graphics. The 3D models are generally generated in a high-end workstation using 3-D modelling and visualization tools like Solidworks, Maya, Creator Pro or even open source OpenGL. 3D models created by Solidworks can be optimized by Maya software to reduce the number of polygons to match the Level of Details (LOD) required. Degrees of Freedom (DOF) and LOD are added to the model after importing it into visualization environment. The 3D graphical model with DOF and LODs not only provides precise object definition, but also supports real-time visualisation and interaction in the virtual reality environment. In order to meet the faster

rendering requirements a graphic cluster can also be considered, which can perform distributed rendering. (Fig.1). The video output of Image generator is given to the multiple projectors through a magik box/video splitter which converts the VGA output into RGB output as required by the projectors. Each projector displays 1/3rd of the image and output of all the three projectors are optically combined to give the feeling of single seamless 3D image.

Conclusions:

With the availability of cheaper processing technology, software & hardware tools, virtual reality has indeed become reality in our day to day life. Now even this technology is available on mobile phone platform with just an addition of small display hardware. Visual Simulation helps in easier understanding of system by virtual walkthrough inside the prototype even at the conception stage. This provides significant inputs to the designer and based on user feedback it provides an opportunity to designer for further improvement of the system. In coming years virtual reality is going to become an inherent and significant part of our life.

■

About the Author:

Mr. Pramod Kumar Jha [CSI - 00052824] is working as Scientist- E at Centre for Advanced Systems, (DRDO) Hyderabad. He is having more than 16 years of experience in the field of Hardware in Loop Simulations, Visual Simulations, Real Time Networks and optimal production. He is a recipient of DRDO team ward, three lab level award and CSI's Significant Contributions award. His current areas of interest include Lean manufacturing and Quality Management, Computer Networks and Automation. He can be reached at pkj@cas.drdo.in.

Synthetic Perception: New Era of Virtual Reality in Mental Health Care

Neelam Sharma
Indian institute of Technology Patna

Maheshkumar H. Kolekar
Indian institute of Technology Patna

Sushil Chandra
Institute of Nuclear Medicine & Allied Sciences (INMAS), DRDO, New Delhi

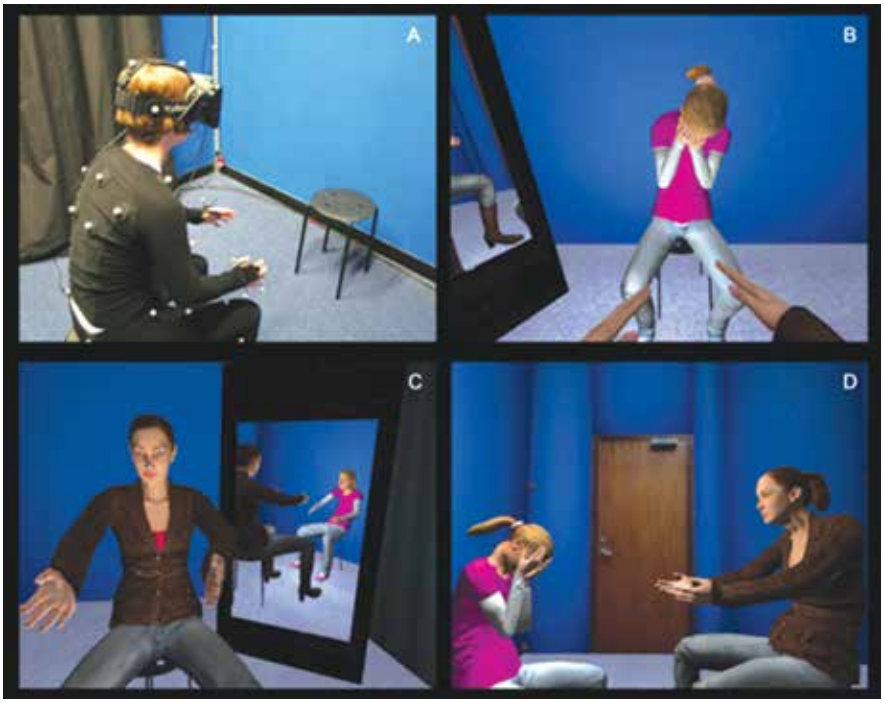
Source: INMAS-DRDO Lab, New Delhi

Virtual reality is revolutionizing technology in the entertainment industries. Basically, virtual reality replaces our reality into new computer generated environment which could be a game, film or your favorite brand outlet in 360 -degree view. VR experience is far amazing in comparison to watching a 3D or 5D movie. The main idea behind this experience is synthetic perception. When we put on VR, our brain triggers that it is our new reality and it allows us to immerse into an incredible new world around us. Apparently, sensors build in headset provides a real experience. There are two types of headset have been used still now. First, Head mounted device (HMD) which is trending device and the second is the computer automatic virtual environment (CAVE). Again, there are two types of HMD; one is an accessory type in which you just plug your phone that work as your screen such as Google Cardboard, Samsung Gear VR. Another type is a standalone unit, which include everything like its own screen and gyroscope for example Oculus Rift, HTC Vibe.

HMD devices like Facebook Oculus Rift and Google Cardboard have created a huge anticipation and projected educational potential over virtual reality. Even though, in the early 1990s computer game developers had tried to make virtual reality as the consumer trend. But the graphics of the environments or games were lack of realism that time. Now companies are commercializing this technology at vast level and Industries had never been so fast in past eras, within few years we have five or six major products like Oculus rift, Samsung gear VR in market from zero level and more are coming soon such as HTC Vive, Sony Morpheous. Apart from this, Industries are also trying to enhance our Augmented reality experience in the combination of Virtual Reality. Thus, Microsoft is launching its Hololens device after Google AR classes. Actually, augmented reality adds or combine something in your real world like google classes provide google navigation map while VR replaces our entire reality.

Meanwhile, the scientists across the globe have adapted this technology rather than an unlikely tool, they have been experimenting with virtual reality to provide therapy for some serious mental disorders. And thanks to the years integrated research many mental issues now have been addressed in a grass root level. More than one in every 4 people worldwide will have a mental health issue at some point in their life and treatment ranges from medication to psychotherapies and to most extreme electroencephalography therapy. But, still there is so much about the brain that we haven't explored and the treatment on the way is effective. A group of research hopes virtual reality technology could help transform our approach to mental health.

Initially, Virtual Reality utilized in the air force to provide real time aviation stimulation training for pilots. It has been shown very effective and cheapest tool rather than crashing of actual aircraft in training which cost thousands million dollars. Virtual reality's application in mental health care has introduced a long way since 1900s and VR have recently been utilized as therapy for mental illness. The first use of virtual reality was recognized in treating phobia of the patient. One virtual avatar in the form of psychologist Eliza was born in 19's. It was believed that the patient would more comfortable with a machine rather than human [1]. However, use of virtual reality in the rehabilitation sector increased tremendously. In Defence, one research group used virtual reality to treat post-traumatic stress disorder (PTSD) of soldiers and a virtual Iraq has created to treat their stress. These kind of virtual environment provides a platform for replicating real life scenarios which give the clinician a facility to understand patient behavior in a real setting rather than laboratory



Source: http://www.gizbot.com/miscellaneous/news/virtual-reality-can-help-people-cope-with-depression-031398.html

manoeuvre [2]. Because, People with PTSD hide themselves off from their emotions and it is harder to avoid with VR therapy. Further, this research group extended this work in making cognitive test battery in virtual reality for replacing concepts of the traditional neuropsychological test battery [3]. And recent studies show that therapists have been using VR to treat Arachnophobia, acrophobia, fear of flying, fear of public speaking, social phobia, ADHD and Neurocognitive disorders like Dementia [4-8].

Recently The National Autistic Society (NAS) in the U.K. developed a short virtual reality film for the non-autistic to experience episodes of sensory overload of autistic people. A research group from Oxford university studied paranoid condition and provide VR therapy to 50 people with severe paranoid such as schizophrenia. In paranoid condition patient mistrust other people, believe that others are intentionally trying to harm them and some sufferers are not able to leave their house. The study shows that some severely paranoid patients have "major reductions" in their condition after one 30-minute session [9]. In India, this work is accepted in the architecture sectors and a large number of a building is prototyped in the VR to give a buyer a full immersion of his future house/office. In defence, Institute of Nuclear Medicine & Allied Sciences (INMAS) Delhi has dedicated

Source: http://www.presentationsimulator.com/fear-public-speaking/exposure-therapy/

one decade in understanding the use of virtual reality in enhancing cognitive abilities of a normal population. The lab built cognitive test battery in a virtual reality [10]. Now, it has extended the work in the field of spatial cognition and VR environments have been developed and validated that focus on component cognitive [11]. Apart from mental therapy, recently VR is also used as a diagnostic tool for tumour in a surgery at angers university hospital in France [12].

Source: http://ignisvr.com/portfolio/arachnophobia-virtual-exposure-therapy/

To put in the nutshell, VR could be an extra instrument that psychotherapists use before and now it becomes more recognized treatment available. This new shortcut could prove incredibly helpful and waiting lists for psychotherapies continue to swell. Beside these, Virtual Reality has immense scope in combination with other emerging technologies in the future, such as augmented reality [13], artificial neural network and big data visualization. An amalgamation of VR and artificial neural network (ANN) can do wonders. The ANN can help in developing more realistic and interactive VR environments [14]. The VR can create new methods of big data visualization as it is a new emerging sector [15].

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About the Authors:

Ms. Neelam Sharma is currently pursuing her PhD from Indian Institute of Technology Patna in the Department of Electrical Engineering in the area of diagnosis of neurocognitive disorder using EEG signal analysis. She has worked as a Research Assistant at Thapar University, Patiala, India for the project titled as "Performance Enhancement of the Sports Players by improving the cognitive skills" for the duration of one year (2013-2014).

Dr. Maheshkumar H Kolekar [CSI-10058525] is working as an Assistant Professor in Electrical Engineering, Indian Institute of Technology Patna since march 2010. He was Departmental Head, Electrical Engineering, IIT Patna during Jan 2013 to Dec 2013. Also from Jan 2014 to May 2015, he was holding the position of Head of the Center for Advanced Systems Engineering at IIT Patna. He was a post-doctoral research fellow in the Department of Computer Science, University of Missouri, Columbia, USA. His research interests are in the field of digital image and video processing, video surveillance, bio-medical image and signal processing. He can be reached at mkolekar@gmail.com.

Dr. Sushil Chandra is holding a Senior Scientist position (Scientist- F) with 30 years of experience in DRDO and the Head of Dept. of Biomedical Engineering. His Current research is focused on Cognitive Science, Virtual reality simulation for Military operations, Biomedical Engineering and their applications in defence R&D. He also acted at senior level in partnerships/collaboration with various international Organization, NGOs, Societies and Government Departments. Coordinated, a large number of research projects on between various professional & educations institutes & INMAS (Bio-medical Engg.).

Virtual Reality: A Computer Simulated World

Sanjaya Kumar Panda
Assistant Professor
VSSUT, Burla, Odisha

Swati Mishra
M. Tech. Scholar
VSSUT, Burla, Odisha

Brojo Kishore Mishra
Associate Professor
CVRCE, BBSR, Odisha

Virtual Reality (VR) consists of two contradictory words, namely virtual which is typically used for unreal or fake and reality which is used for real or original. Therefore, VR is the consequence of physical existence without having it. For instance, we may never play international games such as Olympic, Cricket and Football but we can play these games using VR. This is possible by the help of high performance computers, head trackers, data gloves, 3D controllers and head mounted displays which actually create the imaginary world. The term VR is popularized by Jaron Zepel Lanier [1].

The recent development in VR headsets is Oculus Rift and HTC Vive [2] which are released by Oculus VR and HTC & Valve on 28th March and 5th April of this year respectively. According to the world's leading IT research and advisory company, Gartner Inc. [3], the sale of wearable devices will generate revenue of 274.6 million in 2016 which is 18.4% more than 2015. Moreover, the Gartner hype cycle July 2015 [4] shows that the plateau for VR will reach in the next 5 to 10 years. Therefore, many companies are finding cost-cutting solutions for their products and services using VR. Some of the leading VR companies are Virtalis, Facebook, Google, Microsoft HoloLens, Marxent Labs, Bricks and Goggles, WorldViz, Vuzix and CastAR.

Types: Virtual reality is of various types such as fully immersive, semi-immersive (or projection), non-immersive (or desktop) and simulation (or mixed reality) [5]. Note that these VRs are based on the closeness of physical reality. In fully immersive VR, the user wears a head mounted display (HMD) and a data glove to experience the virtual environment. One of the examples is the virtual cockpit of a warplane. On the other hand, Flight simulator is a well-known example of a semi-immersive VR. This VR consists of a screen, projection system and monitor like a theatre. It does not require HMD and data glove for the user as used by fully immersive VR. Therefore, the user is far from the fully immersive environment. On the contrary, the non-immersive VR is the least immersive in compare to the previous two VRs. Here, the user interaction is performed using keyboard, mouse and 3-D devices. 3D implant planning is a non-immersive VR.

VR vs Augmented Reality (AR): The objective of both realities is to immerse the user. However, they perform it in a different ways. AR deals with the real world by communicating the virtual objects [6], whereas the VR deals with a computer simulated world. AR simply uses handheld devices like a smartphone or iPhone to display the pictures into real world objects. Note that it is possible through apps, sensors, GPRS and many more. VR performs well for games and social networking (i.e., mainly entertainment applications) whereas AR is especially used for museum tours, medical applications and presentation (i.e., non-entertainment applications). Google Glass 2, Sony SmartEyeglass and Microsoft HoloLens are the leading companies of AR. In 2014, Facebook paid $2 billion for Oculus VR. On the contrary, Magic Leap has gained $542 million from Google, Qualcomm and others [7]. The reasons of the failure of AR are lack of ownership brand, lack of experiences, integration, battery life, small display and low resolution. For instance, Google Glass has failed because it does not meet the expectations. On the other hand, Magic Leap has succeeded in fulfilling the user expectation and addressing the mixed reality.

VR in Training: VR is applied in the teaching and learning process [5] to make this process more effective. This can be done in two ways as follows. The first way explores the virtual environment through a display, keyboard and mouse whereas the second way requires HMD and data glove for communication. For example, a student may explore a heritage building and walk inside in it. Note that such exploration is not possible using the online materials and books [8].

Applications: Virtual reality has an inexhaustible range of applications such as scientific visualization, military, healthcare, business, media, games, entertainment, heritage, engineering, telecommunication fields [9]. In order to bring the virtual reality into our life, the tools such as Magic Leap, Tilt-a-whirl, Heat Map, Lytro, Stick Figure and Half Panorama are used to create the virtual environment. However, VR is unconvincing due to latency, expensive equipment, poor resolution, limited view, complexity and gravity.

Advances in VR: There is a rapid development of VR devices such as input devices and headsets. Microsoft's Kinect and Wii controls are the two recent developments in the input devices of VR. Similarly, PlayStation VR is a headset that is recently released by Sony. This headset provides various games such as Batman Arkham VR, Farpoint, Eagle Flight and Job Simulator in which the user will get 360 degree vision and 3D audio.

Recently, many efforts have been put to integrate two latest technologies, namely cloud computing and VR or AR as the technologies have drawn huge attention in business communities. Cloud computing has the enormous computing power which can simply fulfill the requirements of VR applications. Moreover, the rapid change of the requirements such as software, hardware and devices in VR can easily be addressed by cloud datacenters. Cloud can also overcome the network latency of VR which is very much essential for the gaming applications. Therefore, it is expected to get the cloud-based VR solution soon [10].

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About the Authors:

Mr. Sanjaya Kumar Panda [CSI - I1503212] is working as an Assistant Professor in the Department of CSE and IT at VSSUT, Burla, Odisha, India. He is pursuing Ph. D. degree at ISM, Dhanbad, India. He also received CSI Young IT Professional Award, Young Scientist Award, CSI Paper Presenter Award at International Conference and CSI Distinguished Speaker.

Ms. Swati Mishra received M. Tech. degree from VSSUT, Burla, India and B. Tech. degree from SUIIT, Burla, India. She received CSI Young IT Professional Award in 2016. She has published few papers in reputed international journals. She acted as reviewers in many reputed journals and conferences.

Dr. Brojo Kishore Mishra [CSI - I1501747] is an Associate Professor in the Department of IT, C. V. Raman College of Engineering, Bhubaneswar, Odisha, India. Also he is the CSI State Student Coordinator, Odisha. He is associated with a CSI funded research project as a Principal Investigator. He was the Regional Convener of CSI YITP 2015-16. He can be reached at brojokishoremishra@gmail.com.

CSI Gunupur Chapter Inauguration

CSI Gunupur Chapter was inaugurated on 30th July, 2016 by Dr. Anirban Basu, President, CSI & Dr. Satya Prakash Panda, Chairman, Gandhi Group of Institutions at Gandhi Institute of Engineering & Technology, Gunupur, Odisha.

Sri Sanjay Mohapatra, CSI Vice President, Sri R. K. Vyas, Hon Treasurer, Sri H. S. Mishra, Regional Vice President (Region-IV), Dr. Jagadish Panda, Chairman, CSI Gunupur Chapter, Dr. Chandra Dhwaj Panda, Hon. Secretary of Gandhi Group of Institutions, Dr. A. V. N. Sharma, Principal In Charge, Gandhi Institute of Engineering & Technology were delivered talk during the Inaugural Ceremony. Dr. Satya N. Das, State Student Coordinator of CSI was present during the inauguration programme.

More than 100 CSI Life Members, 500 student members participated in this Inaugural ceremony.

Genetic Algorithms: How do they mimic Natural Evolution?

Apoorva Mishra & Anupam Shukla

Soft Computing and Expert System Laboratory, ABV - Indian Institute of Information Technology & Management, Gwalior, M.P.

Introduction

The life on our planet has incredibly evolved over a relatively short period of time to its current complex form. This has been possible only because of the beauty of natural evolution. The idea behind genetic algorithms is to use this power of natural evolution to solve complex real life optimization problems. Over the past three decades, genetic algorithms have been applied to solve innumerable problems across different domains[1–6]. Genetic Algorithms are inspired from the process of natural evolution. The working principle of the genetic algorithms is based on the Darwin's theory of "the survival of the fittest". The theoretical explanation for the success of genetic algorithms is given by schema theory; and the chance of survival of a group of schemata (plural of schema) has also been derived to establish a new insight into it[7].

Some of the jargons associated with the genetic algorithms are defined as follows:

Fitness: *The fitness of an individual is a measure of its ability to solve a problem.*

Selection : *Selection is the process by which the pairs of individuals that will participate in crossover operation are selected.*

Crossover : *Crossover is the genetic operator that performs the task of recombination of two individuals (parents) to generate individuals of the new generation (offspring).*

Mutation : *Mutation is the process by which new characteristics are introduced into the population*.

Working of Genetic Algorithms

The common operators used in genetic algorithms are selection, crossover and mutation[8]. The algorithm begins by initializing a random set of population, then the fitness of each individual and the complete population as a whole is evaluated and it is checked whether the solution set meets the termination criteria; if the termination criteria is satisfied, then the algorithm is stopped, else, the following genetic operators are applied in succession: selection, crossover and mutation, to obtain the next generation population, then, again the fitness in evaluated and the process repeats. The algorithm iterates through the set of solutions to the problem over generations to get the optimal solution. The working of genetic algorithms is represented by Fig. 1.

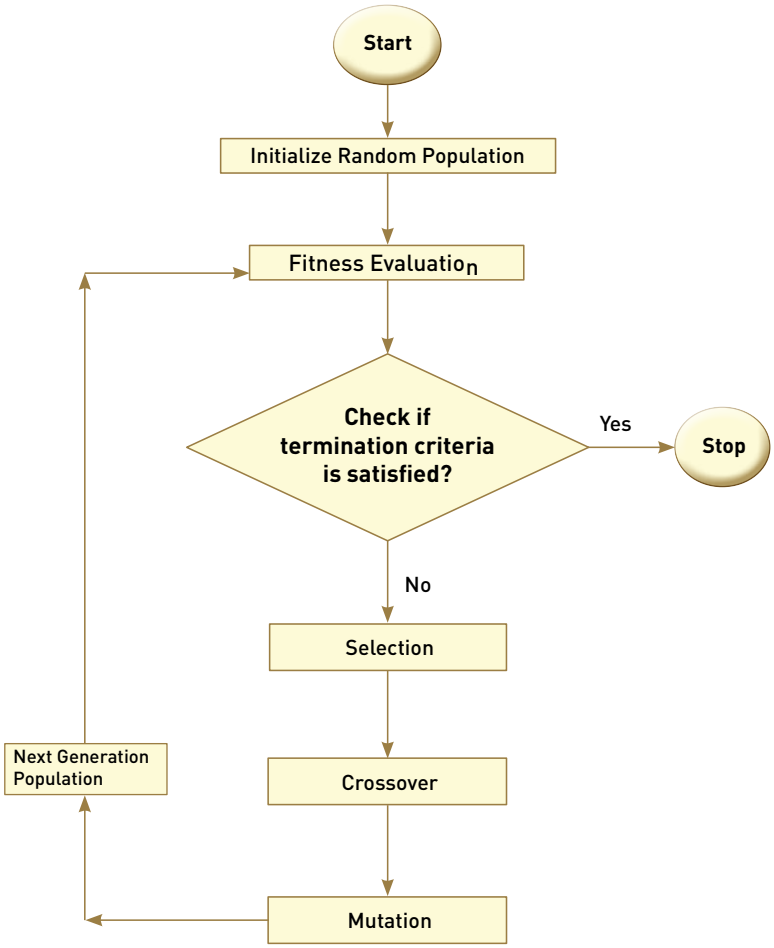


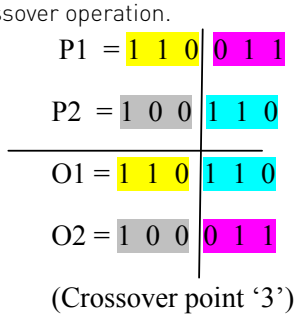
Fig. 1 : Flowchart Representing the Working of a Genetic Algorithm, Imitating Biological Evolution

Correspondence between Genetic Algorithms and Natural (Biological) Evolution

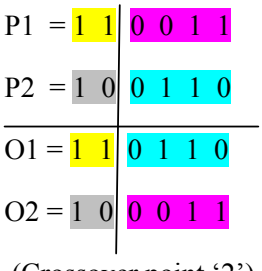
Genetic Algorithms imitate the process of biological evolution, which is evident from the flowchart depicting the working of genetic algorithms as represented by Fig. 1. The genetic operators (selection, crossover and mutation) imitate the biological phenomenon of evolution. Selection refers to the process of selecting the fit chromosomes to participate in the crossover operation, as it occurs in the natural world. Crossover involves the participation of the two parents to create two offspring, as in the biological evolution two parents mate together to produce offspring [9]. The mutation operator introduces new characteristics unique to the offspring [10], just as it does in the biological evolution. The following examples illustrate the working of the crossover and mutation operations, which will further clarify their resemblance to the process of biological evolution.

Illustration of the Working of One-Point Crossover Operator & its Resemblance to Sexual Reproduction

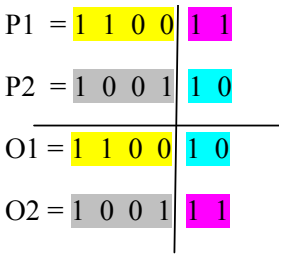
Let the two parents participating in the crossover operation be denoted by 'P_1' & 'P_2' and the two offspring generated as a result of crossover be denoted by 'O_1' & 'O_2'. Following three examples illustrate the working of crossover operation.



(Crossover point '3')



(Crossover point '2')



(Crossover point '4')

It is clear from the above examples that, an offspring consists of the partial contributions of both the parents. As, in biological genetics parents mate to form offspring, in genetic algorithms parents participate in the crossover operation to create offspring.

Illustration of the Working of Mutation Operator & its Resemblance to Biological Mutation

Mutation is used to bring diversity to the population. It provides the exploring capability to the genetic algorithms. Offspring formed after crossover contains properties of both the parents involved in the crossover operation; but the offspring also needs to have some different properties of its own, these new properties are introduced into the offspring through mutation operator. In biological genetics also, the child consists of some unique properties of its own, in addition to inheriting properties from its parents. The working of the mutation operator is illustrated by the following examples:

Offspring before mutation= 1 0 1 1 0 0 1

Offspring after mutation = 1 1 1 1 0 0 1

Offspring before mutation = 1 0 1 1 0 0 1

Offspring after mutation = 0 0 1 0 0 0 1

Applications of Genetic Algorithms

Genetic Algorithms have been applied to solve the problems across various domains. Some of the areas of application of genetic algorithms are mentioned below:

- Travelling salesman problem
- Training artificial neural networks
- Vehicle routing problems
- Mobile communications infrastructure optimization.
- Robot trajectory generation
- Container loading optimization
- Design of water resource systems
- Financial analysis
- File allocation for a distributed system
- Game theory
- Learning fuzzy rules
- Linguistic analysis
- Multiple criteria production scheduling
- Speech processing
- Multiple fault diagnosis
- Tactical asset allocation

Conclusion

Genetic Algorithms have proved to be an excellent tool to solve optimization problems across disciplines. They utilize the power of natural evolution by mimicking biological processes. As per the Darwin's theory, the more fit individuals are more likely to survive and participate in mating, in genetic algorithms also; same principle is applied through the process of selection. Crossover mimics the sexual reproduction, as two parents perform the crossover operation to generate new offspring. Mutation operation mimics the biological mutation by allowing the bit(s) in offspring to change (mutate) and hence possess new properties which neither of the parents possessed. The iterative nature of the algorithm resembles the phenomenon of natural evolution occurring over the generations. Inspiration from the natural evolution is the crucial factor responsible for the success of the genetic algorithms.

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Mr. Apoorva Mishra is a Ph.D. scholar at Indian Institute of Information Technology and Management (ABV-IIITM), Gwalior, India. He has worked as 'Assistant System Engineer' at Tata Consultancy Services (TCS) till May 2012. He can be reached at apoorvamish1989@gmail.com.

Prof. Anupam Shukla [CSI-01099955] is currently the founding Dean of Sponsored Research and Consultancy, a Professor in the Department of Information and Communication Technology (ICT) at ABV-Indian Institute of Information Technology and Management (ABV-IIITM), Gwalior and a visiting faculty at Indian Institute of Management (IIM), Rohtak. He has 28 years of administrative, research, and teaching experience. He is globally renowned for his research on artificial intelligence, which has won him several academic accolades and resulted in collaborations with academicians across the world. He is the author of two patents, three books, published by international publishers such as CRC Press, USA & Springer-Verlag, Berlin, 166 peer-reviewed publications, editor of three books published by IGI Global Press, USA and mentor of 107 doctorate and post graduate theses. He has successfully completed 13 government-sponsored projects worth ₹ 10 Crores. He can be reached at dranupamiiitm@gmail.com.

Software Project Risk Assessment: Application of Boehm Metrics

Dinesh Bhagwan Hanchate
Computer Engg. Department, Vidya Pratishthan's KBIET
Baramati, Dist. Pune, Maharashtra

Rajankumar S. Bichkar
Electronics Department, GH Raisoni College of Engineering,
Wagholi, Pune, Maharashtra

Risk assessment is generally done on the basis of impact and prediction by domain experts in software project. But, we put the idea of predicted duration of task rather than project to be considered for the risk evaluation and analysis. The proposed Software Project Risk Assessment (SPRA) takes the base as pessimistic task duration of COCOMO-II. The expansion of this result in getting the risk analysis of all the tasks involved in the software project. Ultimately, the total project duration (DUR) does effect on risk analysis as DUR is baseline for every project. Risk exposure is taken as the product of probability of the risk and calculated risk impact.

I. Introduction

Risk is as an uncertain event [1]. It is also condition due to which, there is an influence in either direction of the project. It may go down and also come up. It is also possibility of disclosing and expressing unpredictable and uncertain consequences of conditions which may occur in various ways in the tenor of project. Risk always depends on the future plan. The future plan depends on the schedule of the project and various project planning. We proceed with the GRGA schedule obtained from the author's paper. This GRGA schedule is shown in Table 3 as baseline. In the baseline of project planning, a Project Manager (PM) may decide to the project under some decided technology. Uncertainty lies in the decision of technology to be used in the planning. There may be the possibility of changing the technology, process, product, procedure during the future project plan. For every activity and task involved in the software is accompanied with risk. It is iterative process where for each activity, estimation of effort and identification risk related to concerned task are decided till the _ne granularity of both the processes achieve satisfied and managed level of activity to be done in actual schedule.

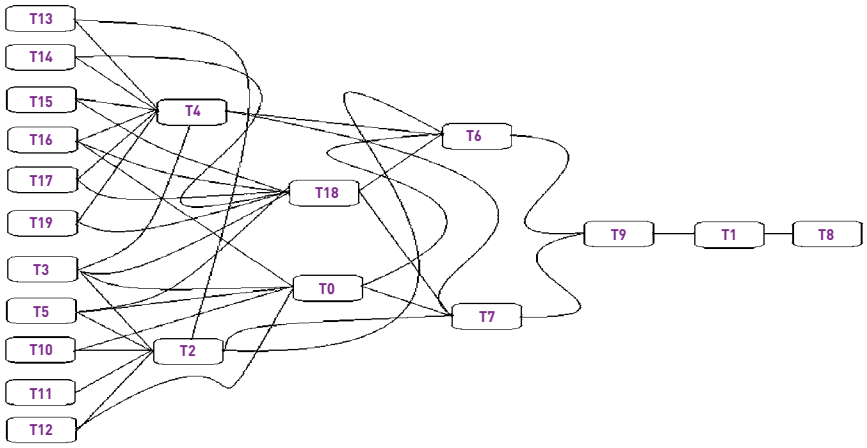

Fig. 1 : Task Precedence Graph of project which contains 18 tasks and 10 Employees are assigned to complete the project using this TPG.

Table I

Following table shows the Tasks of project with their individual required effort

Task ID	T0	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	Total
Effort	10	15	20	10	15	15	10	10	20	20	10	15	20	25	15	10	15	10	265

II. Proposed Method based on Schedule

A. Steps for Risk Assessment

Risk assessment consists of following steps-

1. Selection of project and make the distribution of the tasks [2].
2. Calculation of COCOMO-II duration, pessimistic duration from the Carl's Data Set [3].
3. Obtaining the schedule and task duration using author's GRGA method [4].
4. Obtaining the probability of risk and impact from GRGA Schedule [5].

- Doing the Risk Analysis of given project.

Table - II

Following table shows the Task ID with its effort and COCOMO-II duration required to complete each task and it's pessimistic value.

Task ID	Effort	CDT	CPDT
T0	10	6	9.6
T1	15	7	11.2
T2	20	8	12.8
T3	10	6	9.6
T4	15	7	11.2
T5	15	7	11.2
T6	10	6	9.6
T7	10	6	9.6
T8	20	8	12.8
T9	20	8	12.8
T10	10	6	9.6
T11	15	7	11.2
T12	20	8	12.8
T13	25	8.5	13.6
T14	15	7	11.2
T15	10	6	9.6
T16	15	7	11.2
T17	10	6	9.6
Total	**265**	**124.5**	**199.2**

Table - III

The last row shows the value of each duration obtained for the task T i.e. $GRGAD_T$. This schedule is obtained for minimum time and cost with all skilled matching. Duration $GRGAD_T$ is shown in bold values in Table 3 to 5. In table, $GRGAD_T$ is represented as GD. Sk is Skill and J for Java. VC++ is denoted by VC.

	T0	Sk	T1	Sk	T2	Sk	T3	Sk	T4	Sk	T5	Sk	T6	Sk	T7	Sk	T8	Sk
E0	0.5	J	2	VB	2	VB	0	J	1.5	VB	0.5	J	0	VB	0	-	2	VB
E1	1.5	J	1	J	0	-	0.5	J	0.5	J	1.5	J	0	-	1.5	C	1	J
E2	0	-	0	-	0	-	0	-	1	C++	0	-	1.5	C++	0	-	0	-
E3	0.5	J	0	VB	0.5	VB	1	J	0	VB	0.5	J	2	VB	2	VC	0.5	VB
E4	0	C	0	-	0	-	0	C	0	-	0	C	0	-	1	C	0	-
E5	1	J	2	VB	1.5	VB	1	J	0	VB	0	J	0	VB	0	-	1	VB
E6	2	J	2	J	2	-	2	J	2	J	0.5	J	0.5	C++	0	-	2	J
E7	1.5	J	1	VB	0.5	VB	2	J	1	VB	1.5	J	2	VB	0	-	1	VB
E8	2	J	2	J	2	-	2	J	1	J	1	J	0	C++	0	-	2	J
E9	0	C	0	-	0	-	0	C	1	C++	1.5	C	0	C++	1	VC	0	-
GD	9	-	10	-	8.5	-	8.5	-	8	-	7	-	6	-	5.5	-	9.5	-

III. Selection of project and make the distribution tasks Proposed Method based on Schedule

The Fig. 1 shows the TPG of the project. Table 1 is the input to our proposed method which shows 18 tasks and their required efforts to complete the task. Both Figure 1 and Table 1 are taken as input data set from [3].

IV. Calculation of COCOMO-II duration, pessimistic duration

Following Table 2 shows the calculation of COCOMO-II duration and pessimistic duration [4]. The calculations are also done according to the formula given by COCOMO-II [6].

$$CD_T = 2.5 \times efforts^{3.8} \quad (1)$$

$$CPD_T = CD_T \times 1.6 \quad (2)$$

V. Obtaining the schedule and task duration using GRGA method

The value of each task duration i.e. $GRGAD_T$ is obtained by GRGA method [4] and taken as it is from author's paper. It is shown in Table 3 to Table 5. The obtained schedule duration $GRGAD_T$ must satisfy the following condition

$$CD_T \leq GRGAD_T \leq CPD_T \quad (3)$$

Table IV

Table 3 is continued

	T9	Sk	T10	Sk	T11	Sk	T12	Sk	T13	Sk	T14	Sk	T15	Sk	T16	Sk	T17	Sk
E0	0	J	0	-	1	J	2	VB	0	-	2	VB	0	VB	0	-	2	J
E1	1	J	2	C	1	J	0	-	0	-	0	-	0	-	0	-	0.5	J
E2	0	-	1	C++	0	-	0	-	0.5	C++	0	-	1	C++	1	C++	0	C++
E3	1	VC	0	-	1	VC	2	VC	0.5	VC	1	VC	1	VB	1	VC	1.5	J
E4	0	-	1	C	0	-	0	-	0	-	0	-	0	-	0	-	0	-
E5	2	J	2	C++	1	J	1	VB	1	C++	2	VB	0.5	VB	0.5	C++	2	J
E6	2	J	0	C++	0.5	J	0	-	2	C++	0	-	0	C++	0.5	C++	0.5	J
E7	0.5	J	2	C++	2	J	2	VB	2	C++	2	VB	2	VB	2	C++	1.5	J
E8	1	J	1	C++	0	J	0	-	1	C++	0	-	1.5	C++	1.5	C++	0.5	J
E9	0.5	VC	1	C++	0.5	VC	1.5	VC	2	VC	1.5	VC	1	C++	1	VC	0	C++
GD	8	-	10	-	7	-	8.5	-	9	-	8.5	-	7	-	7.5	-	8.5	-

This can be observed from the Table 2 to Table 4.

VI. Obtaining the probability of risk and impact for GRGA Schedule

A. Risk Planning

After selection of the project, PM has to go either for identification of project scope and objectives or to do the identification of project infrastructure. The next step is to analyze project characteristics where PM has to look after the requirement specification. Next step will be the reviewing of the project again and its activities for the estimation of effort for every activity. After finding and getting defined activity, PM's task will be identifying its risk. The process of effort estimation and risk identification are done for every identified activity in the project. Then allocation of resources, reviewing of publicizing plan, implementation plan with lower level planning will be done. But, lower level details and review are taken as input again if required for fine tuning of project activities and other steps to do again to get more and more lower-level details. In this scenario, risk analysis start from analysis of project up to the identification of activity risks.

B. Risk Assessment

There are many and more categories of risk related to the software. So, it is the need to make distinguishes and classification of risks. This is achieved by

$$RE = PD - PO \quad (4)$$

where RE, PD and PO are Risk Exposure, Potential Damage and Probability of occurrence, respectively. It is assumed that amount of damage has been same during the project work [7]. Nevertheless, it is also true that amount of damage may vary from one task to another task with respect to the time duration. As time elapses, more and more expectations arise from clients and PM has to make the changes in the development plan. Hence, it will be the time consuming and loss of time, consequently it is overrun on the cost. On the other side, it is also connected with the scrap time because some task may be completed within estimated time. Some task may be completed less than that also. This scrap time is also called as gain [8]. This gain is given in Table 6. The gain and corresponding Risk Exposure (RE) are calculated and given in the Table 6 (which is the output of our proposed model). This RE gives the scenario of the complete project in the risk assessment. The loss is measured in terms of number of days when it is calculated the risk in terms of cost. Probability of something occurring is usually guesses and forecast. But, we do the calculation of both the risk losses and probabilities to be assessed using relative scales in the range of 0 to 10 according to the Boehm assumption given in [6]. This is shown in Table 6.

Table V

Following Table shows COCOMO-II risk (CDR in %) and GRGA Risk (GRGAR in %) to the it's pessimistic duration. The impact (I in the range of (0-10)) and probability risk (i.e. likelihood, L in range of (0-10)) are nothing but COCOMO-II and GRGA risk values arranged in the range of 1-10. Risk Exposure (RE in the range of 0-100), RE= L*I. G means gain. TR indicates individual Task Risk and is represented as TRT where T=0, 1, ..., 17. GRGAR, CDR are respectively denoted by GR, C .

	TR0	TR1	TR2	TR3	TR4	TR5	TR6	TR7	TR8	TR9	TR10	TR11	TR12	TR13	TR14	TR15	TR16	TR17
C	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5
GR	6.3	10.7	33.6	11.5	28.6	37.5	37.5	32.3	25.8	37.5	1	37.5	33.6	33.8	24.1	27.1	33	11.5
G	31.3	26.8	3.9	26	8.9	0	0	5.2	11.7	0	36.5	0	3.9	3.7	13.4	10.4	4.5	26
L	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
I	0.6	1.1	3.4	1.1	2.9	3.8	3.8	3.2	2.6	3.8	0.1	3.8	3.4	3.4	2.4	2.7	3.3	1.1
RE	2.3	4	12.6	4.3	10.7	14.1	14.1	12.1	9.7	14.1	0.4	14.1	12.6	12.7	9	10.2	12.4	4.3

Table VI

Amanda's Risk Exposure assessment: RID, TRID are Risk ID and Task Risk ID respectively. Table shows the Risks and it's identification number corresponding to the Task Risk ID taken for proposed method. For example, R1 is the risk of delay in SRS associated with Task 15 i.e T15 and Task 2 i.e. T2.

RID	TRID		Risks/Type of Risk						
R0	TR10,	TR3	During	Coding,	Change	In	SRS.		
R1	TR15,	TR5	Delay	In	Giving	The	SRS.		
R2	TR17,	TR2	Critical	Position	Of	Staff	(Physical	or	Mental).
R3	TR13,	TR4	Sudden	Change	In	The	software	Platform.	
R4	TR14,	TR7	More	Testing	Requires	At	the	last	Movement.
R5	TR11,	TR8	Debugging	Give	Changes	In	the	Coding.	
R6	TR16,	TR9	Change	in	The	management	Policy.		
R7	TR12,	TR6	Design	with	dificiency.				
R8	TR0		Testing	tools	Take	insufficient	test	Cases.	
R9	TR1		Overrun	in	Time				

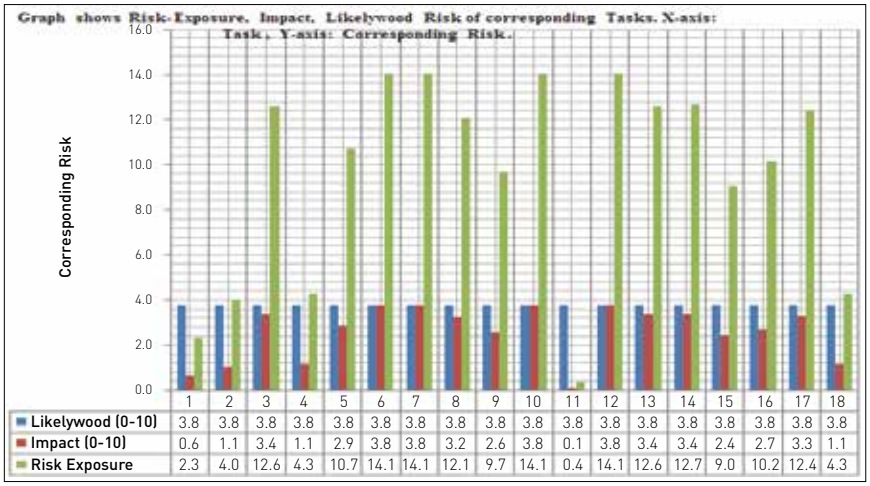

Fig. 2 : Task with their corresponding Amanda's Risk Exposure assessment.

The respective impact, likelihood and its Risk Exposure are given in the Table 5.

C. Risk evaluation and calculation

The values of risk evaluation and it's Amanda's exposure are shown in Table 5. COCOMO Duration Risk (CDR) is the difference between pessimistic duration and COCOMO duration of each task and these are shown in the Table 5. All values are 37.5% as both the pessimistic and COCOMO duration has the fixed relation i.e. CPD = 1.6_ CD. But, the gain values are different as there is the difference between CPD and GRGAD of each task. L is likelihood risk which is taken as CDR but in the range is [0, 1]. I is an impact which is taken as Gene Repair Genetic Algorithm based Risk (GRGAR) as shown in the Table 5. The Risk Exposure (RE) is calculated as the product between L and I. It can be seen in Table 5, also.

VII. Doing the risk analysis of project

Fig. 4 shows the probability impact where high, significant, moderate and low type risks are taken into consideration for finding the impact of risk matrix. The all Task Risk i.e. TRT are classified according to the classification rule given in Table 6.

Please, see the Table 5 for the same where values of Likelihood, Impact and RE has been given.

VIII. Conclusion

So, from the predicted duration, one can get the gain and loss in the risk with Risk Exposure, RE. The task's risk identification is needed for making the further decision whether the project milestone is of low risk or of very high risk. Hence, Project Manager will propose and consider the duration, their related risks and their impact for building the schedule and project risk plan. The better outcome of this paper gives opportunity to project manager of deciding which task has to do early with priority based by taking the help of

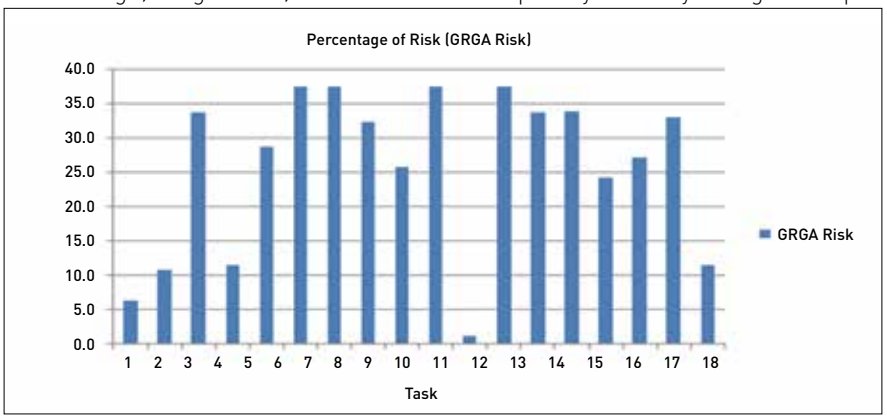

Fig. 3 : Percentage of risk with respect to task according to the completion of calculated task duration GRGAT

Tolerance Line

High				
Significant				
Moderate		TR2, TR4 to TR9, TR11 to TR13, TR15, TR16		
Low	TR0, TR1, TR3, TR10, TR14, TR17			
	Low	**Moderate**	**Significant**	**High**

Fig. 4. A Probability Impact Matrix (PMI) of project under consideration for this paper.

proposed risk analysis method.

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About the Authors

Mr. Dinesh Bhagwan Hanchate [CSI-I1502099] is currently working as Asst. Prof. in Computer Engineering in Vidya Pratishthan's College of Engineering, Baramati. He can be reached at d.b.hanchate@ieee.org.

Dr. Rajankumar S. Bichkar is presently a Professor in the Dept. of Electronics and Telecommunication Engineering, G. H. Raisoni College of Engineering and Management, Pune. He has an academic & administrative experience of 27.0 years. He is currently working as Dean (R&D), GHRCEM Pune as well as CEO of GHR LABS. He has worked in the past as Chairman, BOS, E&TC, SRTMU, Nanded. His research work includes applications of GA to various optimization problems. His research interests include application of genetic algorithms to various search and optimization problems in electronics and computer engineering. He can be reached at rajankumar.bichkar@raisoni.net.

Essence of Management Skills in Technical Education

Baisa L. Gunjal
Head of Information Technology Department, Amrutvahini College of Engineering, Sangamner

Technical education has played vital role in overall development of nation and worldwide as well. The senior scientist Dr. Raghunath Mashelkar has rightly said that **"Education = Future"** is the most powerful mathematical equation in the world for past, present and future. Recently technical education in India mainly focuses on academic, co-curricular, extracurricular activities along with value addition training programs to bridge the gap between educational institutes and industries. The significant efforts are taken to bring continual excellence at all levels of technical education.

However, with widespread use of internet and communication technology world has become global village. Hence, apart from strong technical skills, the present lifestyle and worldwide competitiveness highly demand mentally robust and morally strong engineers and technocrats. An efficient engineer and technocrat must be capable to face ever-growing challenges of recent lifestyle in his personal, professional and social life. The rest of the section of this article gives some key management aspects those need to be developed in young minds of engineers and technocrats through continual excellence in technical education. The key aspects mainly include:

i] To develop mentally strong engineers and technocrats with moral values

The technical education system exerts a lot for developing technical skills required to build up the carrier of their students. In practice, many times technically strong and skillful persons are not capable to handle depressions, failures, pressures/mental stresses and emotions effectively in their personal, professional and social life.

In ancient India, 'Gurukul' education system mainly used to focus on mental and moral values. The mental and moral values are essential in academic, in practice and overall development of human life. The moral values give the courage to do the right and fight for the right. They teach hard work, honesty, forgiveness and respect to others. Mentally robust and morally strong people have following qualities:

- Flexibility during unexpected critical situations and maintain sense of humor even when situation become tough.
- Responsiveness of SWOC(Strengths, weaknesses, opportunities and challenges) in any critical circumstances
- Strengths to work in pressure and tough going situations.
- Resiliency i.e. ability to rebound from disappointments, mistakes and missed opportunities.
- Sportsmanship in day to day decision making
- Presence of courage and ethics.

ii] To develop good leadership qualities

The leadership qualities are essentially required right from personal life to professional decision making. Some of the leadership qualities include:

- Sense of effective team management, time management and conflict management
- Self-motivated vision, mission and objectives to achieve short term and long term goals
- Effective communication skill
- Fully concentered mind management
- Courage to take right decisions at right time
- Ability to stick to persistence, commitment and dedication
- Sense of responsibility
- Strong demonstrating and convincing power
- Being grounded and integrity with strength of character.

iii] To improve Emotional Intelligence (EQ)

EQ is not about being emotional. It is about being smarter with handling emotions. It is about being honest and aware of own feelings and those of others. Emotionally strong people do not ignore their feelings rather they tolerate the pains and they move forward with positive energy. The effective EQ management can improve interpersonal, interapersonal relationship and provides stress management. EQ management improves following abilities:

- Having positive, hopeful and optimistic approach in all circumstances
- Ability to stay calm and quiet under pressure
- Good listener and not jumping to judgments without thinking pops and corns
- Being capable to manage anxiety, stress, anger, fear in about work
- Ability to think from others perspective
- Having maturity to utilize criticism and negative feedbacks for growth.
- Ability to be defensive when somebody is criticizing
- Ability to accept the mistakes freely.

iv] To focus on Ethical values and develop Positive Attitude

Ethical values teaches the principles, ideals, fundamentals, standards and life stands those act as

contd. on page 30

Sustainable Computing: A beginning…

P. K. Gupta
Post-Doctoral Fellow (EECE), University of Pretoria, Pretoria, 0028, South Africa

Mayank Singh
Associate Professor, Krishna Engineering College, Ghaziabad, UP

Introduction

Recent technological and developmental growth in Information and Communication Technology (ICT) devices and software's has posed the environmental issues of energy consumption and heat dissipation. Recently, ongoing focus on the environmental sustainability proliferating in various domains and sustainable computing has been getting increased attention. Sustainable computing represents an environmentally responsible way for reduction of energy requirement for running any computing infrastructure, energy longevity of computing equipment to reduce need for their replacement and ensuring energy consumption within the energy available from the renewable energy sources in the environment.

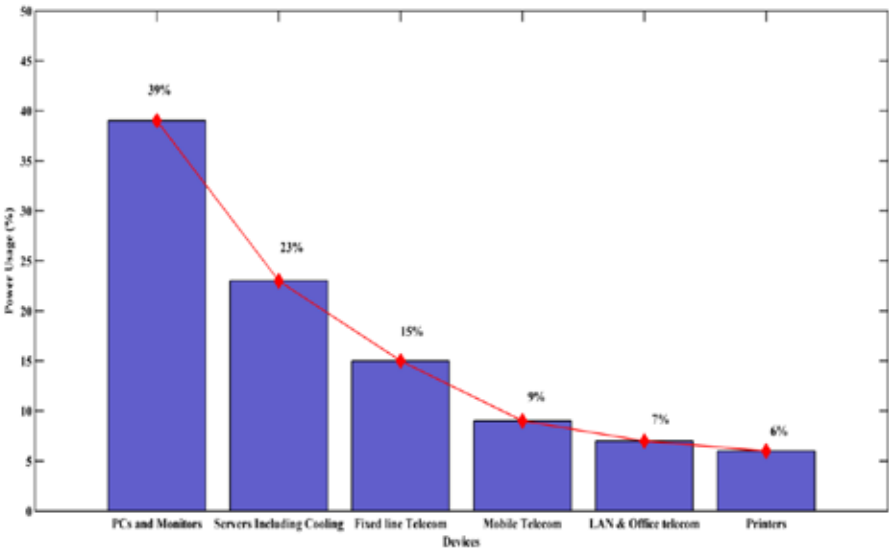

Fig. 2. Power usage by ICT devices

It is noticed that the rate at which ICT devices are being produced is proportional to the increase in the energy consumed and heat dissipated by these devices. We cannot escape the fact that the world is becoming more and more dependent upon the use of ICT, and that personal computers (PC) are one of the means. Here, Fig. 1 shows the predicted worldwide growth rate of sales of Servers, Desktop PCs and Mobile PCs up to year 2015. This can easily be observed that sales of Mobile PC is continuously gearing up whereas there a slowdown in use of Desktop PCs from year 2008 onwards. But above all one cannot neglect the fact that the overall sales of these devices is continuously increasing.

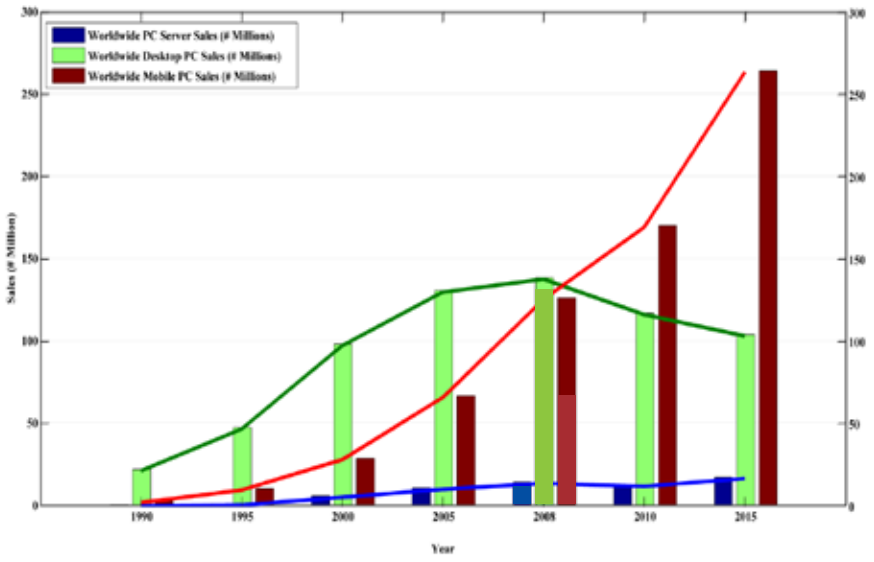

Fig 1. Growth rate of sales of computers

Growth rate of the sales of PC is proportional to energy consumption which can be observed form Fig. 2 that PCs occupy the largest share among the several available ICT products in the market, thus, making them also responsible for the high quantum of power consumption.

Consequently, this surge in power consumption leads to a greater demand for power production by most of the developing countries, as their existing power production is insufficient to meet their citizens' demands. This emerging issue of power dissipation requires

significant changes in design of system and software in the future. Therefore, sustainable computing presents the vision of a sustainable planet and the minimization of the energy consumption by ICT devices and software's.

Myths & Facts

There are vast majority of computer users, which leaves the computer systems running all the time. There are various myths among the users related to PC power turn off. These myths are [1, 2]:

a) Myth: Turning off the computer system and then switching it on soon uses more energy than leaving it on.

   The reality is that the power used by a computer to boot up is far less than the energy your computer uses when left on for more than 3 min.

b) Myth: Computer system is designed to handle 40,000 on/off cycles. If you are an average user, you will initiate significantly more cycles than this in 5–7 years of a computer's life.

c) Myth: Screen savers are for saving energy.

   Most of time users of PC think so but reality is totally different, as the screen savers helps to lengthen the life of B&W monitors. This is one of feature of the Windows operating system, which exists until now from its initial version 3.1.

d) Myth: Liquid crystal display (LCD) monitors use less energy than cathode ray tube (CRT) monitors, and therefore we can leave it on all the time

e) Myth: Network connections are lost when computers go into low-power or Standby mode.

Few interesting facts about electricity usage by personal computers that focuses on the need of proper use of these systems [2], because proper management of these systems not only saves energy but is also good for the environment [1].

- A PC requires just 85 Watts to be idle while keeping monitor off. This could save more energy and in some cases this could be over $50 in energy savings for a week.
- If PC is left on for 24 hours then it costs between $135 and $195 annually, along with 1,500 pounds of CO_2 footprints.
- A tree absorbs 3–20 pounds of CO_2 per year which shows that around 500+ trees will be required to offset the CO_2 footprints.
- Old PCs generate more heat and requires heavy uses of cooling systems. Operational cost of such PCs becomes higher.
- Although, presently, most of the modern PCs have "Stand-by" and "Hibernate" modes and can switch when inactive but most of the users are unaware about this and keep this function disabled.
- Today, most of the home appliances makes the use of Remote and can be switched off using it. Device that uses a remote consume more power even when they are turned off. This phenomenon is called "*vampire energy use*" or "*phantom energy use*," where a device draws Standby power in home.
- This vampire energy loss represents 5–8% of a single-family home's total electricity usage in a year. This, on average, equals 1 month's electricity bill and adds up to at least 68 billion kilowatt-hours (kWh) of electricity annually.

Issues with power management

In computer systems, for minimizing energy consumption various power saving modes are defined by the power scheme of operating system [1, 3]. The following section lists about the various power saving modes implemented either by Advanced Power Management (APM) or by operating systems in PC to save the energy.

- Full-Power-on
- APM-Enabled
- Standby mode
- Suspend mode
- HDD-off mode
- Hibernate mode
- Shutdown mode (Off mode)

With the change of time the power management feature has been shifted from BIOS to Operating system and more power saving modes are being designed to save power but a small amount of power ranges from 3W to 15W is consumed in these modes [1]. Improper configuration of these power saving modes results into less energy savings and in some cases it goes up to 20% in energy savings [1, 2]. There is an illusion among the users of PC that their system is power-managed because the Energy Star logo appears during start up. Many users do not realise that they must first activate the power management features to save energy [4, 5].

Aspects of Sustainable Computing

To handle the issue of power management in efficient manner in computer systems, concept of 'Sustainable computing' is gaining a lot of popularity nowadays. There are basically three major aspects of sustainable computing [6]:

- Reduction of energy consumption from any running computing process on the system
- To ensure the longer life cycle of any computing equipment and
- Ensuring the need of energy consumption within the energy available from all resources in the environment.

While addressing these aspects there is a need for awareness of the non-computing processes like dependency of the equipment life cycle on the environmental factors. In this way, sustainable computing can also be defined as energy sustainable computing, which represents the balance between the power required for computation and power available from sources like renewable sources, green sources etc. However, power required and available power may vary according to the time as solar power will not be available in the night and various PC operations may become unsustainable.

Nature of Energy-Sustainability

Varied nature of energy sustainability can be defined as follows:

a) ***Energy storage:*** Here, energy storage devices are used to store the energy available from green sources with the help of various

available techniques like ultra-capacitors, compressed air storage, batteries, fuel-cells, and flywheels. This storage of energy is constrained by the energy capacity limit of the storage device [6].

b) ***Reducing energy requirement:*** another major direction for energy sustainability is to reduce the energy requirement to avoid unsustainable operations or to reduce the energy need from grid or batteries. This can be achieved in variety of ways, first, by using spatio-temporal distribution of operations, where computing operations are distributed among multiple computing units and no machines gets overloaded [6].

c) ***Scavenging energy from various sources:*** This is another complimentary option for energy-sustainable computing which focuses on need of energy harvesting and requires identification of different energy sources to scavenge energy from them [3, 6]

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About the Authors

Dr. P. K. Gupta [CSI-00172719] is currently working as a Post-Doctoral Fellow in the Department of Electrical, Electronic and Computer Engineering at University of Pretoria in South Africa. He is am Assistant Professor (Sr. Grade) in the Department of Computer Science and Engineering at Jaypee University of Information Technology (JUIT), Solan. His research area includes Cloud Computing, Internet-of-Things, Sustainable Computing, and Software Testing. He can be reached at pkgupta@ieee.org.

Dr. Mayank Singh [CSI-I01209752] is working as Professor and Head CSE Department in Krishna Engineering College, Ghaziabad. His research areas are Software Engineering, Software Testing, Cloud Computing and Internet of Things. He can be reached at mayank.singh@krishnacollege.ac.in.

Responsive Web Design: One size no longer fits all

Naik Vijaya[1], Shalaka Kukreja[2], Prachi Sakhardande[3] and Rajiv Thanawala[4]

[1] Technical Lead, Product Experience CoE
[2] Sr. Interaction Designer, Product Experience CoE
[3] UX & CX Lead, Product Experience CoE
[4] Head, Product Experience CoE

Tina, 30, is a Senior HR Manager with a leading IT company in Bangalore, India. This company has offices in multiple geographies from China and Japan in the East to US and Canada in the West. Tina's job requires that she be available and accessible for any issues or escalations that cannot be resolved by local HR managers.

About five years back, she used to access email at work, and then check for any urgent mails from home later at night and then early morning, before leaving for her two hour long commute. Today however, Tina is no longer chained to a desk. Using her phone, tablet or laptop, Tina can get a lot of her work done on a park bench, a coffee house or on the bus. The obvious reason why Tina now enjoys this flexibility is ubiquitous internet connectivity across devices and the evolution of hardware and software that takes advantage of this connectivity. But what makes this interaction seamless and enjoyable, is a design concept that ensures that the form and function of the user interface (UI) transforms with the device magically. This design concept is called "Responsive Web Design" (RWD).

What is Responsive Web Design?

Using the RWD approach, applications are designed to fit seamlessly into the devices used for viewing the application. Take email for instance. While viewing email in a browser running on a laptop, probably two panes are seen – one listing various folders and settings, and the other listing emails received. Now, if the same application is viewed on a mobile phone, the view changes. The folder pane disappears, and emails would still appear as a list, albeit showing lesser information than the desktop view.

Thus, Responsive Web Design is not only about application sizes shrinking or expanding to fit the available screen area. Entire components change in form, function and layout such that the user interface (UI) is synchronized with the available features of the target device. A responsive web design enabled application will cater to ease of reading, reduction in navigation and eliminating the need to scroll, pan and zoom when viewed across a wide range of devices

When to use the Responsive Web Design?

With a proliferation of mobile and desktop devices in the market today, websites and applications are expected to scale across various screen resolutions and user interfaces. However, designing for responsive web design behavior adds complexity and often increases time, effort and maintenance costs. It is therefore important to have a clear, articulated business need, before investing in responsive web design.

For developing applications using Responsive Web design, consider following points:

1. **Mobile/tablet usage to access current site/application**

For existing website or application, analytics tools [e.g. Google Analytics] help to determine amount of traffic originating from mobiles / tablets. Reports generated from these analytics tools help determine how users navigate the website or application and how much time they spend on different parts of the same. Additionally, the following points need to be considered while designing a new website/application.

- Who are the mobile users of this website/application?
- What would be the most visited webpage as accessed by different mobile users?
- Will mobile visitors end up carrying out business transactions that will contribute to the return on investment in RWD?
- Is business suffering due to poor mobile or tablet experience?

2. **Understanding the browsing needs of users**

- What type of device do the users use to browse the site?
- Does screen size limit the content one chooses to view on the site?
- How does the current mobile or tablet experience impact your decision to do business with us?

Fig. 1 : Responsive layouts across various devices

- If responses to any or all of the above questions indicate a potential benefit by enhancing or extending customer services/ offerings over mobile devices, consider implementing Responsive Web Design.

Determining the Right Approach

The following factors need to be considered for devising the most suitable approach for - applications/ websites.

1. **Selecting Screen sizes, resolutions and devices**

Screen resolution is the amount of real estate available on the device to display the UI. Screen Resolution is expressed in Pixels. Broadly, screen resolutions depend on the device - mobile, tablet and desktop.

Knowing what all resolutions that the UI must be compliant to, is the key requirement for your responsive web design solution.

2. **Design Architecture:**

Device specific rearrangement of UI elements can be done, either at client side or at server side.

When content and layout are controlled at the client side with help of styling rules for different media types/ devices called as "media queries", the approach is termed as "Responsive web design approach". This approach is useful for applications that need to scale so that they may be accessed across a wide variety of screen resolutions (from desktop computer monitors to mobile phones). However, since all the "dynamism" sits on the client side, this approach may impact front end performance and not be suited for applications with complex user interactions.

When the content and layout are controlled with server side scripts, the approach is termed as "Adaptive web design approach". Adaptive web design approach targets a finite set of screen resolutions, using specific CSS files. It generates optimal web design with respect to the targeted device, but may not scale well for in-between screen resolutions.

Choosing the Right Design Toolkit

There are different ways to implement both responsive and adaptive web design.

Screen Resolution	Description
Less than 320 pixels	Older and smaller low resolution phones
Between 320 pixels and 768 pixels	Smartphones / small Tablets (Phablets)
Between 768 pixels and 1024 pixels	Tablets
Greater than 1024 pixels	Wide screens, such as desktops and laptops

Fig. 2 : Mapping between resolutions and devices

Choosing the right approach depends on several factors. The table below outlines the considerations.

	Responsive web design approach	Adaptive web design approach
Responsive Behavior	When size of the browser window is changed, UI elements "respond" to fit across all screen resolutions [truly responsive behavior]	When the application is loaded across different devices, UI elements render differently on each device. This makes the design device specific.
Development Effort	1. A single application instance scales across multiple resolutions - a "one size fits all" approach. Development effort, is lesser compared to adaptive web design approach 2. Since a lot of client side dynamism is coded within the UI, post-development maintenance can be difficult, especially after original developers have moved on.	1. Need to build separate site for a group of resolutions, so each site can have optimized code. 2. The development effort is higher and maintenance effort is lower because different sites are maintained per resolution range.
Page size and its impact on page load time	All files are downloaded without considering their real need for the respective device. This results in increasing overall page size and hence initial page loading time.	Specific files intended for the device are downloaded. This results in reducing overall page size and hence minimizing initial page loading time.
Backward Compatibility	IE 8 and below browsers do not support media queries. Such browsers do not auto-adjust screen contents when window sizes are shrunk. All other browsers (Chrome, Mozilla etc.) have good backward compatibility for media queries. They auto-adjust screen contents when window sizes shrink.	Adaptive web design does not use media queries so this approach has good backward compatibility.
Ease of SEO and Analytics	1. As only one site is implemented for all resolutions, a site analytics tool (like Google Analytics) can track traffic on one targeted site. 2. SEO campaigns are focused, as there is One Website and One URL. Hence, marketing people have to work only on one site.	1. Each resolution specific site needs a dedicated analytics tool to track traffic. 2. SEO campaigns need to be managed around each of those specific sites.
When to Start?	Cannot build responsive web design on an existing site.	Adaptive web design can be built on an existing site.

Implementing Responsive web design Approach: In this approach, the page elements dynamically resize, shift positions, or hide based on the resolution. Either a developer can manually code for this behavior using css and JavaScript, or use a readymade Responsive CSS Framework. Responsive CSS Frameworks help in

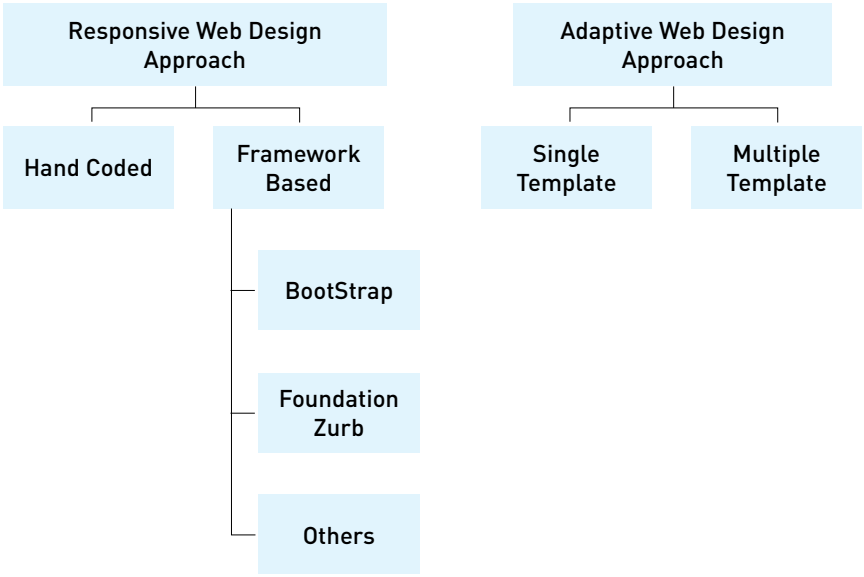

Fig. 3 : Responsive and Adaptive Web Design Approaches

reducing the coding effort, by providing readymade code for responsive behavior. Popular Responsive CSS Frameworks in the market are Bootstrap, Foundation Zurb. Responsive web design can be implemented without using any frameworks - by writing traditional HTML, CSS and JavaScript code. This is called hand-coded HTML

Implementing Adaptive web design approach: In this approach, we can pre-configure the CSS files / HTML files to render in a specific manner for a specific device type. Depending on screen complexity, a developer may choose to configure a single css/ template file for all devices or maintain different css/templates for different devices. This approach is called Single Template or Multiple Template Adaptive UI approach respectively.

Refer Fig. 3 for summary of available ways, to implement Responsive and Adaptive web designs-

We conducted an experiment, where few webpages were created using each of the implementation methods listed above. We then compared these pages for following parameters

1. Load time comparison – Please refer to Fig. 4
2. Generated file size of HTML pages - Please refer to Fig. 5
3. Development effort – Please refer to Fig. 6

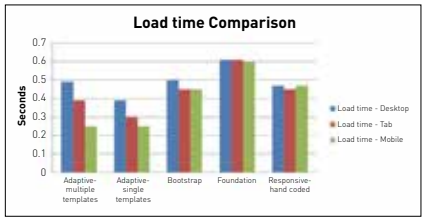

Fig. 4 : Load time comparison

Our Findings

Adaptive approaches always give faster load time, as they try to download only those files which are intended for the target device.

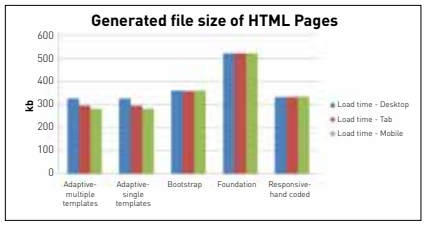

Fig. 5 : Generated file size of HTML Pages

Our Findings

Adaptive approaches always give faster load time, as they try to download only those files which are intended for the target device.

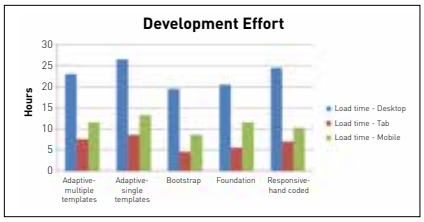

Fig. 6 : Development Effort

Our Findings

Development effort is lower in responsive web design as compared to adaptive web design.

Along with comparisons on test parameters, following general observations emerged from this study.

- Consider Adaptive Approach if minimal load time is the primary need. Adaptive web design approach is also recommended for rich content or complex UI interactions. When development efforts need to be minimal, responsive web design approach is better suited – provided the higher load time and HTML file size do not hamper user experience.
- While designing a responsive web design enabled UI for mobile, tablet and desktop, it is recommended that the designers first focus on the mobile and desktop version. Since the tablet version will be a hybrid of the other two, it typically takes about 50% of coding effort needed for a desktop version.
- To support all available devices and resolutions, responsive web design approach is the best, although there is a little compromise on loading time. Looking at the comparison, Bootstrap emerges as the framework of choice, as the development time, file size and load time are optimal compared to other frameworks.
- To avoid dependency on any framework, consider developing Responsive web design using traditional HTML/JavaScript based coding.

Conclusion and Next Steps

Given the proliferation of devices with ubiquitous internet connectivity, there is no denying the fact that Responsive Web Design is here to stay. Using insights and best practices listed above, web sites can be developed for better end user experience.

As internet technologies continue to mature, user experience community needs to be updated with latest developments and keep evolving both from a design as well as technology perspective.

■

About the Authors

Ms. Vijaya has more than 11 years of development experience in various front end technologies and also researched on related latest trends and technologies. She is currently leading the front end development group in Product Experience Center of Excellence at Tata Consultancy Services.

Ms. Shalaka has 15 years experience in varied areas like Interaction design, visual design, online branding, e-learning. She is involved in designing experiences in varied domains like Healthcare, Retail, Supply Chain Management, Banking. Her current focus area is research and improve various UX processes.

Ms. Prachi leads User Experience and Customer Experience within a Product group at TCS. She has spent more than 15 years dabbling into various aspects of Experience including Design Thinking, Customer Experience, UX Design and Assessment.

Mr. Rajiv Thanawala [CSI - 01210358] is currently working as a deputy lead of a team that promotes Intellectual Property and Product Engineering best practices in Software Product units across TCS. Rajiv has 26 years of IT industry experience, has worked on several technologies and has held several positions in project delivery and product development units. He can be reached at rajiv.thanawala@tcs.com.

contd. from page 22

general guide the behavior of person. The positive attitude enables the person to take risks, motivate, communicate and have confidence to make teaching learning process better. It makes more productive and active atmosphere in working environment of educational institute.

v] To carry out regular entertainment and relaxation activities

The 'Change' is the only 'permanent' thing in technical field. The unexpected academic results, failures, new environment for newly joined students and continuously changing technology lead to frustrations. The regular mind refreshment activities help for new beginnings. This can be achieved through game playing, yoga clubs, hobby clubs, adventure clubs, movie clubs or other group wise entertainment activities in education environment. The fresh minds can think about more innovative ideas and increase productivity and improve quality.

Thus, the technical education system needs to exert more with these management perspectives to develop highly dynamic, mentally robust and morally strong engineers and technocrats. As Dr. A.P.J. Abdul Kalam says, **"Excellence is a continuous process and not by an accident".**

About the Author

Dr. Baisa L. Gunjal [CSI-N1111399] is working as Associate Professor and Head of Information Technology Department, Amrutvahini College of Engineering, Sangamner, MS, India. She is recipient of 'Faculty with maximum CSI publications' award from Computer Society of India. She can be reached at hello_baisa@yahoo.com.

A Quick Look at Data Redaction in Oracle RDBMS

Jignesh Doshi
Associate Professor, L. J. Institute of Management Studies, Ahmedabad

Bhushan Trivedi
Dean, Faculty of Computer Technology, GLS University, Ahmedabad

All over the globe the Information systems have become life lines for governments at all levels and for the commercial organizations of all sizes and types in this highly advanced and competitive 21st century. Smooth running of these information systems has become imperative for every organization to survive, grow and provide better service to its customers. One of the biggest threats to this smooth running is the breach of security of these critical information systems.

Information systems require security at number of different levels. One of the key areas is the security of critical data. Data security is required when the data moves from one environment to another environment within a development organization or when the data is stored on storage devices / transmitted over networks during the operational phase of the information system. In the first case, the data can be secured by using a technique called data masking where the actual data is changed at the time of moving it from the production environment to the development and / or testing environment. In the second case one can use the technique of encryption and decryption of the critical data at the time of storage / transmission.

Data security is also required when the data is displayed on devices or printed for the end users of the information system. All end users do not need to and should not be shown all the data all the time. For example, the Customer Service Representatives of an E-comm company or a credit card company do not need to see all the 16 digits of a credit card to do their job or clerks in an organization do not need to see the actual salary of all the employees. This can be accomplished by hiding all or part of the data at the time of printing or displaying it for different users. This can be done at the application level by the application developer or at the database level. Providing this at the database level is easier and more secure since one does not need to depend on the developers to do it in every application and gets enforced automatically in all applications. The efforts associated with hiding is much less than masking or encryption. Also, making it at database level will work for all types of applications.

Oracle Corporation has provided this facility in its RDBMS version 12c under the Advanced security Options. It is called Data Redaction. The dictionary definition of "to redact" is "to censor or to obscure (part of a text) for legal or security purposes".

Data Redaction is used to protect sensitive information displayed on screen or in a printed report. It does not prevent an authorized user from interacting with the data. It can be applied on any table and any column in a database. It gets applied at the run time, i.e. when the query gets executed.

Methods of Data Redaction

There are four different methods of data redaction as shown in the table below :

Redaction Method	Description
Full	All Numeric values redact to 0 (zero) All Characters redact to a single blank " " Date redacts to 01-JAN-01
Partial	You define the start position, end position and the replacement character. The non-specified characters appear as they are in the original data but the specified characters get redacted by the replacement character. E.g. * for all characters except first two.
Random	Every character gets replaced by a randomly generated character.
Regular Expression	Use of regular expression pattern matching and replacement for redaction e.g. telephone number in USA 999.999.9999

There exists fifth option for Data redaction "No Redaction". It is primarily used in redaction policies during testing of policies.

How to implement Data Redaction

You need to use the DBMS-REDACT package and create a data redaction policy. It can be altered at any time to add additional data redaction. You need to define the schema, object name, column name, policy name, policy description, function type and expression. The expression specifies which role is to be included / excluded for the policy.

Let us take an example to understand how to implement data redaction.

Let us assume the following :

1. Schema name is HR
2. Table(Object) name is EMPLOYEE
3. Policy name is REDACT_RDTEST1
4. Policy description is REDACT RDTEST1 PII
5. The policy will be applicable to the role HR but not to the role CLERK so that role HR will see only redacted information and the role CLERK can see all.

6. We have columns Employee id, First name, last name, salary, e mail and phone number
7. We want to apply FULL redaction to column salary so that all numbers are replaced by a single 0
8. We want to apply PARTIAL redaction to column LAST NAME so that only first two characters of the last name are displayed and the other characters are redacted to *.
9. We want to apply RANDOM redaction to the e mail column so that ALL characters of e mail get replaced by random characters every time the data is fetched.
10. We want to apply REGULAR EXPRESSION to the Phone number column.

You will need two roles to implement and test this feature. The redaction policy can be applied for one role named HR. When any user with the assigned role of HR accesses the data the redaction will be applied and the fetched data will be hidden as per the policy. When the data is fetched by the any user with the other role of CLERK assigned to it, no redaction will be applied and full data will be displayed.

Case Study: Following is an example to create data redaction policy of the FULL type on SALARY column of EMPLOYEE table for all users except the CLERK.

```
BEGIN
    DBMS_REDACT.ADD_POLICY (
    OBJECT_SCHEMA => 'HR',
    OBJECT_NAME => 'EMPLOYEE',
    COLUMN_NAME=>'SALARY',
    POLICY_NAME => 'REDACT_
    RDTEST1',
    POLICY_DESCRIPTION=> 'REDACT
    RDTEST1 PII',
    FUNCTION_TYPE=>DBMS_
    REDACT.FULL,
    EXPRESSION=>'SYS_
    CONTEXT(''SYS_SESSION_
    ROLES'',''CLERK'')=''FALSE'');
END;
```

After the SALARY redaction is in place, the user with HR role can run the following query :

Select EMP_ID, FIRST_NAME, LAST_NAME, SALARY, EMAIL, PHONE_NUMBER FROM HR.EMPLOYEE WHERE EMPLOYEE_ID IN (1001, 1002)

The result displayed will be as follows :

EMPLOYEE-ID	FIRST_NAME	LAST_NAME	SALARY	EMAIL	PHONE_NUMBER
1001	SACHIN	TENDULKAR	0	SACHIN@CRIC.COM	922.810.1234
1002	RAHUL	DRAVID	0	RAHUL@CRIC.COM	922.810.4321

Now, if the user with role CLERK runs the same query , the actual salaries drawn by Sachin and Rahul will be displayed.

Now we will ALTER the policy and will apply PARTIAL redaction to LAST_NAME but leave the first two characters as they are. We need to change the COLUMN_NAME to LAST_NAME, add one more row titled ACTION to add column and then another row to define the parameters for that column.

```
BEGIN
    DBMS_REDACT.ALTER_POLICY (
    OBJECT_SCHEMA => 'HR',
    OBJECT_NAME => 'EMPLOYEE',
    COLUMN_NAME=>'LAST_NAME',
    POLICY_NAME => 'REDACT_RDTEST1',
    POLICY_DESCRIPTION=>' REDACT RDTEST1 PII',
    ACTION => DBMS_REDACT.ADD_COLUMN
    FUNCTION_TYPE=>DBMS_REDACT.PARTIAL,
    FUNCTION_PARAMETERS =>
    'VVVVVVVVVVVVVVVVVV,VVVVVVV VVVVVVVVVV,*, 3,20',
    EXPRESSION=>'SYS_CONTEXT(''SYS_SESSION_ROLES'',''CLERK'')=''FALSE'');
END;
```

After the LAST_NAME redaction is in place, the user with HR role can run the query again and the result displayed will be as follows : The salary is shown as zero and last name characters except for the first two characters are replaced by *.

EMPLOYEE-ID	FIRST_NAME	LAST_NAME	SALARY	EMAIL	PHONE_NUMBER
1001	SACHIN	TE*******	0	SACHIN@CRIC.COM	922.810.1234
1002	RAHUL	DR****	0	RAHUL@CRIC.COM	922.810.4321

Now we will ALTER the policy and will apply RANDOM redaction to EMAIL. We need to change the COLUMN_NAME to EMAIL and remove the row defining FUNCTION_PARAMETERS.

```
BEGIN
    DBMS_REDACT.ALTER_POLICY (
    OBJECT_SCHEMA => 'HR',
    OBJECT_NAME => 'EMPLOYEE',
    COLUMN_NAME=>'EMAIL',
    POLICY_NAME => 'REDACT_RDTEST1',
    POLICY_DESCRIPTION=>' REDACT RDTEST1 PII',
    ACTION => DBMS_REDACT.ADD_COLUMN
    FUNCTION_TYPE=>DBMS_REDACT.RANDOM,
    EXPRESSION=>'SYS_CONTEXT(''SYS_SESSION_ROLES'',''CLERK'')=''FALSE'');
END;
```

After the EMAIL redaction is in place, the user with HR role can run the query again and the result displayed will be as follows : All the characters of e mail id, including @, are replaced randomly by other characters in addition to the earlier redactions on SALARY and LAST_NAME.

EMPLOYEE-ID	FIRST_NAME	LAST_NAME	SALARY	EMAIL	PHONE_NUMBER
1001	SACHIN	TE*******	0	aOc58M#cwp9,wOR	922.810.1234
1002	RAHUL	DR****	0	Wa2u&%RCrt'POc	922.810.4321

In the end we will ALTER the policy and will apply REGULAR EXPRESSION redaction to U.S. telephone numbers. We need to change the COLUMN_NAME to PHONE_NUMBER and add few more rows to define parameters for this type of redaction.

```
BEGIN
    DBMS_REDACT.ALTER_POLICY (
    OBJECT_SCHEMA => 'HR',
    OBJECT_NAME => 'EMPLOYEE',
    COLUMN_NAME=>'PHONE_NUMBER',
    POLICY_NAME => 'REDACT_RDTEST1',
    POLICY_DESCRIPTION=>' REDACT RDTEST1 PII',
    ACTION => DBMS_REDACT.ADD_COLUMN
    FUNCTION_TYPE=>DBMS_REDACT.REGEXP,
    EXPRESSION=>'SYS_CONTEXT(''SYS_SESSION_ROLES'',''CLERK'')=''FALSE''),
    REGEXP_PATTERN => '(\d\d\d). (\d\d\d). (\d\d\d\d)',
    REGEXP_REPLACE_STRING => '***.***.****',
    REGEXP_POSITION => 1,
    REGEXP_OCCURRENCE => 0,
    REGEXP_MATCH_PARAMETER => 'i';
END;
```

After the PHONE_NUMEBR redaction is in place, the user with HR role can run the query again and the result displayed will be as follows :

EMPLOYEE-ID	FIRST_NAME	LAST_NAME	SALARY	EMAIL	PHONE_NUMBER
1001	SACHIN	TE*******	0	bQw3in$cqlr1cGn	***.***.****
1002	RAHUL	DR****	0	Squj&s#AQ;Dob	***.***.****

If the phone number fetched from the database matches the pattern defined here then it will be replaced by the replacement characters (* in this case.) If the pattern does not match the defined pattern then the column will be replaced by null.

Note the EMAIL column. The characters displayed this time are different from the results returned last time. This is because DBMS_REDACT.RANDOM is executed for each query.

If you want to override the data redacted columns of a table then you can create a view on top of that table and then create a "no Data redaction" policy on the view.

Benefits of Data Redaction feature

The key benefits of Data Redaction Feature are

- We can mitigate sensitive data exposure risk and restrict sensitive data exposure selectively for different roles and users for different columns of the same table.
- It is very easy to implement.
- It is very easy to override, when required.

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About the Authors

Dr. Jignesh Doshi is working as Associate Professor at L J Institute of Management Studies,, Ahmedabad. During 1992-2008, he worked in various IT firms like Patni Computer Systems, Vodafone (Fascel), Gujarat Lease Financing Ltd., Erhardt + Leimer (I) Ltd. His areas of interest include Database, Database security, Big data analytics and data mining. He can be reached at doshijig@gmail.com.

Dr. Bhushan Trivedi [CSI-19170] is currently working as Dean Faculty of Computer Technology, GLS University, Ahmedabad. He has four patents to his name. He has written three books, all published by Oxford University Press. The ANSIC++ book enjoyed best-selling position in Oxford Higher Education for four consecutive years. He can be reached at bhtrivedi@yahoo.com.

Multi-label Learning with MEKA

Vaishali S. Tidake
Research Scholar, Dept. of Computer Engineering
NDMVPS's KBTCOE, Nashik

Shirish S. Sane
Vice Principal and Head, Dept. of Computer Engineering
KKWIEER, Nashik

I. Introduction to Multi-label Learning

Consider a photograph of sky, second photograph of forest, and third photograph having both sky and forest. If you want to label these photographs by their contents, then first and second photographs can be labeled straight away as sky and forest. But the third photograph has to be labeled by both sky and forest. This scenario represents the multi-label learning where a photograph may have multiple labels.

Classification is a commonly used data mining task. It uses supervised learning in which a model is trained from a set of known instances, called train set. Each instance in a train set has a set of values one each for the fix number of descriptive features/attributes and a pre-defined class label. Thus each of the training instances belongs precisely to only one class. Once the model is trained and tested, it is used to classify unseen instances. This is known as Single label (SL) classification and has been used in several distinct domains. However, in certain domains such as text categorization (TC), annotation of image, audio and video, bioinformatics, emotion recognition systems, etc, where instances may belong to one or more classes, the SL classification techniques cannot be used. The set of techniques that can handle instances having multiple labels has been developed and are called multi-label (ML) classification. In older days multi-label classification/learning was only used for categorization of text. But it has been used in the recent past for discovery of drug, tag recommendation, prediction of gene function [1] etc. Therefore it has become an upcoming research field in the area of machine learning. This article focuses on MEKA which is a tool designed for Multi-label learning.

II. Basics of MEKA

A. Introduction

MEKA is an open source framework which supports multi-label learning [4]. MEKA uses WEKA software as its base that supports SL classifiers only [3]. MEKA provides framework for machine learning. It helps to develop, run and evaluate various multi-label classifiers.

B. Installing and Using the tool

The latest version of MEKA 1.9.0 is released on 04th Nov 2015. It is available for download as the *MEKA-release-1.9.0.zip* file from the MEKA website directly [4]. This file should be extracted to create the *MEKA-1.9.0* directory which contains necessary APIs, few samples of multi-label datasets, packages and files to run the software. The tool can be used in two ways, either from command line or using GUI. To open the MEKA GUI, use *run.bat* for Microsoft Windows (*./run.sh* for Linux). Fig. 1 shows the MEKA GUIChooser screen as the first screen after opening MEKA. The GUI shows two options "Explorer" and "Experimenter".

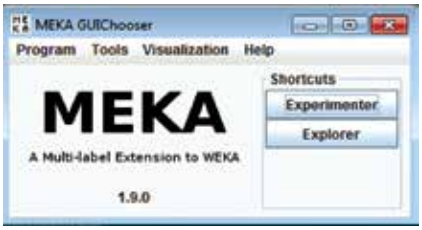

Fig. 1 : MEKA GUIChooser

This article deals only with "Explorer". When someone clicks on "Explorer" button it shows different menus and tabs on the screen as shown in Fig. 2.

Fig. 2 : MEKA Explorer

C. Loading the Input Data

To perform any operation, it is necessary to load the required data. MEKA needs data in ARFF format which is same as that followed by WEKA files.

Fig. 3 : MEKA Explorer showing loaded dataset

In MEKA Explorer, the input dataset can be loaded using *File* menu with *Open* option. The loaded dataset can be viewed in the *Preprocess* tab as shown in Fig. 3. MEKA Explorer shows various information of the loaded dataset in the preprocess tab. On the left side of window, it has a "filter selection" option, dataset and attribute information, and at the bottom is the "remove" button to be used for removal of unwanted

attributes, if any. On the right side, there is option to choose and set class labels among the attributes, followed by selected attribute section showing name, data type and related information of an attribute selected in the left section.

D. Multi-label Classification

Several different methods have been developed and reported in the literature to perform multi-label learning task. Two broad categories used to perform multi-label learning are the *problem transformation* and the *algorithm adaptation* [6].

The *problem transformation* approach involves transformation of an input instance into a representation suitable for traditional single-label classifier. In this approach, the multi-label data representation is transformed into a single-label data representation which is acceptable by traditional SL classification methods. In simple words, problem transformation operates on the principle *"fit data to algorithm"* [7]. Different algorithms which come under this approach are BR, LP, CC, RPC, CLR, etc.

Fig. 4 : MEKA Explorer showing settings of BR classifier

The *algorithm adaptation* approach on the other hand, involves modification of an existing SL classifier algorithm making it suitable to handle multi-label instances [7], [8]. In simple words, algorithm adaptation operates on the principle *"fit algorithm to data"* [7]. Many algorithms such as MLkNN, ML-BPNN, ML-DT, etc. follow this approach.

Ensemble method is also considered an important approach used for multi-label learning that combines outcomes from several classifiers based on either problem transformation or algorithm adaptation and has provided better results [2]. Algorithms such as 'RAkEL', Ensembles of classifier chains (ECC), etc. follow this approach.

As MEKA is designed to support multi-label classification, let us see how to perform it using MEKA. This option is provided in *Classify* tab as shown in Fig. 4.

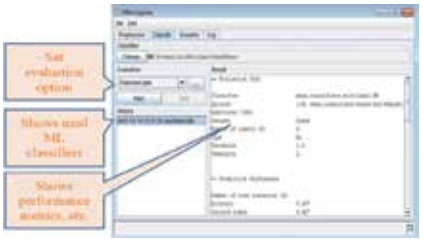

Fig. 5 : MEKA Explorer showing Result of BR classifier

- **Using the Binary Relevance (BR) Classifier**

The BR classifier is a widely used method that takes problem transformation approach. In this method, a multi-label problem is converted into |L| number of binary SL classification problems where L is a set of labels. Each of the binary classifiers votes separately to get the final result [6], [9].

As shown in Fig. 4, the *Classifier* option in *Classify* tab provides variety of ML classifiers. If BR is selected, one needs to specify the base SL classifier by clicking on "BR" that pop ups an option window called *GenericObjectEditor* to choose desired SL classifier. 'NaiveBayes' SL classifier has been selected in Fig. 4. If not selected, default classifier J48 is used.

After selecting a ML classifier, an *Evaluation* option is to be set like Train/test split, Cross-validation, etc. as shown in Fig. 5. If not selected, the first option Train/test split is used for Evaluation. Clicking the *Start* button executes the selected ML classifier on the selected ML dataset and provides *Results* as shown on the right side in the MEKA Explorer in Fig. 5. Results include *evaluation information* and *predictive performance*. If multiple classifiers are run one by one, then their list is displayed in *History* section of MEKA Explorer.

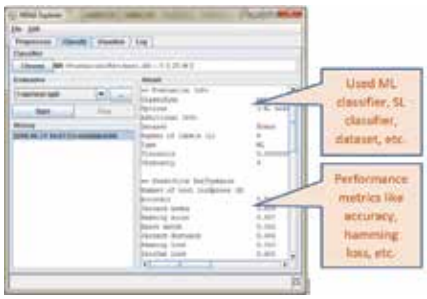

Fig. 6 : MEKA Explorer showing various performance metrics as a result

The *evaluation information* portion in *Results* section shows ML classifier used, base SL classifier used, dataset used, its type and related information. The *predictive performance* portion in *Results* section shows values of various performance metrics like accuracy, hamming loss, one error, etc. Accuracy is related to the labels which are predicted correct. Hamming loss is related to the misclassification of an instance and label pairs. One error is useful to measure when the generated top ranked label does not belong to relevant labels of instances.

- **Label Powerset (LP)**

BR does not consider relationship between labels. This drawback of BR is overcome by LP, also called as LC (Label Cardinality). In LP classifier, each distinct combination of labels is considered as a separate class and the entire problem is treated as a multi-class single-label (MSL) problem [2]. LP classifier also requires use of base classifier like J48 as shown in Fig. 7. However, it performs poorly when there is what is called 'class imbalance'.

Fig. 7 : MEKA Explorer showing LP classifier

- **Classifier Chain (CC)**

The Classifier Chain (CC) approach [2], [12], like LP, also try to overcome the drawback of BR. Similar to BR, a ML problem is transformed into |L| number of SL problems where L denotes a set of labels and for each label L_j, a separate binary classifier C_j is designed. But the input for each classifier C_j is different. Like LP classifier, CC also needs selection of base classifier. If not set, by default J48 SL classifier is used as shown in Fig. 8.

Fig. 8 MEKA Explorer showing CC classifier

- **Multi-label Back Propagation Neural Network (ML-BPNN)**

In Back Propagation NN, once the output is generated and if it is different than the desired output, then an error is calculated and it is used to make changes the weights in the previous layers. This operation is performed for each instance in the training set and for each label in that instance, calculated errors are added up. Addition of all such errors for all the instances is computed and is minimized to improve the performance using the correlation between labels of all the instances that belong to particular instance and labels but do not belong to that instance [13].

Fig. 9 MEKA Explorer showing ML-BPNN classifier

As shown in Fig. 8, ML classifier BPNN can be selected from *Classifier* option in the *Classify* tab. One needs to set base SL classifier. Otherwise default J48 classifier is used as shown in Fig. 9.

- **Random k-Labelsets (RAkEL)**

The problem of class imbalance in LP is removed in Random k-Labelsets. RAkEL is actually an *ensemble* of multiple LP classifiers. It combines various LP classifiers having different k combinations of all labels referred as *labelsets* [2], [11].

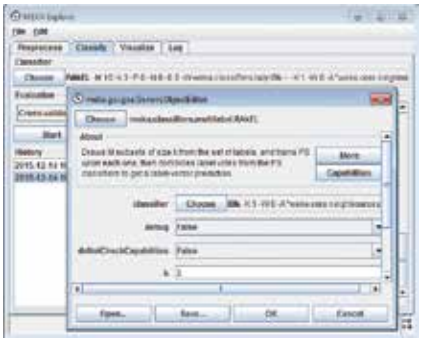

Fig. 10 MEKA Explorer showing RAkEL classifier

Table 1 describes three multilabel datasets namely music, yeast and enron. Table 2, 3 and 4 show comparison of few ML classifiers for three parameters accuracy, hamming Loss and one error respectively using MEKA 1.9.0. Always larger value is expected for accuracy and smaller value is expected for hamming loss and one error. Tables show that BPNN has given better results among all classifiers for the given three datasets on three parameters used.

Table 1 : Datasets used

Dataset	No. of Records	No. of Attributes	No. of Labels
music	592	77	6
yeast	2417	117	14
enron	1702	1054	53

Table 2 : Comparison of various classifiers for Accuracy

Dataset	BR	LP	CC	BPNN	RAkEL
music	0.39	0.445	0.408	**0.546**	0.523
yeast	0.435	0.403	0.413	**0.521**	0.416
enron	0.388	0.355	**0.414**	0.347	0.027
Avg	0.404	0.401	0.411	**0.471**	0.322

Table 3 : Comparison of various classifiers for Hamming Loss

Dataset	BR	LP	CC	BPNN	RAkEL
music	0.318	0.281	0.295	**0.21**	0.249
yeast	0.256	0.278	0.278	**0.213**	0.325
enron	0.06	0.068	**0.054**	0.066	0.065
Avg	0.211	0.209	0.209	**0.163**	0.213

Table 4 : Comparison of various classifiers for One error

Dataset	BR	LP	CC	BPNN	RAkEL
music	0.49	0.48	0.5	**0.262**	0.297
yeast	0.481	0.541	0.522	**0.245**	0.42
enron	0.387	0.463	0.37	**0.359**	0.907
Avg	0.463	0.494	0.464	**0.288**	0.541

E. Prepreocessing

Fig. 11(a) MEKA Explorer showing filter selection

MEKA provides all the filters which are available in WEKA. These filters in WEKA are categorized as unsupervised and supervised. Each of these categories is further grouped into attribute related and instance related methods. MEKA, in addition to these filters, also provides few more filters that are not available in WEKA. As shown in Fig. 3, *Filter* section in *Preprocess* tab is used to select a desired filter. By clicking *Choose* button in the *Filter* section, various available filters are presented. Effect of selected filter on the dataset could be observed by clicking *Apply* button in the *Filter* section as shown in Fig. 3.

MEKA provides two more filters other than WEKA. One is multi-label *SuperNodeFilter* as shown in Fig. 11(a) and the other is unsupervised *MekaClassAttributes* filter which works at attribute level as shown in Fig. 11(b).

The *SuperNodeFilter* works with multi-label datasets. It helps the user to create super labels from the existing

labels if the user has knowledge about existing labels. User needs to specify which labels should be grouped to form new super label that represents all the labels in that group. For example, if $\{L_1, L_2, L_3, L_4, L_5, L_6\}$ is the set of labels in the existing dataset such that L_1, L_3, L_4 form a group L_{134}. Also L_2, L_5 form L_{25} and L_6 forms a separate group. Then new dataset with set of constructed labels will be $\{L_{134}, L_{25}, L_6\}$. But this may sometimes cause changes in the values of the attributes.

Fig. 11(b) : MEKA Explorer showing filter selection

Sometimes a need may arise to alter the sequence in which attributes are arranged or to change the class attributes in the dataset. MEKA assumes all the class attributes being placed at the beginning of the instance in the dataset. This can be achieved using an unsupervised filter operating at the attribute level provided in MEKA called *MekaClassAttributes* which is not available in WEKA, and is as shown in Fig. 11(b). User needs to select the attributes for reordering by specifying their numbers like 10 or a range like 7-10 as shown in Fig. 11(c).

Fig. 11(c) : MEKA Explorer showing filter selection

After applying these settings, specified attributes will be placed at the beginning of the dataset as shown in Fig. 11(d). One can set *Use Class attributes* option provided in MEKA Explorer to change the number of class attributes. This number will be used by the classifier. However, if these attributes are numeric, then algorithm like BR cannot classify. So *Discretize* filter provided in WEKA filter list can be used first to convert numeric attributes to nominal type and then classification can be done.

Fig. 11(d) MEKA Explorer showing filter selection

F. Datasets

MEKA accepts input data as an ARFF (Attribute Relation File Format). For example, scene.arff is a sample dataset which contains information about multimedia and is used in the literature for classification of scenes [2]. The dataset associates scenes to six different contexts such as beach, urban, mountain, field, sunset, foliage. MEKA versions come with few sample datasets. Other multi-label datasets are available for download from the website directly [4].

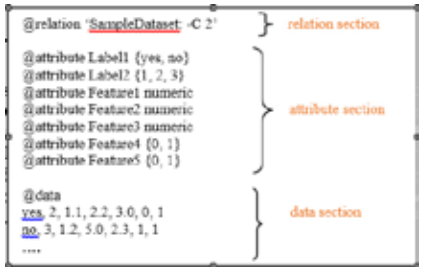

Fig. 12 : Sample multi-label dataset in ARFF format

ARFF represents Attribute Relation File Format. A sample ARFF file having two labels and five features is described in Fig. 12. Every ARFF file has two sections namely the header and the data. The header section contains the relation and the attribute section. The *relation* section is the first one which describes name of dataset and the number of labels in the dataset is specified after -C option. The *attribute* section is the second section where each line describes name of label/ feature and type of data that can be stored in it or a set of values which can appear for that attribute in case of nominal attribute. The *data* section is the third section which shows the data instances appeared in the dataset. Note that MEKA requires class labels to be preceded by features.

To summarize, MEKA is an excellent tool to perform ML classification on ML datasets. One can load a dataset, choose appropriate Classifier, apply attribute and Instance filters, if desired and choose desire evaluation option. It's an excellent tool for the researchers to carry out experiments to evaluate different classifiers. Explorer is suitable for beginners, 'Experimenter' tab provides advanced facilities. Use of some ML Algorithms such as BR, LP, RAkEL, CC, and ML-BPNN has been discussed briefly in this article.

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About the Authors

Ms. Vaishali S. Tidake [CSI-I1504328] is currently working in Department of Computer Engineering at NDMVPS's KBTCOE, Nashik. She can be reached at vaishalitidake@yahoo.co.in.

Prof. Shirish S. Sane [CSI - 00008480] is currently working as Vice Principal and Head of the Computer Engineering Department at KKWIEER, Nashik. He is the Past Chairman of BOS in Computer Engineering, University of Pune. Currently he is working as Regional Vice President for CSI Region VI (Maharashtra & Goa). He can be reached at sssane@kkwagh.edu.in.

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Phone: 09943984483
E-mail: nsc@csi-india.org, prashant@amrita.edu

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Dept. of IT and Systems Calcutta Business School Kolkata, West Bengal
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somnathm@calcuttabusinessschool.org

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Mob. : +91-96626 40500
drnileshmodi@gmail.com

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Dept. of Information Tech.
C V Raman College of Engg.
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Bhubaneswar 752054, Odisha
Mob. : +91-9437875808
brojokishoremishra@gmail.com

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- Becoming part of CSI management committee

Book Title: **Software Project Management - A guide for Service Providers**
Author: **S. Ramanathan**
ISBN: **978-1-4828-7013-8**
Price: **Not Available**
Publisher: **Partridge India**

The book addresses one of the important needs of the developing nations, which have become hubs for offering information technology outsourcing services. The sudden exposure to large and complex projects of the developed nations has posed a formidable management challenge to the service providers. The contracting nations uniformly identify project management as a skill wanting among the service providers. It is to address this skill gap this book has been written. The book focuses on project management needs of such outsourced projects.

The book is divided into 19 Chapters. The first chapter starts with the concept of project and last chapter explains the closure of a project. The lifecycle of the project is described in a very simple and understandable way in intermediate chapters. The knowledge areas are organized in a chronological order to make the readers understand the logical connection among the domains.

The book will be of great use to those preparing for PMP and other certification examinations.

The book is easy to read and understand by the student community. Real life examples and case studies would help the practitioners aspiring to be project managers hone their skills. Extensive practice exercises at the end each chapter will be very useful for students to test their knowledge and understanding.

The book will serve as useful textbook for students in Business management, Computer Science and Information Technology.

Review by:

Dr. Vipin Tyagi
Editor, CSI Communications

Kind Attention: Prospective Contributors of CSI Communications

Please note that Cover Themes for forthcoming issues are planned as follows:

- **September 2016 - Medical Image Processing**
- **November 2016 - Big Data**
- **January 2017 - Applications of IT**
- **March 2017 - Software Engineering**
- **October 2016 - Bioinformatics**
- **December 2016 - Remote Sensing and GIS**
- **February 2017 - Operating Systems**

Articles may be submitted in the categories such as: Cover Story, Research Front, Technical Trends and Article. Please send your contributions before 20 August for September issue. The articles may be long (2500-3000 words maximum) or short (1000-1500 words) and authored in as original text. Plagiarism is strictly prohibited.

Please note that CSI Communications is a magazine for members at large and not a research journal for publishing full-fl edged research papers.

Therefore, we expect articles written at the level of general audience of varied member categories. Equations and mathematical expressions within articles are not recommended and, if absolutely necessary, should be minimum. Include a brief biography of four to six lines, indicating CSI Membership no., for each author with high resolution author photograph.

Please send your article in MS-Word and/or PDF format to Dr. Vipin Tyagi, Editor, via email id : dr.vipin.tyagi@gmail.com with a copy to csic@csi-india.org.

(Issued on the behalf of Editorial Board CSI Communications)

Prof. A. K. Saini
Chair - Publications Committee

Congratulations !!!

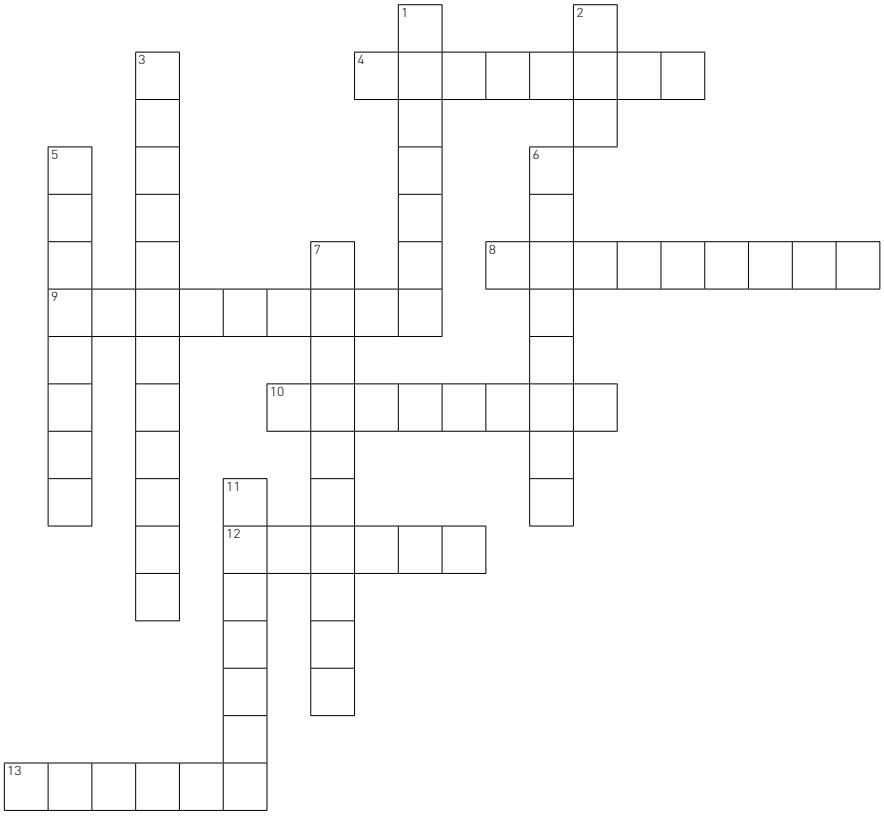
Prof. Dr. Anirban Basu, President CSI has been awarded a project to work on "Developing Techniques for Green Software Engineering" by the Government of Karnataka - Vision Group of Science and Technology headed by Bharat Rathna Prof. C. N R Rao. This subject is gaining lot of importance and the project will involve setting up a Laboratory for measuring energy dissipation during program execution and developing techniques for reducing it.

CrossWord »

Durgesh Kumar Mishra
Chairman, CSI Division IV Communications
Professor (CSE) and Director Microsoft Innovation Center, Sri Aurobindo Institute of Technology, Indore.

Test your knowledge on Robotics

Solution to the crossword with name of first all correct solution provider(s) will appear in the next issue. Send your answer to CSI Communications at email address csic@csi-india.org and cc to drdurgeshmishra@gmail.com with subject: Crossword Solution – CSIC August 2016 Issue.



CLUES

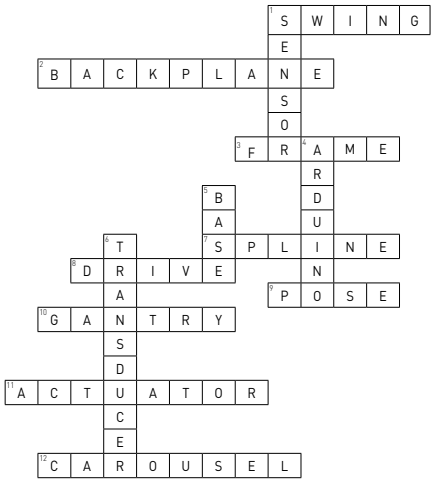
ACROSS

4. A surface defined for a point
8. Combining multiple video sources
9. A device used to maintain reference direction
10. An input device
12. Representation of people
13. A VR company

DOWN

1. Movement of part of body
2. Angular displacement of a view
3. Technology to mimic a particular location
5. A method of creating three-dimensional illusion
6. Another name for lag time
7. Technology to display the three-dimensional objects
11. Touch senses technology

Solution for July 2016 Crossword



Source: www.rio2016.com, www.telegraph.co.uk

The Rio Olympic Games 2016 broadcasters are to use Virtual Reality technology first time in the history. They will provide a 360 degree coverage for seven sport events, and closing and opening ceremony. A special camera is designed to capture views suitable for VR devices. Viewers will need a compatible headset and mobile phone to see live broadcast through video-on-demand services. The VR technology will give in-stadium experience to subscribers.

Rashid Sheikh
Associate Professor, Sri Aurobindo Institute of Technology, Indore

We are overwhelmed by the response and solutions received from our enthusiastic readers

Congratulations!

All nearby Correct answers to July 2016 month's crossword received from the following reader: **Dr. Sandhya Arora,** Professor, Professor, Cummins College of Engineering for Women, Pune

AMRAVATI CHAPTER

Three Weeks Technical Workshop for B.E. Final Year Students during 13th June 2016 – 3rd July 2016, was organized by P. R. Pote (Patil) College of Engineering & Management, Amravati in association with CSI, Amravati Chapter.

The workshop focused on various Technologies like C, CPP, JAVA, and SQL. The courses consist of lectures, assignments and online tests. The sessions were interactive and hands-on practice was provided to students. This workshop aimed to improve the technical skill set amongst students and making them ready for campus placements.

The workshop was inaugurated by Dr. G. R. Bamnote, Chairman, CSI Amravati Chapter and Dean, Faculty of Engineering & Technology, SGB Amravati University, Amravati. Principal Dr. Mrs. S. D. Wakade, Vice-Principal Prof. Mohd. Zuhair, Head of CSE dept. Prof. V B Gadicha, Trainer Mr. Ram Ghonmode & Team Webakruti, Program Coordinator Prof. S. S. Sagane, T&P Coordinator Prof. M. S. Burange were present on the occasion.

Following our Indian tradition, the workshop was inaugurated by Lighting of the lamp. Prof. K. K. Chhajed welcomed all dignitaries. H.O.D. Prof. V. B. Gadicha briefed all about the workshop and its importance to the whole gathering.

Hon. Dr. G. R. Bamnote brief about the New Amravati CSI Chapter. He guided all the students for campus placements and shared his experiences in this concern. He congratulated the Institute for organizing such a program which benefits students to a great deal.

Prof. N. V. Kale thanked all dignitaries, Expert Speakers, invitees, organizing committee, Supporters, and Students for their valuable inputs to the program.

On the occasion of the National Tree Plantation day on 1st July, 2016 Prof. Ram Meghe Institute of Technology & Research, Badnera-Amravati in association with the CSI Amravati Chapter (REGION VI) organized a Tree Plantation Programme. 450 trees were planted by the faculty, members of CSI and the students in the campus.

KOLKATA CHAPTER

Calcutta Business School with Technical Collaboration with Computer Society of India, Kolkata Chapter, organized One Week Faculty Development Programme (FDP) On Computational Intelligence for Optimization Problems during March 28 – April 1, 2016. The Coordinator of the Programme was Dr. Somnath Mukhopadhyay,Dept. of Information Technology, Calcutta Business School, Diamond Harbour Road, 24 Paraganas (S), West Bengal 743503, India.

First Lecture of Lecture Series was held on 02.04.2016 at 4.30 pm in the CSI Kolkata Chapter office where Dr. Indrajit Bhattacharya, Head, Computer Application, Kalyani Govt. Engineering College, Kalyani, Nadia delivered a lecture on "Optimal Site Allocation and Resource Management in Post Disaster Scenarios"

Second Lecture of Lecture Series was held on 07.05.2016 at 4.30 pm in the CSI Kolkata Chapter office where Sandipta Narayan Biswas, Sr. Solution Architect, Telecom BSS, Ericsson Global Services, India deliver his talk on "Optimal Socio-Economic benefits of mobile enabled IOT solutions".

Third Lecture of Lecture Series was held on 04.06.2016 at 4.30 pm in the CSI Kolkata Chapter office where Prof(Dr.) Pradosh Roy, Emeritus Professor, Dept. of Computer Science & Engineering, Asia Pacific Institute of Information Technology, Panipat, Haryana deliver his expert lecture on "Compressed Sensing & 21st Century Digital Universe."

Calcutta Business School with Technical Collaboration with Computer Society of India, Kolkata Chapter, organized one day Workshop on "Technical Content Writing Using LaTeX", on 29th May, 2016 at Management Development & Research Center, Calcutta Business School. The program was jointly coordinated by Prof. (Dr.) Paramartha Dutta, Dept. of Computer & System Sciences, Visva-Bharati University and Dr. Somnath Mukhopadhyay.

The Annual General Meeting (AGM) of Computer Society of India, Kolkata Chapter for the year 2015 – 2016 was held on Saturday, 25th June, 2016 at 7.00 p.m. in The Astor Hotel,

15, Shakespeare Sarani. 70 members attended the AGM. Secretary, Treasurer read the report of the activity of the previous year. A Chapter level award has been proposed and passed by the members in the AGM.

The Pailan College of Management and Technology has organized the two days national conference on National Conference on Computing, Electronics & Electrical Engineering (NCCEEE-2016) with technically sponsored by IEEE Power and Energy, IEEE Computer Kolkata Section, IEEE Circuit and System Society and Computer Society of India Kolkata Chapter at Hotel Hindusthan International on 24th & 25th June 2016. The conference was well versed with authors and academician all around the India with Chief Guest Prof. (Dr.) Ajoy Kumar Ray, Director, IIEST Shibpur, Chairperson of Conference Prof. (Dr.) S. M. Chatterjee, Ex. VC, Shibpur, Guest of Honour Prof. (Dr.) Mita Banerjee, VC, WBUTTEPA and Key Note Speaker Prof. (Dr.) Chandan Kumar Sarkar (Chairman, IEEE Kolkata Section).

MUMBAI CHAPTER

CSI Mumbai Chapter conducted Two days hands on workshop on Network Security during 10th & 11th June 2016.

Workshop was conducted by Mr. Mahesh Gavkar. The workshop focused on security testing and auditing on enterprise networks. This course started with different attack methods used by real time network intruders and further discussed on how to review network architecture, devices and configuration of multiple devices with a good amount of practical hands-on exercises.

CSI Mumbai Chapter conducted One day hands on Workshop on Social Media Marketing on 11th June 2016.

Workshop was conducted by Ms. Milita Datta. Participants were able to learn to match markets to social strategies to profitably to grow business. They also learnt social media tools and platforms to design, manage, and optimize social campaigns to promote growth and position of the brand in the global digital marketplace, and developed targeted content to spark dialogue with various social communities.

CSI Mumbai Chapter conducted Certification Course on ISO 27001 ISMS Implementation and Internal Audit on 24th & 25th June 2016.

Workshop was conducted by Prof. V K Garg. This course included : Introduction to Information security System principles and Concepts, Detailed introduction to ISO/IEC 27001:2013 (ISO 27001) and the related series of standards, ISMS Requirements Definition, Scope Estimation, Design and Implementation (using Requirements Specification, Best Practices and Guidelines, example Deliverables, and Project planning Documentation), Legal, regulatory, Self-Imposed, and Contractual Requirements Definition and Documentation, Information Security Risk Assessment, Governance and Business Continuity Management, ISO and ISMS Audit Perspective and Approach.

CSI Mumbai Chapter conducted Digital Marketing Training online From 17th June to 14th July 2016.

Training was conducted by Ms. Milita Datta. CSI Members & other participants from different cities attended this training program. This training covered Introduction to Digital Marketing, Inbound Marketing, Email Marketing, Search Engine Optimization, Social Media Marketing, Search Engine Marketing, Analytics & Affiliate Marketing

CSI Mumbai Chapter conducted Knowledge Forum Session on Fintech Startups & More on 4th June 2016. The Session was held at C-DAC Juhu, Mumbai on 4th June 2016

The session started with the presentation and talk by Mr. Anand Kumar Bajaj ex CIO of Yes Bank. He shared his experiences in Digital Payments and other changes happening in the industry. He also shared the new age of Fintech Startups coming up in marketplace.

Second Speaker - Mr. Kiran Reddy, Associate Director, Domain Expert Banking in Software Services Industry spoke on entitlement challenges faced by the "Corporate Portal", also the rise of new channels like Mobile and Tablets making the entitlements Ecosystems more Complex.

Third Speaker – Mr. Akshay Dedhia from Money Uncle pitch the Business Case.

The session ended with the Vote of Thanks & Valedictory.

NASHIK CHAPTER

CSI Nashik Chapter organized a program on CISCO Better Tomorrow on 8th July, 2016 powered by CISCO at Express Inn, Nashik. Mr. Diwakar Yawalkar welcomed the speaker of program Mr. Atyujwal Deka, Product Sales Specialist– Security, Cisco India, Mr. Shrirang Rao, Data Center Product Sales Specialist, CISCO India, Mr. Manoj Joshi, Mr. Hrushikesh Nagarkar, Cisco India and Dr. S. S. Sane, RVP Region VI, CSI.

Program was conducted for Medium and Large scale

industries. Two sessions conducted during this program. In first session on "Cisco Security – Security Everywhere" Mr. Atyujwal Deka covered security issues and solutions by CISCO. Mr. Shrirang Rao, in second session on "Transformation begins with Next Generation Datacenter" explained importance and working of Datacenter. During Q & A session Mr. Manoj Joshi and CISCO team addressed participant's questions.

The program attended by CEO, CIO, CISO, System Analyst, System Administrators and IT Heads from various organizations.

CSI Nasik chapter and student branch at Late G N Sapkal College of Engineering, Anjaneri, Nashik has organized "Two Day Workshop on PHP Scripting Language" on 13th & 14th July 2016.

The speaker Mr. Ravindra Varpe, Imparted the knowledege of PHP Scripting Language to the student. By participating in the workshop student were exposed to the application of PHP Scripting Language for development of softwares.

PATNA CHAPTER

Prof. A. K. Nayak giving inaugural speach.

An one day Workshop on the Theme Data Science & Applications was organized by CSI Patna Chapter on 2nd May 2016 at IIBM Auditorium. The Workshop was inaugurated by Prof. A. K. Nayak, Fellow & National Secretary of Computer Society of India and Prof. Arun Kumar Sinha, Former vice chancellor of Patna University graced the Function as Guest of Honor. In his Inaugural address Prof. Nayak has highlighted about the importance of Data Science and it's applications. He further said that data science emerged as new area that combines all the expertise intersecting Social Science, Information & Computer Science.

In his Keynote Address Prof Amrendra Kumar, Director Telenoc Solutions, Washington, USA deliberated upon the scopes & opportunities of Data Science, Big Data & Cloud Computing etc. The function was presided by Prof. U. K. Singh, Director General, Indian Institute of Business management Patna & Fellow, CSI. Prof Shams Raza, CSI Bihar State Student Coordinator welcomed the Guests & Prof. Ganesh Panday, Past Chairman of CSI Patna chapter proposed the vote of thanks. Others who spoke on this occasion were Mr. Sanjay Kumar Sinha, Prof. Sadhna Jha, Prof. Shalini Agarwal & Prof. Rajesh Ranjan.

UDAIPUR CHAPTER

The 1st Doctoral Conference was organized on 3rd March, 2016. The conference provides an open, friendly and thought-provoking environment for Doctoral students and Doctoral Degree Holders to present and discuss their ongoing research in different tracks. We encourage participants to reflect on the scope of their research, both practically and theoretically, and hope to see reflected in presentations the many different methodological approaches employed in research. Doctoral students at Middle/Final stage of their work are encouraged to participate through presentation of their work. All general tracks related to Computers, IT, Management and Electronics or Engineering applications related to IT and E-governance are invited.

First of all lamp lightning ceremony was performed by the guest and other dignitaries on dais. It was followed by the Sarasvati Vandana & Sanstha Geet. After which floral welcome to the guests was done. It was followed by welcome address which was delivered by Dr. Bharat Singh Deora, (Convener, DocCon). He said that this doctoral conference (DocCon 2016) will help in the establishment of better research programs and become a forum for the exchange of research ideas. After welcome address, Er. Amit Joshi, Hony. Secretary, CSI Udaipur Chapter spoke about the Doctoral Conference.

After this the conference is addressed by our two guest of honour Dr. Durgesh Kumar Mishra and Dr. Y.C. Bhatt. After the speeches of guest of honour, the souvenir of Doctoral Conference was released.

Keynote Speech was given by Dr. Anicia Peters, Dean, Faculty of Computing and Informatics, Namibia University of Science and Technology, Namibia addressed the conference. The Presidential address was given by Prof. C. P. Agarwal (Registrar). After that Mementos presentation took place by Secretary Dr. Manish Shrimali. Lastly vote of thanks was given by Dr. Manish Shrimali.

There was a Plenary Session in which Prof. D P Kothari, fellow IEEE and Director - Research Gaikwad-Patil group of institutions, Nagpur; Dr. Swagatam Das from Indian Statistical Institute, Kolkata, Shri Aninda Bose, from Hard Sciences, Springer India and Dr. Rakesh Sehgal, HOD, Cyber Security Technology Division, CDAC Mohali delivered their

talks.

In the Research there were total 62 registrations from different colleges and universities of India. Scholars present their work form which eight best presentations were selected. In the second round four best research proposals were selected for the award. The awardees are

i) Basant Tiwari and Dr. Abhay Kumar for presentation Towards Efficient Layered Architecture For Remote Patient Monitoring
ii) Akhilesh Sharma for presentation Mood Based Music Analysis And Their Effect On Human Psychology
iii) Dr. Bhargavi Goswami and Dr. Hardik Gohel for presentation Design & Analysis Of Optimum Wireless Transmission Strategy On Rate Control Protocol
iv) V P Krishna Anne and Rajasekhara Rao Dr. K for presentation Design and Analysis of Network Intrusion Detection Techniques And Standards

The research sessions were chaired by Prof. D P Kothari, Dr. Swagatam Das, Shri Aninda Bose, Dr. Rakesh Sehgal, Prof. H R Vishwakarma, Dr. Mukesh Sharma, Dr. J K Mandal.

VELLORE CHAPTER

CSI Vellore Chapter organized a one week Faulty Development Programme on "Big Data Analytics and Application Biological Data" from 02-07-2016 and 08-07-2016 at VIT University. Mr. Anikt, Business Analyst from IBM India Pvt. Ltd., Bangalore covered Introduction bigdata, data analytics, data storage over cloud and statistical tools and applications in biological data with research directions, around 60 CSI life members attended the workshop, organized by Prof. G. Jagadeesh and Prof. K. Govinda.

VISAKHAPATNAM CHAPTER

CSI, Visakhapatnam Chapter held its Annual General Meeting on 22nd June 2016 at Hotel Green Park, Visakhapatnam. Sri Dasari Nageswara Rao, Director (Operations), Visakhapatnam Steel Plant took over as New Chairman of CSI Visakhapatnam Chapter and addressed the gathering and explained how CSI vizag chapter is supporting society and members with various innovative activities. About 300 members attended the AGM enthusiastically. The agenda and accounts distributed to the members. Prof P S Avadhani, Principal, College of Engineering, Andhra University & outgoing Chairman CSI Visakhapatnam Chapter chaired the meeting. Sri Y Madhusudana Rao, AGM(IT) and Secretary, CSI – Visakhapatnam Chapter presented the annual report of the chapter. He thanked all the chapter members, stakeholders for giving unstinting support and encouragement in conducting activities like Whiz Kid – 2K16, Tech Whiz Quiz for Engg. Students, opening of Smart Computer Lab for Better Tomorrow at Zilla Parishad High school at Thotada Village and technical talks etc. The accounts for the year 2015-16 was presented by Sri Y Satyanarayana, AGM (MM-ERP) and Treasurer the house approved the same. Sri S Gopal, Nominations Committee Chairman declared the results of the recently conducted chapter elections before the house. Sri K V S S Rajeswara Rao, GM (IT & ERP), Visakhapatnam Steel Plant is unanimously elected as the Vice-Chairman cum Chairman Elect for the period 2016-18. Sri Anindya Paul, AGM (IT), Visakhapatnam Steel Plant is elected as the Secretary for the period 2016-18.

Sri. Y Satyanarayana proposed the vote of thanks.

Tree Planting at CSIED premises on 9th July 2016 by ExecCom

The second ExecCom meet for the year 2016-17 was held on 9th & 10th July 2016 at CSI Education Directorate, Chennai. ED team at Chennai has taken the initiative for planting tree saplings at ED premises by the ExecCom members. The ExecCom members appreciated this initiative and the efforts taken by ED team for this purpose. The ExecCom also expressed that the initiative should be carried by all the members across the country to reduce the carbon footprint.

REGION-II

Gaya College, Gaya, Bihar

29-06-2016 :During visit of Founder chairman of CSI Varanasi Dr. Subhash Chandra Yadav

Report Submission

Student branches are requested to send their report to sb-activities@csi-india.org with a copy to admn.officer@csi-india.org.

Chapters are requested to send their activity report to chapter-activities@csi-india.org.

Kindly send high resolution photograph with the report.

Contact Dr. Vipin Tyagi, Editor – CSI Communications at dr.vipin.tyagi@gmail.com for any query.

REGION-III

Shri Vaishnav Institute of Technology & Science, Indore

5-3-2016 - seminar on Technical Innovation & Startup

Shri Vaishnav Institute of Technology & Science, Indore

8-3-2016 to 9-3-2016 - Two days workshop on Object Oriented Analysis & Design using IBM tool RSA

REGION-III

G H Patel College of Engg. & Tech., Vallabh Vidyanagar

30-4-2016 – one day workshop on Word Press – Website Building Tool

REGION-V

Dr. K V Subba Reddy College of Engg. For Women, Kurnool

25-4-2016 – Mr Satish, Dr Pavan Kumar Mr Yogesh Patel & Dr Mahesh during program on Career Guidance

NBKR Institute of Science and Technology, Nellore

12-7-2016 - Winners receiving awards during Code Debugging Contest

Anurag Group of Institutions, Hyderabad

16-6-2016 – Awareness program by Mr Pattabiraman, TCS

REGION-V

Anil Neerukonda Institute of Tech. & Sc., Visakhapatnam

9-7-2016 – One day workshop on web designing tools

REGION-VI

Dr. D Y Patil College of Engineering, Pune

9-7-2016 – Workshop on Linux Installations Basics and Functional Programming : New Perspectives

REGION-VI

Zeal Institute of Business Administration, Pune

28-6-2016 – Ms. Sadhna Jamwal and participants during workshop on Professional Effectiveness

Zeal Institute of Business Administration, Pune

1-7-2016 – Tree Plantation program as social initiative

Prof Ram Meghe Institute of Tech. & Research, Amravati

1-7-2016 - Tree Plantation Programme

Late G N Sapkal College of Engineering Anjaneri, Nashik

13 & 14-7-2016 - Prof Wankhade & Mr Ravindra Varpe during Two Day Workshop on PHP Scripting Language

REGION-VI

Marathwada Institute of Technology, Aurangabad

4-6-2016 to 9-6-2016 - Short Term Training Program on Big Data and Analytics with R

REGION-VII

Mepco Schlenk Engineering College, Sivakasi

11-7-2016 to 12-07-2016 - Workshop on Mobile App Development using Android

REGION-VI

Valliammai Engineering College, Kattankulathur

31-5-2016 to 1-6-2016 - Dr. Vanathi, Dr. Senthil kumar, Ms. Vijayalakshmi & Mr Shamugam interacting with participants during event on Resource Management Techniques

Mepco Schlenk Engineering College, Sivakasi

26-5-2016 to 28-5-2016 – Dr. Vanathi, HOD-CSE addressing during three day workshop on Grid and Cloud Computing

REGION-VII

National Engineering College, Kovilpatti

12-7-2016 to 19-7-2016 – workshop on PHOTO-O-MAGIC (Photoshop for Beginners)

Einstein College of Engineering, Tirunelveli

24-6-2016 – Dr Devi, Dr Dharmaraja, Dr Ramar & Prof Amudhvanan during Orientation Programme

Regional Student Convention 2016

REGION-II (East/ North- East States)

Organized by **Computer Society of India, Region-II & Computer Society of India, Kolkata Chapter**
In Collaboration with **MCKV Institute of Engineering**, Liluah, Howrah
Saturday, August 20, 2016

Paper Submission details

- Submit a softcopy of the full paper and a presentation through email : csical@gmail.com
- The paper MUST BE in Word format typed in a single A4 size paper (single space, single column, 11pt Times New Roman font, Title in 12pt **BOLD CAPITAL CENTERED**, at least 1 inch margin in all sides, Author(s) affiliation in 11pt Centered, References in 10 pt.
- The paper should briefly mention the Objective and Contribution of the work.
- Any paper exceeding the LIMIT of Six A4 Pages and not conforming to the word processing guideline mentioned above will be rejected.
- Not more than two students are allowed to author a paper. However, more than one paper may be submitted by the same set of author(s).

Registration Fees

₹ 100/- for all CSI Members. ₹ 200/- for non-CSI members. For authors, the paper must accompany registration fee (₹ 100/- per person for CSI member and ₹ 200/- for others). Payment may be made through Cheque (up to 20th August), Draft (up to 20th August). The participants, who will not submit papers, registration fee is ₹ 50/- (for CSI members) and ₹ 100/- (for non-CSI) and fees will be taken through draft/cheque. The draft/ cheque/NEFT must be in favour of "MCKV Institute of Engineering" payable at par in Howrah. Bank: Kotak Mahindra Bank, A/NO: 553010003502, Branch Code: KKBK0006745. IFSC Code: KKBK0000958. Spot registration is not guaranteed.

Last date of submission of Papers	:	**16th August, 2016**
Announcement of short-listed papers	:	**18th August, 2016**
Final Presentation on Convention Day	:	**20th August, 2016**

Contacts :
Dr. S. Mukhopadhyay (0) 9475413463) • **Prof. S. S. Thakur** (0)9836773258) • **Prof. J. K. Mandal** (0) 9434352214

Sanjay Mohapatra, Vice President, CSI & Chairman, Conf. Committee, Email: vp@csi-india.org

Date	Event Details & Contact Information
AUGUST **18-19, 2016**	**International Conference on "Internet of Things",** Venue : APS College of Engineering, Bangalore Contact : hodcse.apsce@gmail.com
SEPTEMBER **10-11, 2016**	**Workshop on Analytics using R** http://csihyderabad.org Contact : analyticsusingr@gmail.com
16-17, 2016	**2016 International Conference on Frontiers of Intelligent Computing: Theory and applications (FICTA), KIIT University, Bhubneswar.** www.fi cta.in Contact : fictaconf@gmail.com
OCTOBER **04-05, 2016**	**National Conference on "Recent Advances in Computer Science & Technology",** RACST-2016, Department of Computer Engineering, G H Patel College of Engineering & Technology, Vallabh Vidyanagar, Gujarat, www.gcet.in Contact : Dr. Maulika Patel, maulikapatel@gcet.ac.in
06-08, 2016	**International Conference on "Computational Systems and Information Technology for Sustainable Solution [CSITSS-2016]"** Organized by CSE & ISE & MCA - R.V. College of Engineering, Bengaluru -560059. www.rvce.edu.in; Contact : csitss2016@rvce.edu.in; Ph: 080-67178183, 8180;
28-29, 2016	**Third International Conference on Computer & Communication Technologies (IC3T - 2016)** at Devineni Venkata Ramana & Dr. Hima Sekhar MIC College of Technology, Vijayawada, Andhra Pradesh, India. http://www.ic3t.mictech.ac.in/ Contact : Dr. S.C. Satapathy, 9000249712, sureshsatapathy@ieee.org, Dr. K. Srujan Raju, 91-9246874862, ksrujanraju@gmail.com Prof. Vikrant Bhateja, 91-9935483537, bhateja.vikrant@ieee.org
NOVEMBER **11-12, 2016**	**International Conference on Advances in Computing and Data Sciences (ICACDS-2016). Proceedings by Springer CCIS/LNCS** Organized by Krishna Engineering College (KEC), Ghaziabad. http://icacds2016.krishnacollege.ac.in/ Contact : Dr. Mayank Singh, icacds2016@krishnacollege.ac.in. Mob: 09540201130
	National Conference on Smart And Innovative Technologies in Engineering And Sciences (SITES 2016) Gyan Ganga College of Technology, Jabalpur, MP. www.ggct.co.in Contact sites: 2016@ggct.co.in
17-19, 2016	**Interntional Symposium on Acoustics for Engineering Applications :** Acoustics for Quality Improvement in Life at KIIT, Gurgaon http://www.nsa2016india.org/ Contact: Prof. (Dr.) S. S. Agrawal, Chairman, OC – NSA-2016, Director General KIIT Group of Colleges, Gurgaon Formerly: Emeritus Scientist CEERI/CSIR,Advisor CDAC-Noida. Email: nsa2016india@gmail.com
18-20, 2016	**2nd International Conference on Communication Control and Intelligent Systems,** at GLA University, Mathura . www.gla.ac.in/ccis2016 Contact: ccis@gla.ac.in
22-25, 2016	**Special session on "Smart and Ubiquitous Computing for Vehicle Navigation Systems"** at IEEE TENCON 2016, Marina Bay Sands, Singapore (http://site.tencon2016.focalevents.sg/) Contact : Dr. P.K. Gupta pkgupta@ieee.org, Prof. Dr. S. K. Singh sks.cse@itbhu.ac.in
DECEMBER **07-09, 2016**	**National Symposium on "Recent Advances in Remote Sensing and GIS with Special Emphasis on Mountain Ecosystems" and their Annual Conventions at Dehradun.** www.isrs2016.iirs.gov.in Contact: Dr. S. K. Srivastav, Organising Secretary & Group Head, RSGG, Indian Institute of Remote Sensing, Indian Space Research Organisation, Department of Space, Government of India , Dehradun, India - 248 001. email : isrs2016@iirs.gov.in
08-10, 2016	**CSI Annual Convention (CSI-2016): Theme: Digital Connectivity - Social Impact;** Organized by CSI Coimbatore Chapter; Pre-Conference Tutorial on 7th Dec. 2016 Venue: Hotel Le Meridien, Coimbatore Contact : Dr. Ranga Rajagopal, Convener, 9442631004 convener@csi-2016.org
	CeBIT INDIA 2016 – Global Event for Digital Business in association with CSI Venue: BIEC, Bengaluru www.cebit-india.com Contact : Mohammed Farooq, farooq@hmf-india.com, +91 9004691833
22-24, 2016	**Joint International Conference on Swarm, Evolutionary, and Memetic Computing (SEMCCO 2016)- 7th Edition & Fuzzy and Neural Computing (FANCCO 2016)- 6th Edition co-located with 1st International Conference on Smart Computing and Informatics (SCI-2016).** Department of Computer Science and Engg, ANITS, Visakhapatnam, India. http://anits.edu.in/semfansci2016 Contact: Prof. Suresh Satapathy, sureshsatapathy@ieee.org, Mob.: 9000249712
23-24, 2016	**8th Annual IEEE International Conference on Computational Intelligence and Communication Network CICN-2016.** Venue : Gyan Ganga Institute of Technology & Sciences, Jabalpur Contact : Dr. Santosh Vishwakarma santoshscholar@gmail.com
FEBRUARY **11-12, 2017**	**International conference on Data Engineering and Applications-2017 (IDEA-17)** at Bhopal (M.P.), http://www.ideaconference.in Contact : conferenceidea@gmail.com

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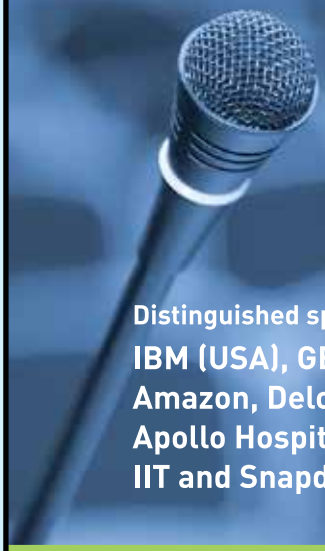

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