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IT2020 Technology…

by Computer Society of India, Mumbai Chapter
The Annual Convention of CSI Mumbai Chapter

27-28 February, 2014
VMCC, Indian Institute of Technology Bombay, Mumbai, India

Renowned speakers with rich industrial experience from India and abroad will be sharing their knowledge and experience.

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IT 2020, the biggest annual convention of the Computer Society of India, Mumbai Chapter is back in 2014. This 2-day technical convention will bring together top industry IT experts delivering case studies and learnings for focused sectors including BFSI, Retail, Healthcare, Logistics and IT Services on the following topics:

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<th>Big Data Analytics</th>
<th>Cloud Computing</th>
<th>Business Productivity Solution</th>
<th>Mobility</th>
<th>Evolution of Data Centre Technologies</th>
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<tr>
<td>Understanding the importance and feasibility of big data analytics and how key challenges and risks are mitigated by big data implementation</td>
<td>Understanding how organisations across the world are adopting cloud computing and responding to their business demands through bringing in agility innovation</td>
<td>Streamline the management and control of content, data, and processes across all areas of the organization with an optimized IT infrastructure.</td>
<td>Critically analysing the new paradigm shift in information exchange and its impact on current business models</td>
<td>Discussing real life business scenarios to illustrate how recent changes in data center technologies are leading to customer centric data centers that are more agile, efficient and secure</td>
</tr>
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</table>

Who should attend:

CxO’s and top management from Retail, BFSI, Logistics, Retail and Healthcare industries, IT Managers, Senior business strategists, technologists, and solution architects, Academicians, analysts and researchers

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Data Visualization and Visual Data Mining
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Dear Members

Let me begin by wishing all of you and your family a very happy new year – 2014. The year that passed by witnessed several interesting activities in CSI. To cap it all we had the 48th Annual Convention in Visakhapatnam during December 2013. What a wonderful event that was! The organizers deserve a special mention in our CSIC. I am sure you will get a detailed report from them. Shri. AP Chowdhary, CMD, RINL, Shri Madhusudan Rao, Director (Finance), RINL, and Shri. Chand, Director, RINL made wonderful arrangements with their team led by Shri Rajeswara Rao, GM(IT), RINL and Shri. P. Satyanarayana, Convenor, CSI-2013. Mere words cannot describe what they did and the experience that they delivered. Hats off to Vizag team. I was left with awe and admiration by the teamwork. Everyone was saying that CSI 2013 has set “new (higher) standard” for CSI Annual Conventions. The glorious days of CSI are back again. Close to 600 delegates and two award events – IT Excellence and e-Governance – made CSI 2013 a historical event.

The annual Students Conventions set new records as well. Over 2600 students from all over India attended the two-day long events. Several paper presentations, workshops, and interactive sessions marked the success of the events. The Vice-Chancellors of Andhra University and JNTU extended excellent support for the students’ convention. Their support was unparalleled in the history of CSI, to say the least. The sheer logistics of handling 2600 students and 600 delegates can make one go crazy. But “Team Vizag” managed everything with a smile.

The presence of Shri Chowdhary, CMD, RINL as Chief Guest during inauguration made a huge difference. A man of vision, Shri. Chowdhary spoke on the importance of the theme of the convention “ICT and Critical Infrastructure” by quoting several examples from steel industry itself. Shri J Satyanarayana, Secretary, DeiTy, MCIT, Gol made an inspiring speech on the theme as the Guest of Honor. Of course, CSI took pride in conferring the “Honorary Fellowship” on Shri J. Satyanarayana for his exemplary contributions to the field. Yours sincerely gave the Keynote Address on the theme.

The competition for CSI – IT Excellence Award was very severe. The jury had a tough time in reaching conclusions, with razor-thin margins in performance! But they did a wonderful job. Every one who was awarded richly deserved it and many were recognized for having reached the final stages with “Certificates of Appreciation”. The CSI – Nihilant e-Governance award this year saw more refined and advanced applications competing with each other. It was a delight to see a qualitative jump in quality of work and presentation. Both the functions were meticulously planned and conducted. Shri J Satyanarayana stayed on as Chief Guest for both. CSI is very thankful to him for the rare gesture.

Prof. Avadhani of Andhra University did a remarkable job of student papers presentation during the annual convention. Five parallel streams of presentation were going on all day. This was in addition to the Invited Talks from experts on various topics. Prof. Avadhani brought out the entire proceedings as book in time for the conference. Tough job indeed; but very well done. Many thanks from CSI to Prof. Avadhani and his team.

I had the opportunity to have an interactive session with students twice during the Students convention. The NextGen is bubbling with enthusiasm for sure. I think CSI should take its commitment to student community much more seriously and engage with them. It was an enriching experience to be with students.

The Convention Dinner was no ordinary matter. From filmy songs to folk songs, from filmy dance to folk dance, and to cap it all a campfire – everything was there. The venue on the top of a hill was an added attraction. Everyone around was enjoying.

On the whole 2013 ended as a year of action for CSI. The Golden Jubilee celebrations were started in 2013. The Students’ Convention and the CSI Annual Convention were a runaway success in 2013. With confidence we step in to 2014. The Delhi team is busy organizing an International Event for the Golden Jubilee as an Indo-French Joint International Workshop on Next generation Networks including Fiber Optics and Wireless Technologies. Shri R K Vyas, Prof Hoda, and Prof SS Agrawal are leading the Delhi Team. I am sure we can look forward to another interesting event soon – perhaps end February or early March 2014.

Prof. S V Raghavan
President
Computer Society of India
Dear Fellow CSI Members,

Very Happy New Year 2014 to all of you. The UN has designated year 2014 as the International Year of Family Farming and Crystallography (i.e. Science that examines the arrangement of atoms in solids). Wikipedia also claims that year 2014 will mark obsolescence of Moore's Law of continuous microchip miniaturization. With this note we wish you all a year full of peace and prosperity, and more particularly many delightful events in 2014 as well as beyond 2014. As a part of revitalizing exercise for your beloved CSI Communications, Knowledge Digest for IT Community, every month, month after month, we, the Editors have been trying our level best and are now close to completing our three years of editorship together. Throughout this period of three years, we have been setting forth the advent of computing in several state-of-the-art arenas to see the color of computing in every sphere of life. It's high time to hear back from you, our beloved readers, about your thoughts and more importantly your feedback. Do send your feedback promptly to csic@csi-india.org.

The UN has designated year 2014 as the International Year of Family Farming and Crystallography (i.e. Science that examines the arrangement of atoms in solids). Wikipedia also claims that year 2014 will mark obsolescence of Moore's Law of continuous microchip miniaturization.

This month, we delightfully present Computer Vision as our theme. Computer vision encompasses technique of capturing, processing and analyzing images or other symbolic information such that machines that see and "understand". Image data can take several forms, video, views through multiple cameras or scanned ones. Computer vision research tries to closely resemble the behavior and characteristics of biological vision applied to machines, computer, in particular.

The cover story of this month is on Hyperspectral Imaging: A Paradigm in Remote Sensing by Dr. Mehul S Raval. In this article, the author has shown how hyperspectral imaging can provide more detailed and accurate information about the ground content within instantaneous field of view (IFOV), which has similar spectral signature. However, one must note that narrow and contiguous bands are more important in hyperspectral imaging rather than the number of bands, which it can measure.

We have three interesting articles in Technical Trends section. First one by Prof. Shantala Patil and Dr. Kiran Kumari Patil is on Roles of Computer Vision, Image Processing and Pattern Recognition in Healthcare Application. Second one is by Chintan Bhatt on Data Visualization and Visual Data Mining. The third one is on Image Retrieval for Computer Aided Diagnosis by Dr. Krishna A N and Dr. B G Prasad.

Our Research Front section is enriched with three eye-opening contributions: first one titled Partial Differential Equation (PDE) Based Medical Image Processing by Rohit Kamal Chatterjee, second one on Automatic Label Prediction for Scene Categorization in computer vision: Issues and Challenges by Madhubala Myneni and Dr. M.Seetha. Third one is De-Noising Image Filters for Bio-Medical Image Processing by Raka Kundu and Prof. Amlan Chakrabarti.

Article section has an article titled Man in the Browser Attack by Aakash Goyal. Author explains in this article how hackers use this attack called man in the browser to break into the well-known two-factor authentication technique and exploit the vulnerabilities in browser security to alter web pages, transactions or insert extra transactions, in a secret way invisible to both the client and hosting server. Author also discusses solutions against this attack.

Very special contribution comes from Great Guru of Software Engineering, Father of Use Cases, Prof. Ivar Jacobson alongwith Ian Spence, and Pan-Wei Ng in Practitioner Workbench’s Software Engineering.Tips() subsection on Agile and SEMAT—Perfect Partners, where authors explain how combining agile and SEMAT yields more advantages than either one alone.

In the Information Security section of the Security Corner, Krishna Chaitanya Telikicherla and Harigopal K B Ponnapalli of Infosys have written their seventh article in the series of articles on Web Application Security. The article is on Protecting Users from Clickjacking Attacks on the Web, wherein authors explain how attackers are stealing user's clicks on the mouse for creating more devastating effects than the keyloggers and provide information about two major defenses which developers can use as mitigating techniques against this new risk.

In the section on ITYesterday(), we have an interesting article by Ms Biji CL of University of Kerala who writes about the Chronicles of Modern Communication from M.F.B. Morse to C.E. Shanon on the backdrop of end of telegraph era in the recent past.

As usual there are regular features such as Brain Teaser, Ask an Expert, Happenings@ICT, CSI Reports, CSI News and various announcements. However, some features like On the Shelf!, Programming.Learn("R") are omitted due to want of pages.

Please note that we welcome your feedback and suggestions at csic@csi-india.org

With warm regards,
Rajendra M Sonar, Achuthsankar S Nair, Debasis Jana and Jayshree Dhere
Editors
Hyperspectral Imaging: A Paradigm in Remote Sensing

Introduction
Science and technology of remote sensing has grown immensely in recent times, thanks to the improvement in sensor technology. Powerful sensors, now available, have opened up new application vistas using remotely sensed images. Remote sensing of the earth using imaging spectroscopy has enabled quantitative analysis of an area within an instantaneous field of view (IFOV) of the sensor. Spectral imaging allows extraction of the information, which cannot be done by human eyes. Hyperspectral (HyS) imager collects two-dimensional (2D) spatial images over the numerous contiguous wavelengths. Each image captures information in the part of the electromagnetic spectrum known as spectral band. Width of each band in the spectrum is known as spectral resolution. Hyperspectral imager measures the reflected radiance over very narrow and contiguous wavelength bands. This results in an extremely high spectral resolution when collected over many bands. Band wise images are then fused to produce the hyperspectral image cube. The three dimensional (3D) cube is a combination of the spatial (X and Y axis) and spectral information (Z axis) of the ground surface as shown in Fig. 1. The image shown in Fig. 1 is one of the bands captured by AVIRIS. This phenomenon of capturing enormously high spectral resolution images is responsible for the nomenclature “Hyper spectral” for the given cube.

Table 1 Imaging sensors and their characteristics

<table>
<thead>
<tr>
<th>Introduction Year</th>
<th>AVIRIS</th>
<th>HyDICE</th>
<th>Hymap</th>
<th>Probe-1</th>
<th>Hyperion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform</td>
<td>airborne</td>
<td>airborne</td>
<td>airborne</td>
<td>airborne</td>
<td>space-born</td>
</tr>
<tr>
<td>Nominal Altitude (km)</td>
<td>20</td>
<td>6</td>
<td>5</td>
<td>2.5</td>
<td>705</td>
</tr>
<tr>
<td>Spatial Resolution (m)</td>
<td>20</td>
<td>3</td>
<td>10</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>Spectral Resolution (nm)</td>
<td>10</td>
<td>10</td>
<td>17</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Spectral Coverage (μm)</td>
<td>0.4-2.5</td>
<td>0.4-2.5</td>
<td>0.4-2.5</td>
<td>0.4-2.5</td>
<td>0.4-2.5</td>
</tr>
<tr>
<td>Number of Channels</td>
<td>224</td>
<td>210</td>
<td>128</td>
<td>128</td>
<td>220</td>
</tr>
<tr>
<td>Swath Width (km)</td>
<td>12</td>
<td>0.9</td>
<td>6</td>
<td>3</td>
<td>7.7</td>
</tr>
</tbody>
</table>

Characteristics of Hyperspectral Imaging (HySI)
The spectral resolutions in HySI spans across visible, infrared and short wave infrared spectral band. The examples of hyper spectral imaging sensors with their characteristics is shown in Table 1 which is available in the J. Nascimento Ph.D thesis.

The pixel value at the ground which determines the spatial resolution varies widely from few meters to tens of meters depending on the altitude of the sensor. Spatial resolution discriminates actual objects of interest on the ground. Higher the spatial resolution, smaller is the size of object on the ground which can be uniquely captured by the sensor.

Multispectral and Hyperspectral Imaging
Notion of capturing ground information across various spectral bands is not new for geospatial applications. In fact since 1970’s satellite images has been captured across multiple bands using multispectral sensors. Some important examples of the multispectral sensors are LANDSAT, SPOT, AVHRR. They measure the earth surface with a small number of wavelengths bands. Also a large gap exists between each of these bands. For example, advanced very high-resolution radio meter (AVHRR) has following channel characteristics shown in Table 2.

Multispectral images thus deals with multiple “isolated” spectral bands spread over a range (0.58 - 12.50 μm). They cannot take measurements across all parts of the electromagnetic spectrum as certain bands are left out. Thus, multispectral sensor fails to capture the complete signature range of the object due to these isolated patches of the spectrum, which do not contribute in the spectral measurements. Hyperspectral imagers on the other hand capture same information over the contiguous wavelength bands and thus they produce the “continuous” spectra for all the pixels in IFOV. The spectrum of the single pixel across the spectra appears like the one measured by spectrometer in the lab. Therefore, HySI is also known as the image spectroscopy. This detail is responsible for providing colossal quantity of information, which is not possible with multispectral imaging sensors. Typical spectral signatures are shown in Fig. 2.
Mathematically hyperspectral image is an over determined system due to excessive information availability over the numerous contiguous wavelength bands (0.4 to 2.5 μm cf. Table 1). This provide immense amount of information and allows greater discrimination between the spectrally similar ground information. Thus, due to data abundance hyperspectral imaging provide more detailed and accurate information about the ground content within IFOV, which has similar spectral signature. However, one must note that narrow and contiguous bands are more important in hyperspectral imaging rather than the number of bands, which it can measure. As seen from the Table I typical spectral width is in between 10 - 20 nm. This phenomenon of narrow and contiguous bands also yields a great advantage to the hyperspectral imaging as it can clearly distinguish between the spectrally similar signatures. This means it can be successfully deployed to distinguish between the vegetation, construction material, camouflage identification for the defense forces and many other applications.

Processing the Hypercube

As seen from Table I the pixel size in HyS image covers roughly 100 m² on a ground for a typical hyperspectral sensor. It is very likely that several substances are present in this coverage area. As a result signal captured by the sensor in a specific band and at a specific spatial resolution is the mix up of the substances present in the area. Therefore, a single pixel in an image is formed due to combination of these substances. The constituent substances in the pixels are termed as end members in the hyperspectral terminology. Each of these end members has a unique signature in the electromagnetic spectrum and therefore a single pixel in the hyperspectral image is formed due to mixing of these end member spectrum. It is very likely that this mixing phenomenon is applicable to every pixel in the given hypercube. Therefore one of the problem formulations using the hyperspectral imaging is as follows:

“Given the hyperspectral cube, decompose each pixel into its basic spectral signature(s) (end member(s)) and find their corresponding fractions known as abundances which are contributing to a pixel formation.

Abundance indicates the fractions or proportion of each end member present into the given pixel. The problem of decomposing given pixel into its end members and finding proportion for each one of them is known as hyperspectral unmixing. This is a very tough problem to solve if only the hypercube is given and both; end members and their abundances are to be identified from it. This problem is known as blind hyperspectral unmixing.

Depending on the mixing proportions, problem is modeled using the linear mixing model (LMM) or non-linear mixing model. Linear mixing model is easy to solve and is applicable if the mixing proportions are very large and substances do not significantly overlap in the pixel. The linear mixing model assumes minimal interactions among the end members constituting the pixel.

The LMM can be written as

\[ r = M \alpha + n \]

Where \( n \) indicates additive white Gaussian noise (AWGN), \( r \) is the spectral measurement (reflectance), \( M \) is the mixing matrix containing end member signature present in the scene and \( \alpha \) are the fractional abundances.

In the nonlinear mixing scenario end members significantly overlap and the light is scattered heavily before it is captured by the sensor. In case, the light scattering is not very heavy than linear model is applicable with a good accuracy.

Typical steps involved in the hyperspectral unmixing are as follows and can be further referred from the J. Nascimento work:

Input: Radiance data cube
Output: End members and/or fraction (abundances).

Step I: Atmospheric correction is applied to radiance data cube which results in the reflectance values. This correction takes care of illumination, atmospheric effects, shadow effects, sensor and sun directionality effects.

Step II: Data reduction is required due to mammoth dimensionality of the hyper cube. Reasons for data reduction are also aided by the fact that number of end members is significantly smaller than number of wavelength bands in the hyperspectral cube. Further, certain noisy bands with minimal information are removed from the cube. The wavelengths in these bands are more susceptible to a specific form of distortions. This step reduce the data size, improves computational efficiency, and signal to noise ratio (SNR).

Step III: Spectral unmixing yields the end members and their abundances at each pixel in the hypercube. Abundances at each spatial locations are combined to yield the abundance maps.

Typical abundance maps are shown Fig. 3. The fractional abundances are non-negative and they sum up to one. Thus, non-negativity and sum to one constraint are imposed on the abundances during spectral unmixing. The problem can be simplified by assuming that either of the \( M \) or \( \alpha \) is known and then unravel problem to find the other unknown entity. This solution is known as supervised hyperspectral unmixing.

Application of Hyperspectral Imaging

U.S. geological survey (USGS) has used tetracorder to identify and map minerals present on surface of the earth, vegetation, snow, water, and pollution. It has created the enormous bank of spectral signatures for various materials and is made available to the researchers. Hyperspectral imaging can be used for many applications like...
target detection, mineral mapping, earth and sea surface properties, material identification and many more. Some application may require identifying targets from a very similar background e.g. detecting military vehicles or installation under the canopy. Similarly, agricultural scientist use hyperspectral imaging to identify the diseased plants among the non-diseased ones. Another interesting application of hyperspectral imaging is in the area of oil exploration. Hydrocarbons leave a specific signature, which can be captured very efficiently by the hyperspectral sensors. Normally hydrocarbons mix with the other substances on the surface and they are very difficult to track using the multispectral sensor. Hyperspectral imaging can be used to identify the material in a terrain, which is inaccessible to humans. Such a finding can have a huge impact on economy of the country. HySI can also be used to map the soil properties like moisture, salinity and helps in improving the agriculture yield.

**Summary**

Hyperspectral imaging opens up tremendous opportunity in many application domains simply due to the richness of available data. Even though blind hyperspectral unmixing is a relatively difficult and an ill posed problem, researchers are striving to develop rich mathematical models and efficient software and hardware solution for the hypercube. These efforts are making HySI a very promising technology for the geo spatial technologies of the future.

**References**


Roles of Computer Vision, Image Processing and Pattern Recognition in Healthcare Application

There has been a long history of computers in medicine. The more advanced the medical instrumentation, the more it relies on the computer capability. For medical imaging, computer vision, image processing and pattern recognition techniques are particularly important to provide the required information in diagnosis and treatment. The progress in these techniques is reflected in the sophisticated software tools some of which are commercially available, and others may still be in research and development stage. The software making use of computing power is very useful to deal with the enormous amount of data in medical imaging.

For medical images, the first thing we need to consider is to use image processing techniques (see e.g. [2][6]). They can include image enhancement in spatial and frequency domains, restoration of object from distorted or convoluted images, color image processing, wavelet and multiresolution image processing, image compression, morphological image processing and image segmentation. Both image enhancement and segmentation can be considered as low level computer vision. For mid-level computer vision, computers can organize the knowledge (information) acquired in the low-level vision to make some useful decisions. For high-level vision, computers must further provide some “thinking” capability like humans do. The above stated division of computer vision tasks may not be precise, but for medical imaging, the low level vision is most important as the results are used for human expert (physicians) to interpret.

Thus interactive and 3-D visualization capabilities can be significant. Pattern recognition is closely linked to the image processing and computer vision especially for image segmentation. Some basic tasks in pattern recognition (see e.g. [7][8]) are feature extraction, pattern description (be it statistical, syntactic, structural or else), learning, and decision making process. A major objective in pattern recognition is to make correct decisions or classification with the help of the other three tasks. A good classification is much needed for image segmentation. Though artificial neural networks and support vector machines have made classifier easier, they still cannot be fully relied on in practical recognition problems. There have been tremendous progress in image processing, pattern recognition and computer vision in the last decades (see e.g. [9-13]) with many applications including the medical area. For images in medical imaging, it is necessary to use the multiple information sources, like intensity, texture, shape, and contextual information within an image and between images. In fact information that captures the dynamics of the medical image patterns can be the key to the success of extracting desired diagnosis information from the images. With greatly improved medical sensors/devices and the use of multiple sensors, it may be necessary to fuse the data from several sources to aid in the diagnosis and treatment. A note on the performance measure is needed here. The simple percentage correct recognition rate can be highly inadequate. For medical imaging, the ROC (receiver operating characteristics) curve is most popular. It is a plot of recognition rate versus the false alarm rate. Other measures include the sensitivity (true positive rate) versus specificity (true negative rate). The accuracy is probably a major challenge for computer vision/pattern recognition in medical imaging. While there was success in early developments like computer chest X-ray screening for black lungs, the high accuracy desired for medical imaging, such as automated detection and segmentation, and extraction of area or volume information for regions of interest, is still not reached to the author’s knowledge. This means that automated method cannot replace the manual operations. With constant progress in computer vision and pattern recognition, however, the opportunities are really unlimited to reach our goals in medical imaging. Among the large number of signal/image processing techniques have been examined for medical imaging use, the multi resolution image processing stands out to be useful most of the time at it captures the intensity and texture information well and for single image the contextual information also. Effort is much needed to make use of information from a sequence of images to achieve improved segmentation.

Medical Imaging

There has been enormous progress in medical imaging techniques and modalities in the last decade or so. For example ultrasound has found its use in many areas previously using x-ray or other techniques. Accompanied with the progress is the greatly increased use of computer vision techniques in medical imaging. In computer vision we talk about the low-level processing which involves basic image processing operations like noise filtering, contrast, enhancement and image sharpening, the mid-level processing which involves image segmentation and pattern recognition as well as 3D reconstruction and the high-level processing which involves ‘making sense’ of an ensemble of recognized objects and performing the cognitive functions at the far end of the processing sequence. Medical imaging refers to the techniques and processes used to create images of the human body for clinical purposes, or procedures seeking to reveal, diagnose or examine disease or studying normal anatomy and physiology [9]. Medical imaging evolved from the discovery of x-rays to the newest magnetic resonance image (MRI). The most commonly used techniques these days are x-ray, computer tomography (CT), ultrasound, MRI and positron emission tomography (PET). The emphasis of medical imaging is to help doctors or other trained personal to provide better diagnosis and treatment and thus the low level and mid-level computer vision is particularly important in the medical area. It is evident that medical imaging has significant impact on medicine and computer vision making use of enormous computing power has enormous impact on medical imaging. The following sections will briefly discuss the nature of some of these medical images and the technology behind them.
Some Medical Imaging Methods

**X-ray**
X-ray is the first and oldest medical technique available to doctors for the visualization of the body without surgery. X-rays were first discovered by Wilhelm Rontgen in 1895. They penetrate most biological tissues with little attenuation and thus provide a comparatively simple means to produce shadow or projection, images of human body. However X-rays have ionizing effects on the body and hence should not be repeatedly used. The X-ray imaging system involves having a film or screen containing a radiation-sensitive material exposed to the x-rays transmitted through the region of the body. The developed film or excited phosphorous screen exhibits a geometric pattern produced by the structures in the beam path [4]. However X-ray imaging is limited as the signal can be reduced due to the scattering of a large percentage of radiation from the body and much detail is lost in the radiographic process with the superposition of 3D structural information onto a 2D surface. Fig 1 is the X-ray image of the bones. X-ray system has now been greatly improved. Its use for digital mammogram is particularly important (see e.g. Fig. 2, based on our 1996 data base [14]).

**Magnetic Resonance Image (MRI)**
Magnetic Resonance Image was developed in the early 1970s and has become versatile and clinically useful. MRI become versatile and clinically useful developed in the early 1970s and has Magnetic Resonance Image was e.g. Fig. 2, based on our 1996 data base [14]).

**Intravascular Ultrasound (IVUS)**
Intravascular Ultrasound (IVUS) allows us to see the coronary artery from the inside-out. This unique picture. A growing number of cardiologists think that new information yielded by IVUS can make a significant difference in how patient is treated and can provide more accurate information which will reduce complications and incidence of heart diseases. Intravascular ultrasound (IVUS) is a catheter-based

**Conclusions**
Although images in digital form can easily be processed by basic image processing techniques, an effective use of computer vision can provide much useful information for diagnosis and treatment in health care domain. It has been a challenge to use computer vision in medical imaging because of complexity in dealing with medical images.

**References**

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Data Visualization and Visual Data Mining

Introduction
With today's data size, it is only possible to view very small portions of the data at a time. If data is presented textually, the amount of data that can be displayed is in the range of some one hundred data items, but this is like a drop in the ocean when dealing with data sets containing millions and billions of data items. The ubiquity and increasing power of computer technology has significantly increased data collection, storage, and manipulation ability. Researchers from the University of Berkeley estimate that every year about 1 Exabyte (= 1 Million Terabytes) of data are generated, of which a large portion is available in digital form. Early methods of identifying/extracting patterns in data include Bayes’ theorem (1700s) and Regression analysis (1800s). As data has grown in size and complexity, direct “hands-on” data analysis has increasingly been augmented with indirect, automated data processing, aided by other discoveries in computer science, such as neural networks, cluster analysis, genetic algorithms (1950s), decision trees (1960s), and support vector machines (1990s).

Data mining is the process of applying these methods to uncover hidden patterns[1] in large data sets. One of the most challenges we face today is making sense of all this data (i.e. find out relevant/useful/valuable data from large heterogeneous databases). Data Visualization is the creation and study of the visual representation of data, meaning “information that has been abstracted in some schematic form, including attributes or variables for the units of information”.

Benefits of Visualization
Visual data exploration can be accomplished by automatic techniques from statistics, pattern recognition, or machine learning. In addition, the main advantages of visual data exploration:

- Visualization can provide a qualitative overview of the data, allowing managers/scientists/researchers to take appropriate decisions.

Data Visualization Tools
Different tools are available for data visualization. They are explained as follows:

Weka 3: Data Mining Software in JAVA
It contains machine learning algorithms (i.e. classification algorithms, clustering algorithms etc.) to perform different data mining tasks. Here I have used data set of IRIS which contains 150 instances. The data set contains 3 classes of 50 instances each, where each class refers to a type of iris plant. Here J48 classifier (which contains Class for generating a pruned or unpruned C4.5 decision tree) is applied on above data set. First you have to fit your decision tree (J48), in the usual way. In the results list panel (bottom left on Weka explorer), right click on the corresponding output and select “Visualize tree”. As visualization, output is shown in Fig. 1.

With the help of visualization, we can easily traverse through each and every node of above tree. J48 provides both functionalities i.e. more accuracy and high speed for small data sets.

Other data mining tools for visualization are Orange, XGobi/ggobi, Explain etc.

Methods for Visual Data Mining
Methods used in visualization of data (based on type of data) are explained below:

- Univariate data (Methods are Histogram and Pie Chart)
- Bivariate data (Methods are Scatter plots and Line Graphs)
- Multivariate data (Methods are Icon based methods, Pixel based methods and Dynamic parallel coordinate system)

Again following methods are there for multidimensional multivariate data:

- Icon based methods
- Pixel based methods
- Dynamic parallel coordinate system

Fig. 1: Result of J48 on IRIS data set

As data has grown in size and complexity, direct “hands-on” data analysis has increasingly been augmented with indirect, automated data processing, aided by other discoveries in computer science, such as neural networks, cluster analysis, genetic algorithms (1950s), decision trees (1960s), and support vector machines (1990s).
Application of Visual Data Mining

Visual Data Mining can be applied to each and every sector including medical, education, agriculture, automobile, entertainment, social media (smiley in facebook, twitter, whatsapp etc.) etc. due to its advantages like presentation, confirmatory analysis and explanatory analysis. It can be used for governments also (Example is given below). Here concept of Chernoff faces (Icon based method) is explained with example. In 1973, Herman Chernoff introduced a visualization technique to illustrate trends in multidimensional data\(^3\). Different data dimensions were mapped to different facial features, for example the face width, the level of the ears, the radius of the ears, the length or curvature of the mouth, the length of the nose etc. All useful features are displayed in Fig. 2:

Fig. 2: Different features of faces

Basic idea of Chernoff faces is to visualize data Values as features of icons.

Anyone can make customized face as per requirement and application. Fig. 3 shows application of Chernoff faces in which different parameters are used like unemployment rate urban stresses etc\(^3\). Here another example is illustrated in which chernoff faces can be used to analyze agriculture growth for different regions in any country. We can develop this type of applications.

From table 1 we can easily analyze agriculture data in different regions. For example North region contains high crop production and water availability, but management of Livestock and fisheries is poor. Interpretation of different facial expressions is shown in Table 2.

![Table 1 Result of different regions](image)

<table>
<thead>
<tr>
<th>Result</th>
<th>North</th>
<th>South</th>
<th>East</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>😊</td>
<td>😞</td>
<td>😞</td>
</tr>
</tbody>
</table>

Table 1 Result of different regions

Where

<table>
<thead>
<tr>
<th>Crop Production</th>
<th>Livestock and fisheries management</th>
<th>Water Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>🍇</td>
<td>🍇</td>
</tr>
<tr>
<td>Medium</td>
<td>🍉</td>
<td>🍉</td>
</tr>
<tr>
<td>Low</td>
<td>🍇</td>
<td>🍇</td>
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</tbody>
</table>

Table 2 Mapping of different agriculture parameters to different facial expressions

Conclusion

Visual Data mining is an evolving filed and expanding fast. It can be used for almost all types of data. Main challenge is to find out appropriate techniques to simplify exploration of data and provide sufficient understanding and interaction with huge amount of data and multidimensional datasets. 3D visualization is also a big research challenge right now we are facing. Dealing with images is a big challenge as it consumes more bandwidth and space. Image processing is also comes in picture while handling with these kind of applications. Other research topic is Hybrid Techniques which provides necessary features for new problems.

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Image Retrieval for Computer Aided Diagnosis

The last century has witnessed vast development as far as imaging tools go. Magnetic Resonance Imaging (MRI), Computed Tomography (CT), Positron Emission Tomography (PET), Single Photon Emission Computed Tomography (SPECT) and Ultra-sonography are some of the latest developments which have assisted the medical fraternity immensely. All these non-invasive imaging tools have benefitted the doctors in giving more accurate and timely diagnosis of diseases so as to improve patient care. Added to this, is the high research attention/focus on newer areas like molecular, functional, cellular and genetic imaging tools, coupled with increasing capabilities in the Information Technology, image fusion and integration capabilities. Image guided therapy, non-invasive treatment methods, ultra-sonography based disease prevention and cure are some of the latest advancements. All these help in enhancing ability to accurately diagnose and recognize diseases and thereby improve patient care and therapy.[1][2]

The development of Computer Aided Diagnosis (CAD) systems to assist physicians in making better decisions has been the area of interest in the recent past. CAD systems aim to provide computer output as a second opinion in order to assist radiologists/physicians in their image interpretation in detection of abnormalities, quantification of disease progression and alternate diagnosis of lesions to improve the accuracy, efficiency and consistency of diagnosis. The CAD systems developed so far include the detection of breast masses and micro-calculifications in mammograms, detection of lung nodules and pulmonary embolism in chest radiographs and thoracic CT, detection of polyps in CT colonography, detection of lacunar infract, unruptured aneurysm, occlusion in MR brain images and detection of glaucoma, diabetic retinopathy and hypertensive retinopathy in retinal images.[3][4]. Among them, CAD systems for detection of breast cancer on mammograms and detection of pulmonary nodules in X-ray images are commercially available. A major impact of CAD on medical imaging and diagnostic therapy may be expected in the future. Since a number of commercial CAD systems for detection of breast cancer are currently available for clinical use, some recent research has been focused on clinical studies evaluating the effect of CAD on radiologist’s performance. Though CAD improves radiologist’s efficiency in searching for and detecting micro-calculifications, the majority of CAD-cued false-negative cancers associated with malignant tissues are discarded by the radiologist’s as false-positives. Such errors may be due to (1) relatively low performance of CAD systems and (2) the inability to explain the reasoning of CAD decision making.[5]

Support of past similar images and their reports is critical to a radiologist’s examination reading, providing a baseline essential for confirmation, comparison and/or evaluation of the suspicious radiographic signs detected on the current examined images. Such support is of clinical importance and may have significant effects on radiologist’s examination reading efficiency, work satisfaction and service quality. To alleviate time and physical demands on radiologists and support their prior image reference needs, a pre-fetching strategy that selects a set of patient images presumably relevant to a current examination reading task and makes them available to the radiologist in advance of an examination reading is to be adopted. An ideal scenario is where a medical image (or image series) generated by an imaging station will be analyzed for possible abnormalities and then compared with existing (reference or target) images stored in a database. With such capabilities, role of medical imaging would expand and the focus could shift from generation and acquisition to more effective post processing, organization and interpretation. To approach this kind of automation, image retrieval need to be addressed and integrated in a computer assisted diagnostic environment.[6][7].

Medical Image Retrieval

The term image retrieval means finding similar images (may not be exact) from a large image archive with the help of some key attributes associated with the images or features inherently contained in the images. A large amount of research has been carried out on image retrieval (IR) in the last two decades. In general, the research efforts on IR can be divided into two types: Text Based Image Retrieval (TBIR) and Content Based Image Retrieval (CBIR). In the traditional TBIR, images are manually annotated by humans and then indexing and retrieval is performed based on the annotated textual descriptions. Annotating a large amount of images manually is time-consuming, tedious and expensive and is often subjective, context-sensitive and incomplete. In CBIR, images are indexed and retrieved based on automatically extracted visual content features such as color, texture and shape. There are many factors to consider in the design of a CBIR systems based on the domains and purposes, choice of right features, similarity measurement criteria, indexing mechanism and query formulation technique. The most important factors in the design process is the choice of suitable visual features and the methodologies to extract them from raw images, as it affects all other subsequent processes.

A visual content descriptor can be either global or local. A global descriptor uses the visual features of the whole image, whereas a local descriptor uses the visual features of regions or objects to describe the image content. A better method is to divide the image into homogenous regions according to some criterion using region segmentation algorithms that have been extensively investigated in computer vision. A more complex way of dividing an image, is to undertake a complete object segmentation to obtain semantically meaningful objects.
CBIR is like an information filter process and is expected to provide a high percentage of relevant images in response to user query. It should conform to human perception of visual semantics. Medical images arising from photography (e.g., endoscopy, histology and dermatology), radio-graphic projection (e.g., x-rays, some nuclear medicine) and tomography (e.g., CT, MRI and ultrasound) impose unique, image dependent restrictions on the nature of features available for abstraction. Medical images arising from photography suggest a database indexing scheme that could take into account color hue as an indexing feature because of their inherent properties of color, shading and resolution. Thus a query structure could be devised to retrieve images sharing a common staining technique. Ultrasound images of large organs with relatively uniform tissue such as spleen or liver present relatively homogeneous image patterns. These might be indexed by mathematical image processing approaches that characterize global image texture (e.g., the Fourier or Laplace transforms). Tomographic images grouped by acquisition from individual subjects also have the unique virtue of retaining the data required for unambiguous, three-dimensional reconstruction of tissue structures, thus offering further computational opportunities for novel, shape-matching similarity operations. Images whose dominant features are patterns of overlapping structures might lend themselves to computational indexing by global image processing parameters. These computational approaches could perhaps concentrate on reducing, say, the image intensity profile into its non-visible frequency components, such as edge boundary orientation. An alternative approach might be abstraction by mathematical morphology to density BLOBs (Binary Large Object), which can then be compared and ranked mathematically. In this section, we will introduce some widely used techniques for extracting color, texture and shape features from images.

**Color**

Color feature is the most direct-viewing and powerful descriptor that simplifies object identification and is one of the most frequently used visual features for CBIR. Its three-dimensional values make its discrimination potentiality superior to the single dimensional gray values of images. It is relatively robust to background complication and independent of image size and orientation. Key issues in color feature extraction include the choice of a suitable color space based on human perception, color quantization to reduce computational complexity and color descriptor to generate a feature vector. There are a variety of commonly used color spaces, such as RGB, HIS, HSV, HMMD, L*a*b*, L*u*v*, with uniform and non uniform quantization. Some of the popular color descriptors are color histograms, color moments, color correlograms, dominant color regions approach and color clustering. While color is one of the visual cues often used for content description, most medical images are gray-scale. True color-based characterization is applicable only where color photographs are used for diagnosis, such as ophthalmology, pathology and dermatology or when color is used to scale flow velocities or intensity scales such as in nuclear cardiology.

**Texture**

Texture is considered as one of the most important characteristics which have been used to classify and recognize objects and regions of interest in an image. Despite its importance, there is no unique and precise definition of texture. Many images may present an irregularity in local region, but actually display some kind of regularity in whole, which is usually called texture. A texture is usually characterized by the two-dimensional variations of the intensities present in the image. In medical domain, texture-based descriptors become practically important as they reflect the fine details contained within an image. An effective texture descriptor can significantly improve the performance of image retrieval. Existing texture analysis approaches can be loosely divided into four categories: structural, statistical, model-based and transform-based methods.

**Structural** approaches represent texture by well-defined primitives (micro-texture) and a hierarchy of spatial arrangements (macro-texture) of these primitives. To describe the texture, one must define the primitives and the placement rules. The choice of a primitive and the probability of the chosen primitive to be placed at a particular location can be a function of location or the primitives near the location. The structural approach provides a good symbolic description of the image and is more useful for synthesis than analysis tasks. The more powerful tool for structural texture analysis is provided by mathematical morphology. It may prove to be useful for analysis of bone images, e.g. for the detection of changes in bone micro-structure.

**Statistical** approaches do not attempt to understand explicitly the hierarchical structure of the texture. Instead, they represent the texture by the non-deterministic properties that govern the distributions and relationships between the gray levels of an image. Methods based on second-order statistics have been shown to achieve higher discrimination rates than the transform-based and structural methods. The most popular second-order statistical features for texture analysis are derived from the co-occurrence matrix. They were demonstrated to be a potential feature for effective texture discrimination in biomedical-images.

**Model based** texture analysis attempt to interpret an image texture by use of generative image model (using fractal model) and stochastic model. The parameters of the model are estimated and then used for image analysis. The computational complexity arising from the estimation of stochastic model parameters is the primary problem. The fractal model has been shown to be useful for modeling some natural textures. It can be used also for texture analysis and discrimination. However, it lacks orientation selectivity and is not suitable for describing local image structures.

**Transform** methods such as Fourier, Gabor and wavelet transforms represent an image in a space whose coordinate system is closely related to the characteristics of a texture (such as frequency or size). Methods based on the Fourier transform perform poorly due to lack of spatial localization. Gabor filters provide better spatial localization. However, their usefulness is limited in practice because there is usually no single filter resolution at which one can localize a spatial structure in natural textures.
Compared with the Gabor transform, the wavelet transforms has the following advantages:

- Varying spatial resolution allows representing textures at the most suitable scale.
- Wide range of choices for the wavelet function allows choosing wavelets best suited for texture analysis in a specific application.

The above features make the wavelet transform attractive for texture segmentation. The problem with wavelet transform is that it is not translation-invariant.

**Shape**

Shape features of objects or regions are the most important features in CBIR. To extract regional or local features, segmentation is very important in medical imaging. Shape-based retrieval involves three primary issues: shape representation, shape similarity measure, and shape indexing. Among them, shape representation is the most important issue. Shape descriptors can be classified into two categories: contour-based versus region-based. Contour-based shape descriptors such as Fourier descriptors, curvature scale space and shape signatures exploit only boundary information, they cannot capture shape interior content. Besides, these methods cannot deal with disjoint shapes where boundary may not be available; therefore, they have limited applications. In region-based techniques, all the pixels within a shape region are taken into account to obtain the shape representation. Common region-based methods use moment descriptors to describe shape. These include geometric moments, Legendre moments, Zernike moments and pseudo Zernike moments. Recently, several researchers also use the grid method to describe shape. The grid-based method attracts interest for its simplicity in representation, conforms to intuition and also agrees with shape coding method in MPEG-4. Since region-based shape representations combine information across an entire object rather than exploiting information just at boundary points, they can capture interior information in a shape. Other advantages of region-based methods are that they can be employed to describe disjoint shape and are robust to shape distortions.

**Semantic Indexing and Retrieval**

Though many sophisticated descriptors have been designed to describe color, texture and shape features, these alone do not adequately model the image semantics. Extensive experiments on CBIR systems show that low-level contents often fail to describe the high-level semantic concepts in users mind. Therefore, the performance of CBIR is still far from users expectations. In order to improve the retrieval accuracy of CBIR systems, research focus has been shifted from designing sophisticated low-level visual feature descriptors to narrowing down the semantic gap between the low-level visual features and the richness of human semantics. Five major categories of the state-of-the-art techniques to narrow down the semantic gap are: (1) using object ontology to define high-level semantics; (2) using machine learning (either supervised or unsupervised) to extract (or learn) associations between low-level features and high-level concepts; (3) using relevance feedback to learn users intention; (4) generating semantic model to support image retrieval with high-level semantics; (5) fusing the evidences from HTML text and the visual content of images for WWW image retrieval [9].

**Indexing Structures and Similarity Measures**

An important aspect of IR systems is the speed and efficiency with which a query object can be compared to the database. Often, indexing mechanisms are used to improve upon pair-wise comparisons of the query to all database objects allowing retrievals to filter out large irrelevant portions of the database using distances to reference keys. To make the CBIR truly scalable to large size collections, efficient multidimensional indexing techniques need to be explored. The existing popular multidimensional indexing techniques include $k$-d tree, $hB$-tree, R-tree, $R^+$-tree, Buddy-Tree, M-tree, GC-tree, T5-tree.

Once images are indexed into the database using extracted feature vectors, the retrieval of images is essentially the determination of distance between the feature vectors representing the images. The desirable distance measures should reflect human perception. That is to say, perceptually similar images should have smaller distance between them and perceptually different images should have larger distance between them. Computation efficiency should also be considered when choosing a distance measure. Various distance measures have been exploited in image retrieval, they include city block distance, Euclidean distance, cosine distance, histogram intersection distance, $x^2$-statistics distance, quadratic distance and Mahalanobis distance.

**Conclusions**

A well-organized image database, accompanied by an intelligent retrieval mechanism, can support clinical treatment and provide a basis for better medical research and education. This requires intelligent systems that have the ability to capture, recognize and understand the complex content of medical images. CBIR is a promising approach to achieve these tasks and a number of techniques have been developed for use with medical images. More research is needed for the solution of high-level semantic based image retrieval, where images can be segmented automatically into objects of anatomical interest and diagnosis can be performed automatically from objects visual features by incorporating appropriate domain knowledge, machine learning, reasoning and human computer interaction. Automated classification of biomedical images is potentially of great significance; this may be used as a front-end in CBIR system.

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Partial Differential Equation (PDE) Based Medical Image Processing

Introduction
During the past three decades, there has been a significant increase of different devices in the field of medical imaging like CT, SPECT, PET, MRI, FMRI etc. or one of a myriad of microscopy platforms. These technologies bestow a noninvasive way to visualize human body internals and truly revolutionized diagnosis of different diseases. Three dimensional volumetric visualization of CT and MRI data of spine, internal organ and brain become routine patient diagnostic care. Huge amount of medical image data are produced and scanned by pathologist, radiologist or nuclear medicine experts every day for diagnostic purposes in hospitals. This gives birth to the necessity of automatic recognition of internal organs or pathology. What is perhaps most remarkable about the innovation of automatic diagnosis in medical images requires improvement and innovation in all fields of image processing techniques. Main three steps in image processing are i) Enhancement, ii) Segmentation and iii) Feature extraction. Of which image segmentation is a vital step in analyzing the constituent biological or medical targets. Segmented images are now used routinely in a multitude of different applications, such as, diagnosis, treatment planning, localization of pathology, study of anatomical structure, computer-integrated surgery, among others. However, image segmentation remains a difficult task due to both the variability of object shapes and the variation in image quality. Particularly, biomedical images are often corrupted by noise and sampling artifacts, which can cause considerable difficulties when applying rigid methods. This article provides a very brief outline of biomedical image segmentation using partial differential equations (PDE) known as deformable models.

Image Segmentation by Deformable Models
The name “deformable models” stems primarily from the use of elasticity theory at the physics, generally within a Lagrangian dynamics setting. Deformable model-based segmentation approaches consider an object boundary as a whole and can make use of a priori knowledge to constrain the segmentation problem and thereby it can overcome many of the limitations of traditional image processing techniques. Among two types of deformable models, parametric deformable models represent curves and surfaces explicitly in its parametric form and its popularity in medical image analysis is credited to the work of “snake” (active contour) by Kass et. al. Other variant of deformable models is geometric deformable model which is based on the theory of curve evolution and geometric flow, represents curves and surfaces implicitly as a level set of an evolving scalar function and used as a powerful technique for computing interface motion.

Classical Active Contour (Snake)
This revolutionary deformable model in image segmentation was introduced in the late eighties. It is known as snakes or active contours. According to Google Scholar, the “snake” paper published by M. Kass, A. Witkin, and D. Terzopoulos in 1987 in the International Journal of Computer Vision has been cited more than 5,000 times to date! In biomedical image analysis, snake methods have created a tremendous sensation. There are quite a few reasons behind this huge success story of snakes. During the course of rest of this article, we unravel the snake evolution methods, examine the factors behind the popularity, and illustrate different biomedical applications for snakes.

Kass, Witkin and Terzopoulos (KWT) snakes can be thought as an energy-minimizing spline, which is attracted by image features such as edges. For this reason, the energy functional consists of two parts: an internal energy fraction which controls the smoothness of the result, and external energy term attracting the result to salient image features. Such snake is represented by a curve $C(s)=(x(s), y(s))^T$ which minimizes the functional:

$$E(C(s)) = \frac{1}{2} \int_{C} \left( \frac{1}{2} |\nabla C(s)|^2 + \frac{1}{2} |\nabla \psi(C(s))|^2 \right) ds$$  (1)

where $\psi$ represents differentiation of $C(s)$ w.r.t. $s$ and $s$ is parameter. The first summand is an elastic term causing the curve to shrink, the second one is a rigidity term which encourages a straight contour, and the third term pushes the contour to the high gradients of the image $I$. First two terms describe the internal energy, while the third one represents the external (image) energy, the nonnegative parameters $\alpha$, $\beta$, and $\gamma$ serve as weights of these expressions. Since this model makes direct use of the snake contour, it is also called an explicit model. Minimizing the above functional by steepest descent gives

$$\frac{\partial C}{\partial t} = \alpha\frac{\partial \xi_{\alpha}}{\partial y} - \beta\frac{\partial \xi_{\beta}}{\partial y} - \gamma (f|V| f)$$  (2)

which can be approximated by finite differences.

In equation (1), the internal force (the stretching and the bending terms) and the external force (terms involving image gradients) are trying to balance each other. When the net result force is zero, the snake stops evolving, and we obtain a local minimum of Equations (2).

On digital image domain of these equation becomes discrete, thus a discrete formulation is required. A initial discrete polygon snake $C(x, y)$ is created around the object to be segmented (see Fig. 1). This is performed by representing the continuous parameter $s \in [0, 1]$ with indices $i \in \{0, 1, ..., n - 1\}$, with $n$ being the total number of snaxels. Thus, the discrete counterpart of $(X(s), Y(s))$ is $(x_i, y_i)$. The discrete forms for the Equations (2) are as follows:

$$\frac{dx_i}{dt} = x_i - x_i' + x_i''$$

$$\frac{dy_i}{dt} = y_i - y_i' + y_i''$$

and

$$\frac{dx_i''}{dt} = -x_i - x_i'' - x_i'''$$

$$\frac{dy_i''}{dt} = -y_i - y_i'' - y_i'''$$

where $\tau$ and $\tau + 1$ represent two successive time instants with step length $\gamma$. The + and...
- operations involving the subscripts of $X$ and $Y$ in Equations (3) and (4) are modulo $n$ operations. These modulo operations take into account the wraparound for a closed contour. In Equations (3) and (4), we have used approximations for the second and fourth derivatives.

Now time has come illustrate evolution of KWT snake, we introduce an initial contour manually on the image and iteration starts from this initial contour by solving equation 3 & 4. Contour $X(s)$ and $Y(s)$ are updated in each iteration. Sobel operators are used to calculate gradients ($I_x$ and $I_y$) of the initial image. The gradient magnitude $f(x,y) = \sqrt{I_x^2 + I_y^2}$ works as external force in as in equation (3 & 4). Fig. 1 illustrates snake contour evolution, in this example we diffused the gradient magnitude to increase the capture range. After fifty iterations final snake contour (extreme right figure) is shown in red, starting from the initial blue contour.

**Snake External Forces and Capture Range Problem**

There are two main difficulties in classical KWT model: first the snake must be initialized fairly close to the final target in order to get convergence. To make a really good initialization we need to have a very good estimate of the solution before starting the iterative process of adapting the snake. So we can find a good solution if we already know the solution. That is not very interesting of course. Secondly, the model will fail to converge to a narrow concave boundary. The vectors of force field become parallel to each other in narrow concavity. So, the snake cannot progress deep into the concave boundaries. Figure 2(a) shows an image and 2(b) shows gradient vectors and contour lines of a selected portion of the boundary. From Fig. 2(c) it is clear that capture range of the boundary is restricted to a close neighborhood only, thus snake will not converge if it is away from this capture range.

Figure 3 (a) shows an image with a very narrow concave boundary. Figure 3(b) shows its gradient magnitude and Fig. 3(c) shows gradient vectors and contour lines of the opening of the concavity, this can be seen clearly that the vectors becomes parallel to each other (in opposite direction), restricting the snakes progress in the cavity.
Many researchers addressed snake capture range problem in various ways, we will discuss the most well known solution proposed by Xu and Prince.

**Gradient Vector Flow (GVF)**

Xu and Prince observed that smoothing will increase the capture range, but will not provide convergence within concavities. Other methods, for instance those based on distance maps are even better at increasing capture range, but the concavity problem remains the same. Xu and Prince’s solution is based on diffusing the gradient information. They developed two new classes of external force fields derived from generalized vector diffusion equations that address both the problems. GVF is an external force field \((u(x,y), v(x,y))\) constructed by diffusing the edge force \((f_x, f_y)\). This is achieved by minimizing the following energy functional:

\[
E = \frac{1}{2} \left( \int |\nabla I|^2 dx dy \right) + m \int \left( \frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} \right)^2 dx dy
\]

where \(m\) is a non-negative parameter controlling the degree of smoothness of the field \((u,v)\). Notice that the first term in equation 5 will smooth the data, that is, far from edges the field will be kept as smooth as possible by imposing that the spatial derivatives be as small as possible. Close to edges (where \(|\nabla I|\) is large) the field is forced to resemble the gradient of \(I\) itself. So \((u,v)\) is smooth far from edges and nearly equal to the gradient of \(I\) close to edges.

![Fig. 4: GVF force field with contour](image)

Figure 4 shows GVF force field of the same U shaped image in the opening of concavity; observe that directions of vectors are down towards the opening, so the snake progresses to the concave boundary.

Figure 5(a) shows a MRI image of brain. Figure 5(b) shows evolution of GVF snake starting from the initial contour and Fig. 5(c) gives the final result after 80 iterations.

Saha and Chatterjee et al. have combined KWT and GVF model for segmentation of the cortical outer surface from MR image of brain. They have developed an Anatomy Guided Hybrid Deformable (AGHD) Model to make it fully automated and accurate segmentation of brain cortical surface from skull. They have hybridized the parametric classical snake of KWT with GVF to exploit the power of greater capture range and greater progression into boundary concavity along with precise anatomical guidance. Detail of the algorithm is discussed in [Saha10]. A result of their segmentation algorithm is shown in Fig. 6.

![Fig. 5: (a) MRI image of brain; (b) GVF snake in progress; (c) Final segmentation after 80 iterations](image)

![Fig. 6: (a) Input MRI of brain; (b) red line shows final result of AGHD model](image)
Geometric Active Contours

Problem with classical snake is that it is connected, i.e. it cannot split to adopt to objects, for instance, holes or multiple small objects inside its initial domain. This model is not capable of handling changes in the topology of the evolving contour when direct implementations are performed. Therefore, the topology of the final curve will be as the initial curve, unless special procedures or heuristic are implemented for detecting possible splitting and merging. This problem has been addressed by Geometric active contours. The geometric approach brings with it an important advantage: the ability to adjust to the current image topology. In other words, when multiple objects are present and the number of such objects is not known, the geometric active contour can automatically segment and delineate an arbitrary number of regions. The basic idea is to represent the deforming curve, surface, or image as level set of a higher dimensional hypersurface. The pioneering and fundamental work on the deformation of level sets was introduced in Osher and Sethian in the year 1988.

Essentially, the level set approach to image segmentation is based on the fact that the intersection of a smooth three-dimensional surface and a plane yield a closed set of curves [Fig. 7]. In a level set method, $\Phi(x, y, t)$ is the height of the surface at position $(x, y)$ and time $t$. To derive the geometric active contours, we track the positions $(x, y)$ in which $\Phi(x, y, t)=0$. This is the so-called zero level set, and without loss of generality, this zero level set can represent a set of contours that split, merge, and delineate certain object boundaries.

![Fig. 7: Level set curve](image)

To update the geometric active contours, we differentiate $\Phi(x, y, t)$ with respect to time. Using the chain rule we take this partial derivative and set it to zero to achieve an Euler–Lagrange equation (representing the steady state of the contour):

$$\frac{\partial \Phi(x,y,t)}{\partial t} + \nabla \Phi(x,y,t).\{x_{t},y_{t}\} = 0$$  \hspace{1cm} (7)

In this level set model, we assume that the curve moves in the normal direction to the surface. If we take velocity $(x_t,y_t)$ and constrain motion in the normal direction, then we can define the speed of the surface as $V=(x_t,y_t).n$, where $n$ is unit normal to the surface $\Phi(x,y,t)$. Now, form differential geometry we know that on the surface $\Phi(x,y,t)$ normal $n$ is given by $n = \nabla \Phi/|\nabla \Phi|$

Now if we substitute $n$ in (7) we will get the snake evolution equation:

$$\frac{\partial \Phi}{\partial t} + \nabla |\nabla \Phi| (x,y,t) = 0$$  \hspace{1cm} (8)

Most of the case speed $V$ is chosen as to be a function of the curvature and the image gradient magnitude.

![Fig. 8: (a) MRI of brain; (b) Initial contour; (c) Contour after 300 iterations; (d) final segmentation](image)

Figure 8 (a, b, c, d) shows segmentation of MRI of brain starting from a single initial contour, Fig. 9 shows the result of starting from multiple initial contour.

![Fig. 9: (a) Initial multiple contour; (b) Contour after 100 iterations; (c) final segmentation](image)
Conclusion
Deformable models are capable of accommodating the significant variability of biological structures over time and across different individuals. Furthermore, they support highly intuitive interaction mechanisms that, when necessary, allow medical scientists and practitioners to bring their expertise to bear on the model-based image interpretation task. The basic idea behind PDE based methods is to deform a given curve, surface, or an image with a PDE, and obtain the desired result as a solution to this PDE. The art behind this technique is in the design and analysis of these PDEs, the PDE can be formed from variational problems.

References

Rohit Kamal Chatterjee is associated with the Kolkata Centre of Birla Institute of Technology, Mesra as an assistant professor since July 2005. He is currently pursuing his PhD in the department of computer science of Jadavpur University, Kolkata. His research interests are medical and SAR image analysis, machine learning and applications of partial differential equations in image processing.
Automatic Label Prediction for Scene Categorization in Computer Vision: Issues and Challenges

Scene categorization is a complex area in computer vision. To categorize the images from huge collection, the image has to be identified with a label. The automatic labeling is another complex issue. Conventional approaches for image labeling are based on text based tag information, for image segmentation. Automation of labeling can be done by using machine learning algorithms. Most of the earlier works are based on binary problems. While working with multi-class complex data, the data has been transformed to semantic level. It is ascertained that the machine algorithms are suitable for image label predictions of complex data without human intervention.

Introduction
Due to huge collection of image data, need for processing lot of data has paved the way for analyzing and mining data to derive potentially useful information. Various fields, ranging from commercial to military, want to analyze data in an efficient and fast manner. Particularly in the area of multimedia data, images have the stronghold. There are no sufficient tools available for analysis of images. The major issue in image categorization is image data set preparation and identification data row. One of the difficult tasks of image categorization is to obtain prior knowledge/ information from the image. However, the goodness of the features defined initially and the techniques used to extract them, would aid us in the detection process. The output would be a systematic method of feature extraction and an interactive system to support user defined features that can be employed in computer vision applications.

It is an interdisciplinary endeavor that draws upon expertise in computer vision, image processing, image retrieval, and data mining. Coming to the scene categorization problems, scene classification differs from object classification; a scene is composed of several entities often organized in an unpredictable layout. For a given scene, it is virtually impossible to define a set of properties that would be inclusive of all its possible visual manifestations. Once scene categorization is successfully implemented then the object recognition is also made easy. Early efforts at scene classification targeted binary problems, such as distinguishing indoor from outdoor, manmade and natural etc. More recently, there has been an effort to solve the problem in greater generality, through design of techniques capable of classifying a relatively large number of scene categories. Several of these approaches aim to provide a compact lower dimensional representation using some intermediate characterization on a latent space, commonly known as the intermediate theme or topic representation. Hierarchical concept features has used in semantic classification of images[5]

Data Characteristic
In this article scene categorization is implemented on complex data set, which is a combination of 8 categories having the highest similar properties. The data set contains different categories viz. nature, war, aircrafts, flowers, animals, birds. To solve the scene classification problem in generality, the global features are extracted based on hierarchical concept. The nature of data is very near and overlapped feature data.

Methodology
The scene categorization methodology includes three modules which are image Dataset preparation, data transformation, class label prediction and classification model.

Data set preparation: Features are characteristics of images, extracted at two levels viz local features and global features. For image categorization, the identification of suitable features and extraction is critical process. In this work the global features are considered for reducing the computational complexity. The extracted features are represented in vector.

Data Transformation: The nature of extracted feature data has more overlaps and numerical. The transformation can be done by using descritization and normalization techniques. The transformation can be done on two ways either rule based or knowledge based.

Data Label prediction: For binary problems Label prediction is easy task, while coming with multi label predictions is a complex problem. In this work, the class label predictions are done by using principal component analysis. The principal components are identified by transforming the data to Euclidian distance based ranks.

Supervised classification: For categorizing scene images feature dataset, the suitable supervised classification algorithm in image mining should be used. The nature of image feature dataset is noisy, non uniform. Because of all these reasons, there is necessary to choose suitable classifier with high performance.

To classify the images as suitable classes in supervised classification, it requires training of the system. There are many constraints to develop the training model. Even though a model built for one category feature dataset, which cannot be used for different category feature datasets. Even in the same category because of the dominant characteristic, the features are not matched.

Challenges of Scene Categorization
There are many reasons that make scene categorization task as complex while comparing with other data classification. In this article multiple dimensions of challenges are discussed.

One dimension of variation in scene categorization tasks is the data set. The image data set are presented in three ways. one way is low level primitive features based on colour, texture and
edge. Extraction of these features is relatively easy but the query is like indoor and outdoor images. The second way is mid level features based on knowledge data. Knowledge based data is the transformation of low level primitive features. This is relatively easy when compared with semantic data having multiple classes from each category. The third way is semantic data set contains the semantic information viz. temperature, humidity, size, picture capture details, label of contents etc. This is N dimensional data set.

The second dimension focuses on transformation of mid level data set to semantic level is a complex process, even though the semantic gap should rise in the data. This is relatively easy when compared with classification on multiple categories data set. In this knowledge selection is more important for transformation. Even though there is ambiguity for different categories.

The third dimension of variation is class attribute. The existing systems class label predictions needs expert’s involvement. The class attribute should be predicted from feature data set without much semantic information.

Final dimension of variation is the suitable classifier for scene image categorization. There are systems developed for computer vision on bag of features using supervised and unsupervised classifiers. Systems are yet to be developed on hybrid features using suitable learning algorithm.

**Issues in Scene Categorization**

Scene categorization also becomes very much difficult because of the following computational issues:

1. Computational complexity is high.
   - Image data is two dimensional array data with high dimensions. It is very difficult to apply any algorithm without pre-process on pixel intensity values.

2. Feature extraction is necessary and complex for representation of image information as single vector.
   - Low level features as bag of features, all data is numerical and noisy data.
   - High level Features are semantic feature, the data needs expertise’s involvement.

3. Feature transformation to discrete form is necessary and complex process.
   - Equal binning and normalization techniques are noisy.
   - Rule based transformation giving overlaps.
   - Given the above, there will always be overlaps among classes.
   - All categories existed in all bins leads to more rules.
   - Finding optimal machine learning algorithms, and hence minimizing overlaps, is another challenge.

4. The selection of classifier for supervised classification is complex
   - The performance of classifier is dependent on nature of dataset.
   - If the dataset is normalized, decision tree classifier is suitable.
   - If the data set is discrete, probabilistic Bayesian net is suitable.
   - If the data contains class attribute, function based classifiers like support vector machines and multi layer perceptrons are suitable.

**Results and Discussions**

This work has been implemented on 1000 images data, which is having seven categories. Feature extraction has been implemented on human perception concept hierarchy. The hybrid feature extraction is based on concept hierarchy. In hybrid feature extraction, the selected features are R, G, B, H, S, V, mean, GLCM properties, edge mean. The principle component analysis has implemented by using Euclidean distance similarity measure. Among all ranks the min distance components is assigned as class label of that image. Each identified component is labeled as one category. The list of similarity based rank and predicted class label are shown in Table1.

<table>
<thead>
<tr>
<th>M_rank</th>
<th>Tank_rank</th>
<th>Aircraft_rank</th>
<th>Nature_rank</th>
<th>Bird_rank</th>
<th>Animal_rank</th>
<th>Flower_rank</th>
<th>MIN (RANKS)</th>
<th>Predicted class label</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>73</td>
<td>661</td>
<td>613</td>
<td>706</td>
<td>666</td>
<td>669</td>
<td>3</td>
<td>Missile</td>
</tr>
<tr>
<td>18</td>
<td>53</td>
<td>570</td>
<td>181</td>
<td>615</td>
<td>301</td>
<td>303</td>
<td>18</td>
<td>Missile</td>
</tr>
<tr>
<td>193</td>
<td>286</td>
<td>311</td>
<td>94</td>
<td>372</td>
<td>128</td>
<td>124</td>
<td>94</td>
<td>Nature</td>
</tr>
<tr>
<td>235</td>
<td>314</td>
<td>223</td>
<td>161</td>
<td>339</td>
<td>178</td>
<td>192</td>
<td>161</td>
<td>Nature</td>
</tr>
<tr>
<td>169</td>
<td>293</td>
<td>430</td>
<td>50</td>
<td>399</td>
<td>88</td>
<td>72</td>
<td>50</td>
<td>Nature</td>
</tr>
<tr>
<td>444</td>
<td>504</td>
<td>484</td>
<td>85</td>
<td>238</td>
<td>68</td>
<td>53</td>
<td>53</td>
<td>Flower</td>
</tr>
<tr>
<td>484</td>
<td>518</td>
<td>376</td>
<td>195</td>
<td>148</td>
<td>134</td>
<td>116</td>
<td>116</td>
<td>Flower</td>
</tr>
</tbody>
</table>

The knowledge base has created based on these components. For assigning these feature labels, the data has been transformed to discrete levels. The features are transformed to higher semantic level with suitable label by using the knowledge base. The knowledge base has created based on standard color and texture templates.

The image categorization is done on human perception levels. These levels are identified on basic characteristics of image. The list of discrete values for each feature has shown in Table 2.

By applying the above knowledge the data has been transformed to semantic level as discrete values. The predicted rules are shown in Table 3.

From above class rules class1&3 has the same values. To overcome this problem the other features are also considered for categorization. The list of other features for all classes is shown in Table 4.

From the other values the main observation is class 1 and class 3 has same rules, the variance has varied from class 1 to class 3. The other observation is class 4.
Table 2. Discrete values for each feature data

<table>
<thead>
<tr>
<th>S. No</th>
<th>Feature</th>
<th>Condition</th>
<th>Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>COLOR RGB</td>
<td>MAX(R,G,B)</td>
<td>RED/GREEN/BLUE</td>
</tr>
<tr>
<td>2</td>
<td>COLOR HSV</td>
<td>MAX(H,S,V)</td>
<td>HUE/SATURATION/VALUE</td>
</tr>
<tr>
<td>3</td>
<td>COLOR Gray</td>
<td>CONTRAST</td>
<td>DISCRETE VALUE</td>
</tr>
<tr>
<td>4</td>
<td>TEXTURE</td>
<td>Entropy &lt; 5.4</td>
<td>SMOOTH</td>
</tr>
<tr>
<td></td>
<td>Statistical Moments</td>
<td>5.4 &gt; entropy &lt; 6.6</td>
<td>REGULAR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Entropy &gt; 7.7</td>
<td>COARSE</td>
</tr>
<tr>
<td>5</td>
<td>TEXTURE Gray Level Co-Occurrence Matrix</td>
<td>[0-0.33]</td>
<td>CONSTANT</td>
</tr>
<tr>
<td>6</td>
<td>EDGE</td>
<td>edgemean&lt;avg</td>
<td>LOW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>edgemean&gt;avg</td>
<td>HIGH</td>
</tr>
</tbody>
</table>

Table 3. List of rules for each class

<table>
<thead>
<tr>
<th>color label</th>
<th>color range</th>
<th>texture nature</th>
<th>energy level</th>
<th>class</th>
</tr>
</thead>
<tbody>
<tr>
<td>red</td>
<td>value</td>
<td>coarse</td>
<td>high</td>
<td>class-1</td>
</tr>
<tr>
<td>blue</td>
<td>value</td>
<td>coarse</td>
<td>high</td>
<td>class-2</td>
</tr>
<tr>
<td>red</td>
<td>value</td>
<td>coarse</td>
<td>high</td>
<td>class-3</td>
</tr>
<tr>
<td>green</td>
<td>saturation</td>
<td>coarse</td>
<td>mixed</td>
<td>class-4</td>
</tr>
<tr>
<td>green</td>
<td>saturation</td>
<td>coarse</td>
<td>high</td>
<td>class-5</td>
</tr>
<tr>
<td>blue</td>
<td>value</td>
<td>smooth</td>
<td>mixed</td>
<td>class-6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>smooth</td>
<td>constant</td>
<td>class-7</td>
</tr>
</tbody>
</table>

Table 4. List of features for the different classes

<table>
<thead>
<tr>
<th>color mean</th>
<th>variance</th>
<th>smoothness</th>
<th>homogeneity</th>
<th>skewness</th>
<th>uniformity</th>
<th>edgemean</th>
<th>class</th>
</tr>
</thead>
<tbody>
<tr>
<td>126.12</td>
<td>43.33</td>
<td>0.028</td>
<td>0.76</td>
<td>-0.405</td>
<td>0.007</td>
<td>0.04</td>
<td>class-1</td>
</tr>
<tr>
<td>127.81</td>
<td>58.19</td>
<td>0.049</td>
<td>0.94</td>
<td>-0.418</td>
<td>0.005</td>
<td>0.03</td>
<td>class-2</td>
</tr>
<tr>
<td>129.06</td>
<td>60.64</td>
<td>0.054</td>
<td>0.81</td>
<td>-2.13</td>
<td>0.007</td>
<td>0.05</td>
<td>class-3</td>
</tr>
<tr>
<td>65.81</td>
<td>52.68</td>
<td>0.041</td>
<td>0.96</td>
<td>3.521</td>
<td>0.012</td>
<td>0.01</td>
<td>class-4</td>
</tr>
<tr>
<td>104.26</td>
<td>39.28</td>
<td>0.023</td>
<td>0.89</td>
<td>-0.015</td>
<td>0.008</td>
<td>0.04</td>
<td>class-5</td>
</tr>
<tr>
<td>59.78</td>
<td>36.38</td>
<td>0.02</td>
<td>0.94</td>
<td>2.614</td>
<td>0.067</td>
<td>0.03</td>
<td>class-6</td>
</tr>
<tr>
<td>110.1</td>
<td>14.42</td>
<td>0.003</td>
<td>0.99</td>
<td>-0.031</td>
<td>0.048</td>
<td>0.01</td>
<td>class-7</td>
</tr>
</tbody>
</table>

Table 5. Mapping of classes to categories

<table>
<thead>
<tr>
<th>class name</th>
<th>category</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-1</td>
<td>nature</td>
</tr>
<tr>
<td>class-2</td>
<td>missile</td>
</tr>
<tr>
<td>class-3</td>
<td>tank</td>
</tr>
<tr>
<td>class-4</td>
<td>bird</td>
</tr>
<tr>
<td>class-5</td>
<td>flower</td>
</tr>
<tr>
<td>class-6</td>
<td>bird</td>
</tr>
<tr>
<td>class-7</td>
<td>aircraft</td>
</tr>
</tbody>
</table>
measurement, speed, precision, recall, F-measure and ROC area. The accuracy of classifier has shown in Table 6.

Table 6. Performance evaluation of Multi Layer Perception Algorithm

<table>
<thead>
<tr>
<th>Test mode</th>
<th>TP Rate</th>
<th>FP Rate</th>
<th>Precision</th>
<th>Recall</th>
<th>F-Measure</th>
<th>ROC Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-fold cross-validation</td>
<td>0.915</td>
<td>0.017</td>
<td>0.917</td>
<td>0.915</td>
<td>0.915</td>
<td>0.994</td>
</tr>
<tr>
<td>2-fold cross-validation</td>
<td>0.879</td>
<td>0.028</td>
<td>0.884</td>
<td>0.879</td>
<td>0.88</td>
<td>0.99</td>
</tr>
<tr>
<td>60% train, 40% test</td>
<td>0.911</td>
<td>0.019</td>
<td>0.914</td>
<td>0.911</td>
<td>0.911</td>
<td>0.995</td>
</tr>
<tr>
<td>80.0% train, 20% test</td>
<td>0.918</td>
<td>0.015</td>
<td>0.923</td>
<td>0.918</td>
<td>0.918</td>
<td>0.996</td>
</tr>
</tbody>
</table>

Conclusions and Future Scope

In this article challenges and issues related to automatic class label prediction for multi class scene categorization problem in computer vision are discussed. Major algorithms used are principle component analysis and knowledge based image data transformation. A systematic study has been performed on different sources of images such as nature scene, war scenes, animals, flowers, aircrafts, and missiles. This method combines the knowledge of information from these sources and an efficient training is done with small data set that helps in classifying multiple categories of images.

The work emphasizes on exploring the details of features at all levels. The optimistic features for scene categorization viz. RGB mean values, HSV normalized values, histogram based statistical moments, gray level co occurrence properties, edge mean. This work highlights the importance of image dataset has implemented using Multi layer perception back propagation algorithm. The 96% of accuracy has achieved with knowledge-based dataset.

This system is useful to represent more number of categories with minimum training data. This system is also useful in other domain data provided if there is a preprocessing unit, which would identify the framework for automatic class label prediction. The performance of the system is good for complex data contains nature scene data, military data, animals, birds. This system is also suitable for medical and forensic image data.

References


About the Authors

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Please note that cover themes of future issues of CSI Communications are planned as follows -

- February 2014 – Open Source Technologies
- March 2014 – Indic Computing

Articles and contributions may be submitted in the categories such as: Cover Story, Research Front, Technical Trends and Article.

Please send your contributions before 20th January for consideration in February 2014 issue.

For detailed instructions regarding submission of articles, please refer to CSI Communications September 2013 issue, where Call for Contributions is published on the backside of the front cover page.

[Issued on behalf of Editors of CSI Communications]
De-Noising Image Filters for Bio-Medical Image Processing

Biomedical Image Processing

Biomedical Image Processing is one of the emerging domains of research work with wide and intense application in medical field. It creates a bridge between engineering and medical disciplines with a motivation to provide an overall enhancement of health care. Image processing over medical image is known as Biomedical Image Processing. The image is to be in digital form for getting processed by digital computer. Digital image is composed of pixels where every pixel has some unique location and an intensity value. The processing of this digital image by digital computer by various image processing techniques produces output either as display or generates some numeric result.

Application

Whenever patients go to doctors, the doctors many times prescribe medical imaging to have a good realization about the patient’s abnormality. X-ray, CT, MR and ultrasound are some common form of medical imaging. Medical imaging is the non-invasive visualization of internal organs, tissues, etc and processing of these images digitally helps us in gathering better information about the diseases related to any human organ. This information is used by doctors for better comprehension and diagnosis of diseases. In other words we can say Biomedical Image Processing makes the treatment procedure reliable, fast, cost effective and hassle free. It helps in automated identification of abnormality of organs and promotes automated medical measurement. Patients suffering from particular disease can determine the stage of the disease. It not only helps in monitoring the patient but also helps in taking precaution about any disease. These computerized developed techniques can be used at hospitals and even at remote areas where there is lack of enough number of doctors, trained technician and medical facility. To name a few, the challenging researches’ in this inter-disciplinary area are 3D modeling of human organs, cancer detection, fracture detection, infected tissue identification from microscopic image, etc.

Image Noise and De-noising

We must have heard about image noise. Noise is unwanted information and image noise causes occurrence of false intensity (color) value. Medical images like other images are sensitive to noise, which may get contaminated at the time of image acquisition or there may exist some other reason. Every single image detail is very vital in medical image. A small degradation or change in image intensity information may affect the post image processing steps and may lead to erroneous results. Image noise also creates disturbance in having a clear visual verification. This increases the necessity of pre-processing the image by a suitable digital de-noising technique. De-noising of image is one form of image enhancement. De-noising estimates true intensity value of pixel using other pixel’s intensity values. It enables to have a better image quality.

To name a few, the recent states of the art techniques in medical image denoising are non-local means, bilateral filter, trilateral filter and anisotropic diffusion. The good noise removal results has attracted the attention of many researchers to further improve the performance of these filters in terms of de-noising quality, reduction of run time and automated parameter tuning. We have performed a comparative study of the de-noising techniques and have found non-local mean’s performance quite impressive for medical images. So we took interest to further enrich its performance.

Some New Approaches

The theory for non-local means image de-noising is based on self similarity of texture of the image. It gives more weight to pixels with similar neighborhoods and less weight to pixels with dissimilar neighborhood. Fig. 1 explains the theory. Each restored pixel value \( p \) in the image is the weighted average of all other pixels \( q \) of the image. But, chances of similar neighborhood of \( p \) and \( q \) lie in the local neighborhood around the current position \( p \). A local neighborhood region \((SxS)\) is defined to reduce the search space from whole image to local region. So, for non-local means each restored pixel value \( p \) in the image is the weighted average of all other pixels \( q \) of the confined local neighborhood region \((SxS)\).

The equations for NLM are as follows:

\[
NLMv(p) = \frac{1}{d(p,q)} e^{-\frac{d(p,q)}{h}}
\]

where, \( v(p) \) is the restored value, \( w(p,q) \) is the weight between \( p \) and \( q \), \( v(q) \) are pixels within the local neighborhood of current position \( p \), \( h \) is the de-noising control parameter and \( d(p,q) \) is the Euclidean difference.

Noise is an outlier whose value is quite different from the rest of the intensity population. We need to use statistical methods to reduce noise. The groups of pixels that are used for computing the new pixel value are initially arranged in ascending order. Now we know that image noise is outlier. So it is expected that outliers will reside either at the beginning or at the end of the arranged data intensity set. From Fig. 2 it can easily be said that if we are capable of discarding these outliers by mathematical techniques then we can enrich the performance of estimation of new de-noised intensity value. So we can take the help of few statistical techniques and find whether they were fruitful in enhancing the de-noising performance.

One of those statistical techniques is based on alpha trimmed mean. From statistics it is known that trimmed-mean is relatively insensitive to outliers as compared to mean. Traditionally in standard Non-local means all the pixels of
the array are considered for computation of the de-noised intensity value. Trimmed-mean is computed by discarding certain percentage of the lowest and highest scored data and then computing the mean from the remaining scores. The equation is as follows:

\[ T_m = \frac{1}{n-2k} \sum_{i=k+1}^{n-k} x_i \]

Where, \( x_i = \{ x_1, x_2, x_3, \ldots, x_n \} \) are the observed scores and \( k \) is the trimming percentage.

The results obtained from the trimmed mean method for non-local means produce an enriched de-noised image than the traditional non-local means. The new approach also proves to be a better edge preserver. Fig. 3 shows the visual verification result.
We have also observed another statistical approach for non-local means to reduce the outliers and increase the robustness of de-noising. It is found that clipping the arranged (ascending or descending) data by median absolute deviation (MAD) and computing the weighted mean for non-local mean can give a fruitful result. Theoretically these two clipping approaches based on statistics can be used in many other image processing techniques for reduction of outliers of any data set.

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References

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Man in the Browser Attack

Introduction
Using a password is well-known authentication technique, but user can forget a password or may lose it, even the hacker can steal password by means of several practices, like guessing or brute force attack etc. As of now password is not an unsurpassed method to authenticate user and due to the frequent online attacks, like phishing and false identity attack, quite a lot of social websites like Facebook and Gmail along with banks and other financial institutions websites, are using two-factor authentication for security. For example the bank website provides an additional layer of security, and it also sends one time password through SMS to the user. If the user is legitimate the OTP by SMS, the bank website authenticates the user after the right credentials are entered by the user. Although, there are lot of benefits of two factor authentication, hackers have found the methods to crack into two factor authentication technique and the most prevalent technique amongst them is Man-in-the-Browser attack (a variant of a man-in-the-middle attack). Man-in-the-browser (MitB, MiB) is a Trojan horse that exploits the vulnerabilities in browser security to alter web pages, transactions or insert extra transactions, in a secret way invisible to both the client and hosting server. It can defeat OTP verification on mobile by waiting for the transactions or by man-in-the-mobile (MitMo) Trojan infection on the mobile phone and later the Trojan horse alter the communication between user and the website. A MitB attack may be countered by utilizing out-of-band transaction verification. A hacker just needs a Trojan horse and the browser to carry out the man-in-the-browser attack. It is multiplatform as it can target OS like Windows, Linux and MAC and can exploit most used browsers, like Internet Explorer, Opera, Firefox and Chrome. A MitB Trojan utilizes common facilities provided to improve browser facility such as:

Browser Helper Object (BHO) is a Dynamic Link Library (DLL) module that can access document object model and it is for Internet Explorer. The DLL get loaded when we launch Internet Explorer. For example the flash player plug-in that allows Internet Explorer users to play flash files within the browser is a BHO. Trojan horse can control the communication using BHO.

Use of Extensions: Browser extensions or plugins can be easily created to carry out malicious actions on the user’s browsers and spammers utilize it to capture secret information of the user; alter the request and communication.

Use of Scripts: Using the scripts (Greasemonkey, a Firefox plugin) that automatically pick up the information and inject on the web page may cause modification or stealing of information as it is possible that script is designed by hacker.

API – Hooking: API – Hooking means modifying application by intercepting the .EXE between DLL.

Working
This section an overview of working of MitB and various cases of MitB reported in cyber world over different platforms like Windows, MAC and Linux is presented. The MitB attack is based on Trojan horse, thus, the first step is targeting the victim’s computer. It can be done by social engineering techniques. Spam emails Phishing email and Exploiting the web application weakness to target the victim’s computer. The second step is performed by Trojan horse as it has ability of self activation. The Trojan horse silently watches the actions of the victim can give the control to its server. The Trojan horse has been designed to observe and when user visit specific websites, the Trojan horse can sense it and perform its preferred functions. The Trojan horse bypasses two way authentication and alters the communication between user and the website. The Trojan horse has ability to enter the data in the website form by itself. For example:

<table>
<thead>
<tr>
<th>Victim’s Browser</th>
<th>Bank Server Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payee name: Aakash Goyal</td>
<td>Payee name: XXXX</td>
</tr>
<tr>
<td>Account no: xxxxxxx789</td>
<td>Account no: xxxxxxx345</td>
</tr>
</tbody>
</table>

Everything is controlled by Trojan but still user side is unaware as everything is going perfect on user side window. The bank server performs the task as it from authenticated and legitimate user. The final receipt issued by server is also modified by Trojan horse but bank server side is unaware as everything is going good, but the MitB attack has been accomplished.

Below are the particulars of some Trojan horses that perform MitB (man-in-the-browser) attacks on different operating systems and browsers [Wikipedia]:

Solutions
The man-in-the-browser attack is a very harmful and also, it has extremely low detection ratio. Some of the possible ways to protect computer from a man-in-the-browser attack are as follow:

Out-of-Band Transaction Verification is a successful technique of fighting with any MitB attack it uses transaction verification method in which the transaction details are verified as received by the website of bank, to the user through any other channel not browser; for example SMS, a mobile call or app with graphical cryptogram. The OOB transaction verification adds slower steps to the security and may cause frustration to user. Also, Trojan Man-in-the-Mobile (MitMo) can overcome OOB SMS transaction verification.

Hardened Software: The hardened browser does not permit any extension to be added and it also prevents user scripts to run on the secure channel (SSL). Use of live distribution for important transactions or other main browsing can add extra step in the security. Various live distributions like Ubuntu (Linux), BartPE (windows) are available as open source.

Virtual Machine: Surfing on virtual machine (VMware, Virtual Box etc) for important websites by using Network Address Translation (NAT), instead of...
bridge network make the transactions secure as attack on virtual machine is very costly.

**External Authorization devices** External authorization devices have no link to the Personal Computer. So the user enters the transaction details on the external authorization device and personal computer. For example, Mobile phone of user could also be used as external authorization devices.

Alternatively, *eToken NG-FLASH* with a portable browser is a secure, zero-footprint certificate-based USB strong authentication token with onboard Flash memory. *eToken NG-FLASH* validates user’s identity and secures the communication channel between the browser and the Web application using SSL client-certificate authentication [SafeNet].

**References/Sources**


<table>
<thead>
<tr>
<th>Name</th>
<th>Details</th>
<th>OS</th>
<th>Browser</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carberp</td>
<td>targets Facebook users saving e-cash vouchers</td>
<td>Windows</td>
<td>IE, Firefox</td>
</tr>
<tr>
<td>ChromeInject</td>
<td>Greasemonkey impersonator</td>
<td>Windows</td>
<td>Firefox</td>
</tr>
<tr>
<td>OddJob</td>
<td>keeps bank session open</td>
<td>Windows</td>
<td>IE, Firefox</td>
</tr>
<tr>
<td>SpyEye</td>
<td>successor of Zeus, widespread, low detection</td>
<td>Windows</td>
<td>IE, Firefox</td>
</tr>
<tr>
<td>Sunspot</td>
<td>widespread, low detection</td>
<td>Windows</td>
<td>IE, Firefox</td>
</tr>
<tr>
<td>Weyland-Yutani BOT</td>
<td>Crime ware kit like to Zeus, not widespread</td>
<td>Mac OS X</td>
<td>Firefox</td>
</tr>
<tr>
<td>Zeus</td>
<td>widespread, low detection</td>
<td>Windows</td>
<td>IE, Firefox</td>
</tr>
</tbody>
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**Name Details OS Browser**

- **Carberp** targets Facebook users saving e-cash vouchers. Windows IE, Firefox
- **ChromeInject** Greasemonkey impersonator. Windows Firefox
- **OddJob** keeps bank session open. Windows IE, Firefox
- **SpyEye** successor of Zeus, widespread, low detection. Windows IE, Firefox
- **Sunspot** widespread, low detection. Windows IE, Firefox
- **Weyland-Yutani BOT** Crime ware kit like to Zeus, not widespread. Mac OS X Firefox
- **Zeus** widespread, low detection. Windows IE, Firefox

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Aakash Goyal has done B.Tech.(CSE) and M.Tech.(CSE). He is currently Working as Assistant Professor in Jind Institute of engineering and technology, Jind (under Kurukshetra university, Kurukshetra). He has published 2 national and 3 international papers in various conferences. He is a member of working committee of international journal JRPS (Journal for research publication and seminar). His area of interest is network security, Cryptography & information security, Mobile ad hoc networks.
Agile process has emerged as the most popular and prevalent software development methodology in modern times. Software Engineering Method and Theory (SEMAT) is taking shape as a new initiative. Issues arise whether SEMAT and agile stand complementary or competitive, or is it just another waterfall planning contrary to agile? Do they coexist and complement? We will explore and demonstrate how agile and SEMAT initiatives go hand in hand and benefit the community.

In reality, agile and SEMAT complement one another, providing complete foundation and empowerment to the development teams in promoting non-prescriptive value-based philosophies that encourages to choose and use appropriate practice that aids to continuously inspect, adapt, and improve their ways of working. Scrum and test-driven development, for example, have established as modern developer’s choice of agile practice. SEMAT provides effective way of working towards software engineering as well as software development, used interchangeably, as a common reference model strengthening agility to all teams while continuously inspecting, adapting, and improving their ways of working; SEMAT and agile initiatives, used in conjunction to true empowerment to the teams to innovate, experiment, and improve the results they deliver.

**What SEMAT Adds to Agile**

In principle, agile technique provides a set of values that influence and shape the way software developers interact with the stakeholders including the customers. However, the continuous inspection, retrospection and adaptation are needed to evolve in changed perspective and from lessons learnt from past. This is reflected in the growing number of agile teams that assemble a bespoke method from the available set of practices rather than taking a made-to-measure method off the shelf.

The use of SEMAT can help agile teams do the following:

**Detect systemic problems early and take appropriate action.** Agile teams continuously inspect and adapt using fast feedback and close collaboration.

**SEMAT provides a number of simple checklists to help teams understand their progress and health, and to help them in the early detection of problems with their way of working. Akin example from other profession can be given like surgery teams in U.K. hospitals reduced death by surgical errors by 47% by using a simple 19-question checklist that had questions such as “Do you know the names of the other members of the surgical team?” Similarly, SEMAT checklists help in reducing risk of catastrophe by helping them avoid common mistakes thereby improving upon any inefficient ways of working, unrealistic expectations and dysfunctional teams.

**Measure the team’s progress and health regardless of the method or practices selected.** The key measure of progress in agile method is the speed and amount of production. SEMAT complements these measures by providing another view of monitoring that help teams maintain their speed as they and the systems they produce mature. SEMAT checklists helps to assess current state, teams can easily understand where they are, where they should go next, and how their efforts fit within any organizational governance practices they need to support.

**Compare and contrast practices and select the best ones for the team.** Agile teams try to continually improve and evolve. SEMAT provides the mechanisms to understand the extent, purpose, and content of practices, helping teams understand their coverage and where they overlap, conflict, or compete. It also allows teams to plug-and-play practices, safely mixing and matching them within the context of their favorite agile framework—for example, Scrum or Kanban.

**Evaluate the completeness of the set of practices selected, and understand the strengths and weaknesses of the way of working.** Many a times, teams unknowingly leave non-apparent holes while rushing to adopt new practices. This may later come as a bumerang in terms of eventual consequence like drop in productivity and falling short of expectations. SEMAT helps teams reason about the way of working and make fact-based decisions about the breadth and depth of their selected set of practices. For continual improvement, use of Having mechanisms to help understand the strengths, weaknesses, and completeness of their way of working is invaluable.

Keep an up-to-date record of the team’s way of working, and share information and experiences with other teams. The agile community thrives on collaboration and interaction as means if improving and evolving. SEMAT provides mechanisms to help teams accurately record their way of working in a lightweight, agile fashion, with real time sharing with all - colleagues or collaborators. This provides transparency in way of working to all.

**Be agile with methods, easily and safely evolving the team’s set of practices as it inspects and adapts its way of working.** Inspecting and adapting the way of working in agile team may be affected when teams lack to effectively adapt to newer practices; freeze the way of working; select different but less-effective practices that introduce more problems than they address. SEMAT provides the frameworks and thinking tools to help teams more effectively inspect and adapt their way of working, understand the consequences of their decisions, and continuously improve their way of working.

**SEMAT for Agile Organizations**

SEMAT provides additional support that helps entire organizations become agile without compromising the agility of the teams that form them. In particular, it helps:

*Establish the ground rules for software development within the organization, and capture organizational values and principles in a practice-independent fashion.* Software development does not happen in isolation. Development teams must always be cognizant of the organisational culture, values, and principles by having some common understanding ground for all. SEMAT provides a simple definition of the common ground shared by all software-development teams as a firm foundation. Organizations can extend the SEMAT definitions to capture any additional rules or advice that applies to the specific kind of software they develop.
or the specific environment within which they develop it. Establishing the common ground is a prerequisite to organizational agility, but gets amended with the practice of effective sharing of practices among the teams.

Define practice-independent governance procedures and quality gates. For business, legal, and safety-critical reasons, applying governance to their software-development efforts become crucial to some especially large organizations. Unfortunately, many organizations define their governance as a series of sequential phases, with a finish to start dependency. Agile teams fail to achieve their full potential in this kind of rigid, prescriptive environment. Governance procedures and quality gates should be aligned to the natural evolution of the software systems produced, focused on the key results required rather than artifacts to be produced, and manifested as simple practice-independent checklists. SEMAT allows governance procedures and quality gates to be defined in a lightweight and practice-independent fashion. The agile teams can then mix and match whichever agile practices they desire, and they can continuously inspect and adapt without ever having to fall out of governance.

Track and encourage the use of practices within the organization. Agile teams love to learn and share new practices as a fundamental need to continuous improvement. By basing all software development effort around a common ground in SEMAT way, teams can more readily and easily share their practices.

More readily and easily form teams and mobilize teams of teams. Although agile teams are intended to stay together, but in reality teams change and reorganize. Context switching in this way can often reduce velocity, increase friction, and waste time. SEMAT provides teams with a common language for software engineering that will help them understand one another, clearly express themselves, and share the practices they know—all of which will help them collaborate quickly and effectively—minimizing wasted time, pointless discussions, and unnecessary misunderstandings. It also provides mechanisms for modeling the competency prerequisite by teams and attained by individuals, thus helping to find right people to join right teams.

Scale agile approaches across teams of teams and systems of systems. Scaling agility is one of the biggest challenges. The SEMAT approach helps organizations scale agility in a number of ways:

- It establishes a common ground for all the teams involved.Scaled agility requires collaboration. Working on the same systems and improving the same value flows with a shared understanding of what they are doing and a shared language to help them communicate.
- Scaling agility requires even more flexibility in the set of practices that teams can use. Teams working on certain systems will need to use some of the practices originally used to develop the system. SEMAT’s ability to mix and match practices, swapping them in and out of play as needed, provides the flexibility in the way of working that teams need to succeed in a scaled agile environment.
- It helps teams understand their interaction points with other teams, the boundary of their responsibilities, and how their progress and health affects the teams they work with. If everybody is using a common ground to indicate their responsibilities and how they are progressing, then inter-team working is easily monitored and improved.

Select enterprise-level tooling. SEMAT provides a common ground for enterprise-level tooling to choose practice independent tooling, practice-specific tooling they need, and how these are related. SEMAT also helps teams understand how to integrate the tools they use by providing definitions of the common elements they will share.

What Agile Adds to SEMAT

SEMAT is nonprescriptive to such an extent that it does not care what approach a team adopts as long as it produces “good” software in an effective and healthy fashion. For organizations adopting SEMAT, agility adds a number of important elements in the area of software-engineering methods, including:

- Principles and values. Provides a necessary qualitative dimension to the evaluation of progress and health.
- Many practices. All of new and innovative agile practices could be codified and made available as SEMAT practices for teams safely to compare, contrast, and mix and match.

- A driving force for improvement. Agility embeds the inspect-and-adapt cycle into every aspect of the team’s work.

Before adopting SEMAT, a team should establish the principles and values it would like its new way of working to embody; otherwise, it will be very difficult to select the right practices or break out of what can at first appear to be an academic process building exercise.

How Does SEMAT Do All This?

The goal of the SEMAT initiative is to provide software developers with a sound practical and theoretical foundation to improve their performance. (For more detailed information, see Jacobson et al. [3]) The first step in the SEMAT initiative is to establish a common ground for software professionals (developers, testers, among others) to stand upon when they talk about what they do. This common ground manifests itself in Essence, a kernel of universal elements in software development—elements prevalent in every development endeavor. Essence includes these elements: requirements, software system, work, team, way of working, opportunity, and stakeholders. These elements have states, which can be used to measure progress and health. For example, a team can take the following states: seeded, formed, collaborating, performing, and adjourned.

To achieve a particular state, a number of checkpoints must be fulfilled, representing real achievements. To achieve the state collaborating, for example, the following checkpoints have been fulfilled: the team works as one cohesive unit; communication within the team is open and honest; the team is focused on achieving the team mission; and the team members know each other.

Traditionally, checkpoints have been used to measure the completion of an activity or a document, but the SEMAT checkpoints measure outcome. Thus, the universal elements represent achievements rather than documents or artifacts. This makes them agnostic to any particular method—agile or not. These elements are called alphas.

Software development is multidimensional, and alphas identify
the typical dimensions every software development endeavor must consider to progress in a healthy manner. A radar chart, as depicted in Fig. 1, gives a view of the current progress along each dimension\(^1\). Each line originating from the center represents an alpha, and the radials on that line represent the current state of that alpha.

Essence also provides a lightweight approach to describe practices on top of the kernel and thus extend the kernel. From a library of practices, teams can select appropriate ones and compose them to get the way of working they are satisfied with. In this way, they can evolve their way of working over time by replacing existing practices with newer and better ones. Practices can be of different kinds—for example, business, social, or technical. Each practice can add guidance for moving an alpha from one state to another, or it can add alphas not included in the kernel. In this way the endeavor will add more dimensions. It can also add work products to each alpha it touches. For example, the use-case-driven development practice might add a use case as an alpha and use-case specifications and realizations as work products.

**Cards and checklists.** The Essence specification provides a detailed description of the kernel alphas, including the definition of their checkpoints. In its daily work, however, a team would not carry the Essence specification with it. A more concise and practical representation in the form of a deck of cards suffices. Fig. 2 shows the state cards for the team alpha. Each card has the name of the alpha at the top, followed by the state name and a concise list of checkpoints. These act as useful reminders for team members.

**Boards and visuals.** In addition to state cards, there are alternative ways of working with alphas—for example, an alpha abacus, as shown in Fig. 3. An abacus is a Chinese calculation device with beads (counters) on a wire (representing digits). In the alpha abacus, each wire represents an alpha, and each bead an alpha state. This visual board can be used for a variety of purposes. One possible use is for a team to evaluate its current state (where it is) and discuss its next objective (where it wants to go next). This is easily visualized by drawing imaginary lines and positioning the beads as shown in Fig. 3.

**Games.** Once cards and visuals are available, it becomes natural to have games. For example, Progress Poker, a game that evaluates progress and health, is similar to the Planning Poker game used in agile methods. In Progress Poker, each member of the team selects a state card for each alpha to represent the current state of development. If they all choose the same state card, it means they have a common understanding of the progress. If they choose different cards, they probably have different understandings of where their development stands, and different expectations of what needs to be done. This misunderstanding usually signifies the presence of risks. Team members can have further discussions to reach a consensus. Other games—Objective Go, Chasing the State, and so on—can be found at http://www.ivarjacobson.com/alphastatecards.

**Case Studies**

The case studies described in this section are good examples of how software-development teams can make good use of SEMAT and Essence.

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**Equipping Coaches in a Large Telecommunications Company**

We worked with a large Chinese telecommunications-product company that had a number of internal coaches. The capabilities of these coaches were critical to each team’s ability to improve. Equipping the coaches to detect development problems early was important. In our first contact with one of the coaches, we asked how his team was doing. He felt that progress was good. We then asked him to evaluate progress using a deck of alpha state cards. He laid the cards on the table and started shifting them and quickly identified that progress of the stakeholders alpha was slow. He recognized this was a risk and made it a point to work out a plan to address the risk, which was basically to achieve the first four states of
the stakeholder alpha. The initial discussion with this coach took only 15 minutes. A further discussion found the coach came from a development background rather than a business-analysis background, which was probably the reason he neglected the stakeholders dimension.

In this particular case, the coach in question was weak in one area. In other cases, coaches had neglected other dimensions represented by the software-system alpha such as design and quality. In yet other cases, there were disagreements among team members about the way-of-working alpha. Whatever the case, the Essence alphas were simple, intuitive, and effective tools for evaluating progress and health.

**Running Development in an Internet Media Product Line**

The next case study involves several development teams in Beijing collaborating to deliver an Internet media server. This was a new product line, and the team members and leaders were relatively junior. They had much to learn, not just about how to work, but also about their problem domain. In addition, they were transitioning from a traditional stovepipe organization, where testers and developers worked separately, to one in which developers and testers collaborated as a cross-functional team.

Our approach involved using the kernel and the use-case-driven development practice to design the team visualization board shown in Fig. 4. This team visualization board provided visualization from three different perspectives:

- **Process.** This made the alphas visible to team members so they would know their current iteration objectives (that is, which kernel alpha states they needed to reach). This also included a section showing the current states for the use-case slices they were working on. A use-case slice is a piece of use case that represents a unit of work. The states of a use-case slice were described using state cards similar to those in Fig. 1. This made the criteria for achieving each state visible to team members during their daily work.
- **Product.** Each team was assigned a use case. The use-case specification and realization, represented by a UML diagram, were pasted on the board and always represented the current agreement. Changes were scribbled onto the use-case specification and realization. If they became illegible (after some significant changes), someone on the team had to create a clean version.
- **Progress.** Sticky notes representing use-case slices were pasted on the board. During daily meetings, members working on the use-case slices would talk about their work in progress by referencing their slices against the requirements and design, as well as the “definition of done” from the process visuals.

Having process, product, and progress visuals readily available not only helped the junior members to understand quickly what they needed to do, but it also helped the team detect any misconceptions quickly.

**Improving Collaboration Among Teams**

This case study occurred in a Japanese consumer electronics product line of e-book readers. The company had three models, each with different capabilities such as Wi-Fi or 3G access, touchscreen, and so on. It had three product teams (one for each model) and three development teams, as well as an acceptance test team, user experience team, and hardware team. Each team had about four members. Because each team worked separately, coordination was poor, leading to bottlenecks.

We helped the teams make their development work visible through the use of alphas. Specifically, they identified two alphas: a use-case slice and a user-experience element. They defined states for these alphas and the checkpoints for achieving those states. They made the current states visible on a product-line visualization board similar to that in the previous case study, with two exceptions: it had a section for user-experience elements; and it encompassed the entire product line rather than a single team. This was possible because the number of members in each team was relatively small.

Team leaders used the product-line visualization board to plan and discuss progress. With the visualization board, they were able to look ahead and make necessary preparations. In this way each team could make the effort to complete their parts for each integration event, thus eliminating bottlenecks.

**Quick Start for Offshore Collaboration**

The final case study involved a Japanese company that started a new product line with the help of a Chinese offshore vendor providing development and testing. The product line evolved from an initial eight-person team, with whom we worked primarily, into 50 (local Japanese) plus 200 (offshore Chinese) members. These numbers excluded hardware development and local contractors (working on device drivers) who were an integral part of the overall development. This all occurred in the span of about two years.

This Japanese company had no described way of working, and the Chinese vendor’s norm was to follow its
client’s approach, so there was no starting point. Using Essence, we were able to help the Japanese company describe a way of working that included these practices: iterative development, use-case-driven development, continuous integration, and test-driven development.

The next challenge was determining how to allocate parts of the development to the Chinese vendors. The Japanese company wanted this to be gradual so that as the Chinese members grew in their understanding, they could take on larger responsibilities. The allocation of responsibilities was based on both architecture and process. In terms of architecture, the Chinese vendors could work on the user interface and mid-tier areas, whereas the device drivers and processing closer to hardware specifics remained within the Japanese developers’ responsibilities because this required highly specialized skill and the hardware was changing.

In terms of the development process, the alpha states provided a convenient way of discussing responsibilities and involvement. The development process involved several streams of work represented by the alphas. The progress through the requirements alpha states represents the main development. Two other alphas were added to represent work on architecture and acceptance.

In the beginning the Japanese client had primary responsibility over most of the alpha states. As the Chinese vendor grew in knowledge, it assumed greater responsibilities. The alpha states provided a simple means of agreeing on the collaboration. It is important to note that when the Chinese vendor assumed responsibility over one alpha state, it did not mean the Japanese shook off all involvement. The Japanese developers were still involved, but as assistants to the Chinese members.

Using Essence, the Japanese product-line organization could describe their processes, responsibilities, and involvement. It helped the teams get started. It also helped team leaders (both Japanese and Chinese) understand their areas of responsibilities quickly as development grew from eight people to 250.

**A Firm Foundation for Sustainable Improvement**

SEMAT and agile are two complementary—and perfectly aligned—initiatives. They are both nonprescriptive frameworks that help you think about and improve your software-development capability.

If you are serious about making sustainable improvements in your software-engineering capability, either within your team or across your whole organization, then the combination of Agile and SEMAT offers many benefits above and beyond those gained from either initiative alone.

**References**


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**About the Authors**

**Ivar Jacobson** is Chairman of Ivar Jacobson International, a father of components and component architecture, use cases, the Unified Modeling Language, and the Rational Unified Process. A contributor to modern business modeling and aspect-oriented software development, Jacobson is one of the leaders of SEMAT, working to renew software engineering as a rigorous discipline.

**Ian Spence** is Chief Scientist at Ivar Jacobson International, and has been involved in many large-scale agile adoptions over the years reaching thousands of people. He also led the work of the Essence kernel and has co-authored three software development books.

**Pan-Wei Ng** is the Asia Pacific CTO at Ivar Jacobson International. He is an advisor and coach to software development organizations of all sizes and has helped teams apply SEMAT ideas since its inception. He also invented the alpha state cards while coaching in Japan. He has co-authored two software development books.
Information Security »

Protecting Users from Clickjacking

Attacks on the Web

Abstract: This article is the seventh in the series of articles, focusing on security of the web platform. In this article, we shall discuss about Clickjacking, one of the modern web-based attacks which attracted the attention of web attackers as well as security researchers. Using this technique, an attacker can steal a genuine user’s click and use it for malicious purposes. We shall analyze the internals of a clickjacking attack and methods to defend against it while developing web applications.

Introduction

Key loggers, malicious programs which can log and steal keystrokes of end users, have gained prominence in the past. They get installed through various channels in users’ operating system and are the key to board events of the users, thereby stealing sensitive information. Though key loggers are still a threat, enterprises are deploying virtual (soft) keyboards, and strong antivirus solutions today to defend against them. With the web transforming itself into an interactive platform where most of the operations are triggered by click of the mouse, web attacks have seen a newer dimension. Stealing clicks of the user has become the new threat and it has more devastating effects than key logging. The technique of stealing clicks is known as Clickjacking, also known as UI-Redressing. Though this attack technique was feasible by-design from the early days of the web, it was discovered and made public only in 2008 by Jeremiah Grossman and Robert Hansen [1].

Iframes and content isolation

HTML allows nesting of web pages (i.e., embedding one webpage in another) via the “iframe” tag. Typically, iframes are used by developers to embed third-party content into a website.

Consider a webpage (parent) belonging to the origin “http://A.com” embedding a page (child) belonging to another origin “http://B.com”. Since the origins of both the pages are different, JavaScript belonging to the parent page cannot access contents of the child page, due to the security restrictions imposed by Same Origin Policy (SOP). The code in Listing 1 shows how iframes are used to embed remote content.

```
<html>
  ...
  <body>
    <p>This page is from http://A.com</p>
    <iframe src="http://B.com/remotePage.html"></iframe>
  </body>
</html>
```


Advertisements, social plugins such as Facebook “Like” are typically loaded in web pages via iframes, to prevent their scripts from interfering with the operations of their parent page and vice versa.

Hidden iframes – The Culprits

To launch a Clickjacking attack, attackers use hidden iframes (which has content to be exploited) and overlay them on top of fake targets (buttons) using CSS. Since the top iframe is hidden, end users will only see the fake targets behind it. However, when they click on the fake target, they end up clicking on the content inside the top iframe. This is better explained in Figure 1, in which the page from “http://attacker” lures the end user to click and see some photos. JavaScript on the attacker’s page placed an iframe which wraps “Add Friend” page of a social network. Assuming the user is logged in at the social network in another browser instance, when the user clicks anywhere on the page, he/she is automatically added as a friend to the attacker on the social network.

The CSS property “opacity” is used to make iframes invisible by setting the value “0”. The “z-index” property is used to overlay iframes on top of other content. The “position”, “left”, “top” properties are used to position the iframe at a specific location. Using these simple CSS tricks and combining them with JavaScript, an attacker can frame sensitive targets and hijack users’ clicks.

```
Fig. 1: Page from http://attacker overlaying a hidden iframe using CSS
```

Defenses

Clickjacking attacks have attracted the attention of web security researchers in the recent past. There are several proposals which range from JavaScript based defenses to browser extensions to modifying browser architectures to
defend against the attack. One might think that the simplest fix could be at a browser level, which is removing all hidden iframes. However, there are several websites which use hidden iframes for genuine reasons (such as silent form submission) and such draconian policies will break several existing sites. Of all the proposals, the following two solutions have gained acceptance in the industry:

**Frame busting with JavaScript**

Since the inception of Clickjacking, web developers used several variants of JavaScript code to prevent a webpage from framing their genuine site. In 2010, Rydstedt et al., showed that most of such defenses are flawed and proposed a stable JavaScript defense to prevent Clickjacking\(^{[2]}\). Listing 2 is the JavaScript based Clickjacking defense proposed by them and is popularly used in several web pages.

```javascript
if (self !== top) {
    document.getElementsByTagName("body")[0].style.display = "block";
} else {
    top.location = self.location;
}
```

**X-Frame-Options**

Microsoft originally introduced a new HTTP response header called “X-Frame-Options”\(^{[1]}\) to mitigate Clickjacking and it is later supported by all popular browser vendors. It can be configured as follows:

```text
X-Frame-Options: token
```

The value of “token” can be “DENY”, “SAMEORIGIN” or “ALLOW-FROM origin”. If the token is configured as DENY in the response header of a webpage, browsers will not render the page when it is opened in an iframe, thereby preventing Clickjacking. If the token is configured as SAMEORIGIN, then browsers will block rendering of the page only if the origin of its top-most parent is different from the origin of the page being framed. If the token is ALLOW-FROM origin, browsers will block rendering of the page only if the origin of the top-most parent attempting framing is different from the origin in the ALLOW-FROM token. In short, these three tokens enable developers to choose between preventing framing completely to allowing framing selectively. The X-Frame-Options header is being standardized by W3C. Developers are suggested to use this header over JavaScript based defenses, to prevent the dangerous consequences of Clickjacking.

**Conclusion**

Clickjacking is one of the major weapons used by spammers on social networking sites like Facebook. Several spams and scams were found to use this trick to steal sensitive information of users. In this article, we have learnt how attackers use iframes to launch Clickjacking attacks. We have also seen two of the major defenses which can be immediately used by developers to mitigate against Clickjacking. In the next article we will explain about Content Security Policy, one of the recent advances in web security, which helps in securing web applications.

**References**


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**Photo Albums**

Check out the amazing photos from last night!

![Click this to see](Add friend)

Thank you for being my friend!

---

**Fig. 2: Placing hidden iframes below mouse cursor using JavaScript**

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**About the Authors**

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The Chronicles of Modern Communication from S.F.B. Morse to C.E. Shannon

“Study the past if you would divine the future - Confucius”

The telegraph era came to an end after the 160 years old long service. The good old friend shared the tidings of joy and tears. The nostalgic look back to early days narrates the importance of communication for mankind. The quest for transmitting signals for long distance started with the use of hand gestures, fire, smoke, trumpets and drums. Later the art of training birds were the vogue for several years and the dutiful pigeons in turn played their part as very efficient messengers. Living in the era of micro blogging, tweeting and instant messaging, it’s worth looking into the annals - the birth of Morse code- a technological breakthrough which ignited the flame of modern communication. Morse code was a foremost method used for instant messaging. The humble Morse code evokes many memories in the technological development of Information age. Samuel Finley Breese Morse owes the dream of transmitting information using electric pulse. The dream becomes a reality on May 24, 1844 after 12 years of his sincere and dedicated efforts in integrating the technologies behind “The electric telegraph” irrespective of his naiveness. Samuel Morse excited the world with his biblical message “What hath God wrought”-Numbers 23:23. Probably, this was the primitive form of SMS and was even embossed in golden letters in the archives of communication.

Samuel Morse was a trained art professor, whose passion in science and electricity eventually helped him to successfully invent “The electric Telegraph”. Samuel Morse, the native son of Charlestown, Massachusetts was born on April 27, 1791. He graduated from Yale with specialization in Mathematics and Philosophy. He further moved to the Royal Academy in London to explore his interest in painting and sculpturing. Samuel Morse was even been honored for his contribution in painting. His arts are better categorized for its sincerity and insight into the theme. He got married to Lucretia in 1818 and had three kids. While being seriously involved in his prolific painting, his wife had a sudden heart problem which Morse was completely unaware. The picture postcards of daily life during the time reveal that the long distance messages were communicated with the help of messengers on horseback. Due to the lack of a reliable communication system, the sick message reached Morse with delay and by the time he returned back to New Haven, his wife was buried. This incident together with his interest in electricity forced him to think of an unfailing instant communication system of transmitting intelligence through electric wires. The mutual interest in mathematics and arts helped him to frame the logic of telegraph system[1]. In 1837, Samuel Morse gave a public demonstration of his prototype electric telegraph system. The model had very complicated code system assigning a number for every word. So, when a signal comes through, the operator had very hectic way of flipping the pages in deciphering the original word. The system was quite slow and clumsy. But the demonstration inspired the young Alfred Vail and he joined along with Morse to redesign the system. Alfred Vail used his mind and engaged his imagination to develop the Morse code. It is worth fitting to record an expression of gratitude to the brain behind the birth of Morse code.

Alfred with his sheer interest created a corpus from newspaper and analyzed the statistics of text carefully. His experiments proved that the frequency of occurrence of English alphabet varies to great extend. The letter e is more frequent compared to q. Understanding this basic notion, he coined dots and dashes to represent a variable length representation for letters. Rather than the semantic of message Alfred Vail applied his creative mind to the statistics of letters. As a modification to Morse model, Alfred thought of transmitting message letter by letter through his new code which earlier called as alpha code and later better as the Morse code[2]. This adaption helped to design a very portable electric Telegraph system which is capable of transmitting message as letter by letter by considering its frequency of occurrence.

The Morse code was adapted for all international communication in 1912. The Morse code is language with dots and dashes, which requires practice to learn[3]. Morse code underpins even in many later developed theories. For example, Claude E. Shannon proposed in 1948 “The mathematical theory of communication”
based on the same principle followed in Morse code\cite{4}. The mysterious concept of information is described based on the frequency of occurrence of letters in a message. The more frequent symbols have to be encoded with short a code which is supposed to be the basic principle of data compression.

In that sense Morse code may even be considered as the successful implementation of data compression algorithm. Again, the Morse code may be referred to as an efficient variable encoding scheme. Morse code is as an obscure language which requires a proper training to understand the message. But still, it holds a rhythm through which the operating staff easily decodes. Even though the SMS of 19th century became a history, the 160 years old Morse code is still alive in various areas of radio communication especially in the hands of amateur radio operators.

References

Biji C.L. is currently working towards her Ph.D from University of Kerala. She is interested in communicating science through popular science magazines and has earlier contributed to CSI communications.
Brain Teaser

Solution to December 2013 crossword

Did you know what aids computer vision: An Eye or AI?

Computer vision deals with automated extraction of information from images. In the process, it tries to resemble what an eye of a human can see (data) or feel (information) using many interesting algorithms and techniques from artificial intelligence (AI) field. 

So, what aids computer vision: An Eye or AI? Both. 😊

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

Congratulations to

Dr. Madhu S Nair (Dept. of Computer Science, University of Kerala, Kariavattom, Thiruvananthapuram, Kerala) and Prof. Balu John (Dept of Information Technology, Govt Engineering College, Barton Hill, Thiruvananthapuram, Kerala)

for ALL correct answers to December 2013 month’s crossword.

CLUES

ACROSS

2. Blurring of an image (7)
4. A region of a digital image where some properties are constant or vary within prescribed range of values (4)
8. Device that causes light to converge or diverge (4)
9. Super video graphics array (4)
10. A device used for measurement of transmittance or reflectance of things (17)
11. Standard lossy compression method for image format (4)
12. Process of partitioning a digital image into multiple segments (12)
19. Type of image detection to capture the major axis of symmetry of an elongated object (5)
20. Integration of data from multiple sources into a single representation (6)
21. Science of measurement (9)
23. Ratio of width and height of an image (6,5)
24. Device that takes pictures (6)
27. Part of eye located in the retina (5)
28. A common compressed image format (3)
29. Motion of observer related to observed scene (9)
30. Type of linear transformation for images that preserves parallel lines (7)

DOWN

1. Instrument that helps to visually examine interior of bodily organs (9)
2. Application of noise in image to randomize quantization error (9)
3. Opening that controls the amount of light reaching the image sensor (8)
5. A line that touches a curve at two distinct points (9)
6. Raster graphics image format (6)
7. A curve approximation technique represented as a combination of basis functions (7)
13. An Android based image recognition application (7)
14. File format for tagged image (4)
15. Cylindrical coordinate representation of pixels in color model (3)
16. A map from one projective space to another preserving collinearity of points (12)
17. Opensource computer vision library (6)
18. Use of data from moving sensors to estimate change in position over time (8)
22. A sensor for recording images (3)
23. Effect that causes different sampled signals to become indistinguishable (8)
25. Reflection coefficient (6)
26. Picture element (5)

Solution to December 2013 crossword

Brain T easer

Dr. Debasish Jana
Editor, CSI Communications

Test your Knowledge on Computer Vision

Solution to the crossword with name of first all correct solution provider(s) will appear in the next issue. Send your answers to CSI Communications at email address csic@csi-india.org with subject: Crossword Solution - CSIC January 2014
On Lambda Expression in C++11

From: Anonymous

Q C++11 has introduced a new concept called lambda expression. Explain the concept with some examples of its usage.

A Lambda expression in C++11 originated from the concept of lambda calculus (also written as \( \lambda \)-calculus) used in functional programming where a computation of an expression is based on abstraction of function, variable binding and substitution. Instead of having explicit name, a function may be anonymous in \( \lambda \)-calculus. In C++11, a lambda expression to define an anonymous function takes the following form:

\[
\text{[capture]}(\text{parameters}) \rightarrow \text{return_type}\{\text{function_body}\}
\]

In simplest form, \([\{} \] or \([\{} \] mutable \( \rightarrow \) \( T \) \}, where \( T \) is the return type of function

Pair of brackets i.e. \([\{} \] represents capture list of external variables to be captured within lambda function variables to be captured by value or by reference. Possibilities include as given in the following table:

<table>
<thead>
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<th>Capture</th>
<th>Description</th>
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<tr>
<td>([] )</td>
<td>no external variable to be used inside lambda</td>
</tr>
<tr>
<td>([x] )</td>
<td>variable ( x ) captured by value</td>
</tr>
<tr>
<td>([&amp;x] )</td>
<td>variable ( x ) captured by reference</td>
</tr>
<tr>
<td>([&amp;] )</td>
<td>any external variable in scope implicitly captured by reference</td>
</tr>
<tr>
<td>([=] )</td>
<td>any external variable in scope implicitly captured by value</td>
</tr>
<tr>
<td>([x, &amp;y])</td>
<td>variable ( x ) captured by value and variable ( y ) captured by reference</td>
</tr>
<tr>
<td>([&amp;, x])</td>
<td>variable ( x ) captured by value and any other external variable implicitly captured by reference</td>
</tr>
<tr>
<td>([=, &amp;x])</td>
<td>variable ( x ) captured by value and any other external variable implicitly captured by value</td>
</tr>
</tbody>
</table>

Pair of parentheses i.e. \( () \) represents the list of arguments as passed to a function. Pair of braces i.e. \( \{ \} \) defines the function body that gets executed when the lambda is actually called. The return type of a lambda function can be chosen to be omitted if having single return statement, with implicit type of decltype(return_ statement). A lambda may be marked mutable if we decide to mutate the values that have been captured by value. For example, \( \{\}(\text{int x, int y}) \{ \text{return x + y; } \} \)

The return type is implicit; it returns the type of the return expression (decltype(x+y)). The return type of a lambda can be omitted as long as all return expressions return the same type. A lambda can optionally be a closure.

An example program follows:

```cpp
#include <iostream>
#include <string>
#include <vector>
#include <algorithm>

using namespace std;

template<typename T>
ostream& operator<<(ostream& o, const vector<T>& v)
{
    for (auto& el : v)
        o << el << ' ';
    return o;
}

int main()
{
    vector<int> nos = {10, 12, 15, 20, 25, 27};
    cout << "(before):" << nos << endl;
    int x = 5;
    nos.erase(remove_if(nos.begin(), nos.end(),
                       \[x\](int number) { return number % x != 0; } ),
               nos.end());
    cout << "(after):" << nos << endl;
    return 0;
}
```

Output (when run using a C++11 compiler):

```
(before):10 12 15 20 25 27
(after):10 15 20 25
```

Let's explain. The <algorithm> provides an interesting template function called remove_if, that removes elements from a given list based on a given criteria. It takes the form: template <class ForwardIterator, class UnaryPredicate>

```
ForwardIterator remove_if(ForwardIterator first, ForwardIterator last,
                  UnaryPredicate pred);
```

This function, when called, transforms the range \([\text{first}, \text{last})\) into a range with all the elements for which \(\text{pred} \) returns true removed, and returns an iterator to the new end of that range.

In our example, we have used a lambda function to remove elements from an integer vector that removes elements that are divisible by a number (in this case, 5). So, the original list \(\{10, 12, 15, 20, 25, 27\}\) gets transformed to \(\{10, 15, 20, 25\}\) as the numbers 12 and 27 are not divisible by 5.


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Do you have something to ask? Send your questions to CSI Communications with subject line 'Ask an Expert' at email address csic@csi-india.org.
The following are the ICT news and headlines of interest in December 2013. They have been compiled from various news & Internet sources including the dailies - The Hindu, Business Line, and Economic Times.

Voices & Views

• India the fourth most targeted country in phishing attacks, receiving 3% of the total attack volume lost $53 m to phishing attacks in Q3 – RSA
• IT companies face tough 2014 with a total no. of 1,316 commercial contracts worth $114 billion outsourcing deals due for renewal.
• 90% of Indian firms will use open source software in four years – Gartner.
• The sale of desktops and notebooks is expected to grow from 11 million in fiscal 2013 to 15 million in three years at annual growth of 6% – MAIT.
• The Indian e-commerce market is expanding at a rapid pace, growing from $2.5 billion in 2009 to $14 billion in 2012. It is expected to touch $200 billion by 2020.
• The combined market for serial inkjet and page printer, copier and multifunction products in India grew by 13.2% in Q3 of 2013.
• The Central and State Governments need to provide incentives that would help develop start-ups and encourage entrepreneurship – S. Gopalakrishnan, President of CII.
• The Centre’s policies and adverse attitude towards IT/telecom companies are turning out to be counter productive for the sector - Kiran Karnik, Past Chairman, NASSCOM.
• India is estimated to have 9 million kirana shops, with a vast majority not using any software or just running basic accounting software packages.
• India lags behind China in attracting R&D investments. While in China 385 global companies are investing, India has attracted investments from 228 companies.
• India smartphone market grew by 229% year over year. A total of 12.8 million smartphones were imported in Q3 compared with 3.8 million units in Q3 of 2012.
• Of the total 18.18 lakh software developers in India, about 5.08 lakh or nearly a third of them are hobbyist – IDC.

Govt, Policy, Telecom, Compliance

• Some private telecom players have opposed the Govt.’s plans to set up Wi-Fi hotspots in nearly 2.5 lakh Gram Panchayats.
• Telcos including Reliance Communications and BSNL have asked the DoT to allow them to exit a rural telephony project.
• Idea Cellular has slashed voice tariffs by up to 80% and that of data by 95% compared with standard roaming rates.
• Vodafone India is the second largest telecom operator with a total of about 157 million subscribers as of October-end staying away from 4G auctions.
• GSM operators add 1.66 m rural users taking their overall user base to 274.32 million.
• PM Manmohan Singh asked domestic telecom industry to help build manufacturing base in India by 2020 to restrict India’s future imports and balance of payment (BOP) situation.
• India to seek support from Asian, European countries on Internet governance.

Company News: Tie-ups, Joint Ventures, New Initiatives

• FTI Consulting acquires minority stake in NASSCOM’s CBE Govt

IT Manpower, Staffing & Top Moves

• Top IT firms in Hyderabad to add 1 lakh.
• Cognizant to hire 10,000 more in US.
• Airtel CIO exits amidst allegations of violating code of conduct.
• ISB Hyderabad to help 1,000 students establish tech start-ups.
• Infosys may hire 16,000 freshers next year.
• Vineet Nayar retires from HCL Tech board.
TAMC 2014 aims at bringing together a wide range of researchers with interests in computational theory and applications. The main themes of the conference are computability, complexity, algorithms, models of computation and systems theory. TAMC is happening in India for the first time.

The Programme Committee has 30 eminent experts from 11 Countries. Papers based on originality, technical quality and relevance to the conference have been carefully selected for presentation during the conference.

Eminent Experts will address the delegates. Please Visit: http://www.annauniv.edu/tamc2014

Early Bird Registration [Upto 10 March 2014]

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Registration From 11 March 2014

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For further details about registration, please visit: http://www.annauniv.edu/tamc2014/TAMC2014_Registration.htm

Please register at: https://www.eventavenue.com/attRegLogin.do?eventId=EVT4200

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Academic Sponsors

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By Net Banking You can transfer the registration fees / sponsorship to “TAMC 2014” bank account by Internet Banking using NEFT/RTGS facility using the following account details.

Name of the Account: TAMC 2014
Account Number: 33200163893
Home Branch: State Bank of India, Anna University, Chennai-600 025, India.
Type of account: Savings
NEFT / RTGS / IFSC Code: SBIN0006463
SWIFT: SBININBB291
MICR: 600000239

Please visit: http://www.annauniv.edu/tamc2014

Steering Committee

Manindra Agrawal (Indian Institute of Technology, Kanpur, India)
Jin-Yi Cai (University of Wisconsin - Madison, USA)
Barry S. Cooper (University of Leeds, Leeds, UK)
John Hopcroft (Cornell University, USA)
Angsheng Li (Chinese Academy of Sciences, China)
Zhiyong Liu (Institute of Computing Technology, Chinese Academy of Sciences, China)
CSI ANNUAL CONVENTION AT VISAKHAPATNAM IN ASSOCIATION WITH RINL-VISAKHAPATNAM STEEL PLANT

11-12 December 2013: CSI Annual Student Convention

Inauguration was done by Prof. GSN Raju, Vice-Chancellor, Andhra University. He said that "India is a super power in Information technology (IT). Without students, there are no institutions and no Universities." Highlighting that Knowledge is Power he advised students to be more industrious. Student must constantly ‘ask’ as advocated by ‘Vivekananda’ to seek knowledge from elders. Students should cultivate the ability to "Learn to Listen and Listen to learn".

TK Chand said that there should be a dialogue between the institutions and the industry like in developed countries. Stating that the growth of the country depends on the infrastructure, Mr. Chand added that students with passion and dedication can bring out the new ideas for the benefit of the society. Prof. Raghavan said that the 2-day student convention is a milestone in the history of CSI and he had never seen such a crowd in his life. Prof. Tulasi Ram Das and Prof. SV Raghavan presented awards to the winners of various competitions held in quiz, Movie making, Project expo and best paper presentations like applications of blue tooth, computer forensic and cyber crime, detecting and disabling digital camera, surface computing, mobile technologies in India’s agriculture, DNA computing, cloud computing, session based symmetric key cryptographic technique, gesture recognition etc. Total prize amount was Rs. 50,000/-.

4 Workshops were conducted viz.: Mobile Applications: 320 participants, Security: 2950 participants, Cloud Computing: 290 participants and, Applications Development using Windows: 250 participants.

13-15 December 2013: CSI Annual Convention for the year 2013

Chief Guest AP Choudhary, CMD, RINL inaugurated the convention through a remote. Highlighting the importance of IT as a basic ingredient to success in any sector, he said that speed and accuracy is the essence of profitability. Deployment of IT robust infrastructure is the pre-condition for any successful business, he added. Mr J Satyanarayana and Mr P Madhusudan were Guests of Honor. Presidential and Keynote address on “ICT & Critical Infrastructure” was delivered by Prof. S V Raghavan, President. The convention Souvenir and special edition of Springer publication was released by Sri AP Choudhary.

Lifetime Achievement Award was declared to the eminent IT expert Dr. S Ramadorai, Vice – Chairman, Tata Consultancy Services Limited. Honorary fellowship award was presented to Mr J. Satyanarayana, IAS. Fellow awards were presented to Dr. Devadatta Sinha, Dr. Swarnalatha R Rao, Dr. SM Bhaskar and Mr. Harish Bhatt. During the convention, various meetings of CSI were held. AGM, Exe Com Meeting, National Council Meeting, Regional and Divisional Meetings, Meeting with the Auditors were conducted. CSI Service awards and Academic awards were presented during the AGM. Also during the AGM two staff members of the Educational Directorate, Chennai, Mr. Gnansekaran & Mr. Natrajan were presented the certificate and momentous for their exceptional association with CSI for 25 years.

Various technical sessions were organized in a number of parallel tracks during the convention. Various E-Governance awards were given. Workshop on “ICT infrastructure for ICT systems & their Development” was conducted by Prof. Kasav Nori, Prof. T. V. Prabhakar and Sridhar Chimalakonda. Tutorial on “Green IT” was conducted by Dr San Muregesan. 150 research papers were presented out of 600 received. These included Special Sessions on: Computational Intelligence - Tools & Techniques used for IT Excellence, Software Engineering and its Applications, Digital Forensics and Futuristic Wireless and Embedded Network. Technical tracks were as follows - 1) Information Security & Biological Computing 2) Big Data & Analytics 3) IT Security & Forensics Information Forensics 4) ICT & Critical Infrastructure 5) Advances in ICT 6) Industrial Automation & Intelligent Web 7) MES & Automation, 8) IPv6 - Challenges and Strategies

IT Excellence awards were given in 6 categories. 1) Business Collaboration Solutions: Banking & Finance-3 teams 2) Design & Solutions: Product Manufacturing -5 teams 3) Advance Analytics: Products, Design and Solutions-3 teams 4) Education & E-Learning: Products & Solutions-5 teams 5) Transport-Air, Rail and Road: Product; Design and Solutions-3 teams 6) IT Infrastructure and Equipment Solutions (Merged with Health care)-5 teams.
<table>
<thead>
<tr>
<th>SPEAKER(S)</th>
<th>TOPIC AND GIST</th>
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<tbody>
<tr>
<td><strong>DIVISION IV AND HYDERABAD CHAPTER</strong></td>
<td><strong>13-14 September 2013: International Conference on “Innovations In Computer Science And Engineering (ICICSE -2013)”</strong></td>
</tr>
<tr>
<td>Dr. S R Subramanya, Prof. K Lal Kishore, Prof. Zahir Ahmed, Raju Kanchibotla, Dr. A Govardhan, G S Kohli &amp; Dr. HS Saini</td>
<td>Focus of ICICSE was on innovations in Computer Science and Engineering with the aim of providing an opportunity to computer professionals, aspiring researchers, scientists, academicians and engineers for exchange of information and in depth study of current trends and innovative ideas. Pre-conference tutorials on BIG DATA &amp; ADVANCE DATA MINING were held. Around 295 research papers were accepted for presentation. Chief Guest was Prof. K. Lal Kishore who mentioned that computer science in all its totality is undergoing tremendous transformation in its fabric and ICT was used in all spheres of activity especially in the field of agriculture, healthcare and communications etc. Prof. Zahir Ahmed said that students of computer science form India who pursue higher studies in USA are doing quite well.</td>
</tr>
</tbody>
</table>

| **CSI STUDENT ENTREPRENEUR OF THE YEAR - 2013** | **6 December 2013: Student Entrepreneur of the Year “Techunt 2013”** |
| Amit Grover, CEO of NTA and Mr. Naveen Kshatriya | Techunt-2013 was joint initiative of Nurture Talent Academy and CSI organized in IIT Bombay. 30 college and 20 school teams competed for award. Judges panel included over 20 investors and entrepreneurs. School students presented projects. College students showcased their product ideas including websites and mobile apps. Mr Ramanathan gave certificates and prizes to winners. The winning team of Swapnil, Gaurav and Raski, students from MIT SOT College, Pune, received cash prize of Rs1 lakh and a trophy for “Student Entrepreneur of the Year”. Their idea, Red-Energia, was related to healthcare to detect anaemia, a mobile app targeting pathology labs and patients. Manikandan from NSIT College, Salem received special trophy for “Innovative Idea of the Year”. His idea, Slamly, is a book publishing web application, which allows viewing, sharing, reviews and feedback. Among school students, winner was Akshat Prakash from DPS Ghaziabad. Top 6 colleges received special trophies for supporting and encouraging entrepreneurship in their campuses. Top 7 faculty members were also awarded “Mentor of The Year” trophies. |
| Mr. MD Agrawal & Mr. S Ramanathan honouring winners and mentors | |

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**Limited number of travel grants may be availed by Students / Research Scholars before 31 March 2014.** These travel grants may be availed to attend conferences / symposia / seminars / workshops and such similar events to present selected papers by the respective organizers.

The travel grants may be availed in the following research areas [but not limited to] such as

1. Information Security & Big Data
2. Social Computing & Language Technologies
3. High Performance Computing
4. Enterprise Application Integration
5. Cloud, Embedded and Mobile Computing
6. Pervasive Computing and Nano-Technology

**CSI Travel Grant Policy:**

1. Travel Grant is to be given only to the Primary Author.
2. The recipient must be a member of CSI for at least two years prior to the date of application.
3. A maximum of Rs. 25,000/- may be given as a grant.
4. Priority may be accorded to Post Graduate and Research Scholars for presenting their work in the National and International Conferences being organized by CSI within India.
5. Applications for travel grant are accepted in two spells: 1 April – 30 September & 1 October – 31 March

The pertinent forms may be downloaded from:

- Travel Grant - [www.csi-india.org](http://www.csi-india.org)/c/document_library/get_file?uuid=e1a5f1d11-6362-44b7-82f-3a951270bbca&grouppld=10157
- Travel Grant Bill Report - [www.csi-india.org](http://www.csi-india.org)/c/document_library/get_file?uuid=4a09dfedc-3-40c-4d9a-3fa-36e16cb3&grouppld=10157

The last date for receiving applications is: Thursday, 20 March 2014.

CSI Research Committee
From CSI Chapters »

Please check detailed news at:
http://www.csi-india.org/web/guest/csic-chapters-sbs-news

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<tr>
<td><strong>KANPUR (REGION I)</strong></td>
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</table>
| Prof. Y N Singh, Dr. Raghuraj Singh and Dr. Harish Karnick | **9-10 October 2013:** Two Days workshop on “Introduction to Software System & Communication Network (ALETHAC-2013)”

The workshop was inaugurated by Prof. YN Singh and Dr. Raghuraj Singh. Major topics covered during the workshop included Peer to peer networks, Importance of databases in software systems, Cloud computing, Quality software development approach & Introduction to reactive programming. |

| **KOLKATA (REGION II)** | |
| Mr. Goutam Mukherjee, Mr. Samir Mondal, Mr. Aniruddha Nag, Mr. D P Sinha and Mr. S Daspal | **14 December 2013:** Event on “COMPUTER DAY 2013”

Mr. Goutam said that knowledge of IT should be used as value addition to work and stress needs to be given on fundamental learning of concerned subjects. Mr Samir explained different issues like Career, Security threat and role of Computer knowledge in life. Mr. Aniruddha said that computer plays role of safe guard, keeper of secrets and defense against criminal other than popular usages. Competition started with Quiz conducted by Aniruddha assisted by Mr Sinha. Winner was Birla High School and runner up was Apeejay School. Quiz included Extempore event and Debate on “Internet encourages democracy”. Prizes & Certificates were given to encourage students. |

From Student Branches »

http://www.csi-india.org/web/guest/csic-chapters-sbs-news

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<tr>
<th>SPEAKER(S)</th>
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<tbody>
<tr>
<td><strong>AMITY SCHOOL OF ENGINEERING &amp; TECHNOLOGY, NOIDA (REGION-I)</strong></td>
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</table>
| Ms. Nitasha Hasteer and Mr. Saurabh Jain | **10 October 2013:** Guest Lecture on “Introduction to Mobile Apps and Blackberry 10 Platform”

Guest lecture exposed B.Tech (IT) & M.Tech (IT) students to Blackberry Platform, various Mobile Applications, upcoming mobile applications and provided them brief exposure to HTML5. |

| **CHITKARA UNIVERSITY RAJPURA, CHANDIGARH, PUNJAB (REGION-I)** | |
| Major General SPS Grewal, Mr. Subhash Chander Jain, Brig SS Sahney and Dr. Madhu Chitkara | **12 November 2013:** Student Symposium on “Information and Communication Trends in Technology – ICTT 2013”

Event was organized in association with CSI Chandigarh Chapter. The Symposium provided opportunity for students to exchange their ideas and served as platform to demonstrate their ideas in areas of Web Technologies, Software Engineering, Cloud Computing etc. |
## INSTITUTE OF TECHNOLOGY & SCIENCE (ITS), GHAZIABAD (REGION-I)

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<th>SPEAKER(S)</th>
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| Prof. Yogesh Mittal and Mr. Hemant Kumar | **19 November 2013: Workshop on “PHP”**  
Pro. Mittal emphasized on latest technology trends: Cloud Computing, Mobile computing, FOSS, Responsive Web Design, Embedded Systems, PHP, Perl, Python and other scripting languages. He told about origin and historical background of PHP. Mr. Hemant Kumar discussed how applications can be developed using PHP. He introduced WAMP Server/ XAMP framework and explained how it is to be installed. He spoke about how to develop web-page using PHP in WAMP and how to upload it on Internet. |

### B.P. Poddar Institute of Management and Technology, Kaikhali, Kolkata, West Bengal (REGION-II)

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<th>SPEAKER(S)</th>
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| Dr. Sutapa Mukherjee, Dr. BN Chatterjee, Mr. Soumya Paul, Dr. Debesh Das, Dr. Susanta Sen and Subimal Kundu | **30 October 2013: Workshop on “Electronics System Design and Manufacturing (ESDM’13)”**  
Prof. Sen elucidated advancement of technology in integrated circuits and showed images of laboratories of University of Calcutta where actually microchip implementation and structuring takes place. Prof. Das illustrated facts and figures of current demand and supply of electronic devices in India. Statistics provided by him revealed that India needs to import these devices in large scales. Mr. Kundu provided information regarding ESDM workshop study material. These sessions were followed by an industry trip. |

### GOVT. College of Engineering & Ceramic Technology, Kolkata (REGION-II)

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<th>SPEAKER(S)</th>
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| Dr. Saikat Maitra, D P Sinha, Subimal Kundu, Dr. Sasthi Ghosh, Dr. Chandra Sekhar Roy, Mrs. Somdatta Chakravortty and Bimal Pal | **31 October 2013: Workshop on “Electronics System Design & Manufacturing”**  
Objective was to make students aware of this sunrise sector, its importance for economic growth of our country and attract talent to the sector for meeting its intellectual and human resource requirements. Mr. Sinha and Mr. Kundu summarized relevance of CSI in modern information world. Workshop was followed by electronics industry visit. Students visited Digital Power Corporation in Salt Lake, Kolkata. |

### EAST POINT College of Engineering and Technology, Bangalore (REGION-V)

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<tr>
<th>SPEAKER(S)</th>
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| Dr. Prakash S, Dr. BM Girish, Dr. SM Venkatpathi, Mr. Sarvaravanan, Mrs. Rajeshwari M and Mr. Murale Narayanan | **20 August 2013: “Education Outreach Program by Women’s Leadership Forum- EMC, India”**  
Considering the need to exploit the technical proficiency of students and give shape to their creativity, the college organized this Program. The Education Outreach Program by Women’s Leadership Forum provided platform to recognize and embrace uniqueness of women to deliver high performance with strong leadership support, focusing on profession and individual development, poster innovation to significantly contribute to business and women’s community. |

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*Students along with the CSI-Student Branch Counselor, Dr. Rabins Porwal, Prof. Yogesh Mittal, Mr. Hemant Kumar and Prof. S K Pandey after the Workshop*

*Guests and speakers on stage*

*Inaugural Session of Workshop on ESDM*
<table>
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<tr>
<th>SPEAKER(S)</th>
<th>TOPIC AND GIST</th>
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<tbody>
<tr>
<td>Mrs. Shalaka Dani, Ms. Sylvia Veeraraghavan, Dr. BS Satyanarayana and Prof. KN Raja Rao.</td>
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<tr>
<td><strong>MARATHWADA INSTITUTE OF TECHNOLOGY, AURANGABAD (REGION-VI)</strong></td>
<td>21 September 2013: Workshop on “Ethical Hacking and Cyber security” Mr. Yadav provided detailed training to students about Investigation of IP Address, Ethical hacking &amp; Cracker, Steganography, Neuro Linguistic Programming (NLP) and Data Recovery. He also provided Information about Trojans and how to get the IP Address. The workshop also included practical implementation by participants.</td>
</tr>
<tr>
<td>Mr. Pawan Yadav</td>
<td><img src="image2" alt="Faculty members and participants during workshop" /></td>
</tr>
<tr>
<td><strong>PANKAJ LADDHAD INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES (PLITMS), BULDHANA (REGION-VI)</strong></td>
<td>19 October 2013: A seminar on “PHP &amp; MySQL” Mr. Vinod Pedlewar delivered speech on “PHP &amp; MySQL”. He talked about how to use PHP &amp; MySQL for designing web and various other applications. He also focused on client &amp; server side programming concepts using PHP.</td>
</tr>
<tr>
<td>Dr. PM Jawandhiya, Mr. Vinod Pedlewar, Mr. Vaibhav Narkhede and Mr. Sameer Shaikh</td>
<td><img src="image3" alt="Mr. Vinod Pedlewar conducting the seminar" /></td>
</tr>
<tr>
<td><strong>YADAVRAO TASGAONKAR COLLEGE OF ENGINEERING AND MANAGEMENT (YTCEM), KARJAT (REGION-VI)</strong></td>
<td>9 October 2013: Seminar on “Data Structures Using Java” Lecture provided students knowledge about Data Structures. Dr. Shekokar used interactive Teaching- Learning approach and it helped students to know the subject in-depth. Students got ideas for preparation of university exam for subject OOPM.</td>
</tr>
<tr>
<td>Dr. Narendra M Shekokar, Dr. SK Ukarande, Abhijit Patil, R K Agrawal, S A Borsune, Seema Jagtap &amp; Preeti Hargunani</td>
<td><img src="image4" alt="L-R: Abhijit Patil, Dr. Narendra M Shekokar, Vijay Shelake, Suraj Parhad &amp; student organizers" /></td>
</tr>
<tr>
<td><strong>AMRITA SCHOOL OF ARTS AND SCIENCES, KOCHI, KERALA (REGION-VII)</strong></td>
<td>21-23 October 2013: National Level Hands-on Workshop on “Cloud Computing” There were sessions on Overview of Cloud by Dr. MV Judy, on Green Cloud Computing by Phalachandra and on Tool-based Productivity Engineering for a Cloud Ecosystem by Vinod Panicker. Hands-on workshop was handled by Mr. Chandran, Mr. Mahesh and Mr. Sumesh and it covered topics like Cloud Architecture and Virtualization: Pathway to Cloud, Linux OS: Rudimentary Concepts for Cloud, Building &amp; Managing Private Cloud and Public Cloud - Amazon EC2.</td>
</tr>
<tr>
<td>Sri. MB Santosh Kumar, Sri. Phalachandra HL, Sri. Vinod Panicker, Dr. MV Judy, Mr. Sanal Chandran, Mr. Mahesh A S and Mr. Sumesh S</td>
<td><img src="image5" alt="Inaugural ceremony of the workshop" /></td>
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<td>SPEAKER(S)</td>
<td>TOPIC AND GIST</td>
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<tr>
<td><strong>DR. SIVANTHI ADITANAR COLLEGE OF ENGINEERING, TIRUCHENDUR, TN (REGION-VII)</strong></td>
<td>Mrs. GR Jainish</td>
</tr>
<tr>
<td><strong>6-7 September 2013</strong>: Project Presentation and Banner Design using Photoshop</td>
<td>Students presented projects in various areas like Image Processing, Cloud Computing, and Network Security etc. Presentations helped them enhance ideas for successful completion of projects. ‘Banner Design using Photoshop’ was also organized. A contest was conducted to improve creativity and design skills. Mrs. GR Jainish acted as the judge for the contest.</td>
</tr>
</tbody>
</table>

| **EINSTEIN COLLEGE OF ENGINEERING, TIRUNELVELI (REGION-VII)** | Prof. A Ezhilvanan, Dr. K Rama, Prof. R Velutham and Mr. M Suresh Thangakrishnan |
| **13 November 2013**: Code Debugging Contest | About 80 students participated. Contest was based on C programming. The first prize was won by N Manimegala, Civil [A] and C Ganthimathi, EEE department. |

| **ER.PERUMAL MANIMEKALI COLLEGE OF ENGINEERING, HOSUR, TN (REGION-VII)** | S Ramasamy, P Mallar, Perumal, P Kumar and Dr. S Chitra |
| **20-21 November 2013**: Two-days Inter school Competition “PMC SPARK-2013” | Competition was organized for classes IX to XII of public schools. There were several contests such as paper presentation, miniature project, quiz, mime and elocution for the students. Students took part enthusiastically. Objective was to strengthen skills and capacity in the field of scientific and technical environment. |

| **KNOWLEDGE INSTITUTE OF TECHNOLOGY, SALEM (REGION-VII)** | Mr. Mohit Bhalla |
| **6-7 September 2013**: Workshop on “National Network Security Championship” | Mr. Mohit Bhalla spoke about advances in IP addressing, subnetting, CISCO Routers & Switches. At the end of workshop participants attended competition and two members were selected for next stage. |

| **MEPCO SCHLENK ENGINEERING COLLEGE, SIVAKASI (REGION-VII)** | Mr. R Shankar Prasad, Manager and Prof. K Muneeswaran |
| **30 September 2013**: National Level Technical Symposium “VISARGAH’13” | Mr. Prasad emphasized importance of knowing current trends in IT industry. Special magazine on Information Technology trends called “CACHE” was released on the occasion. Students from many colleges participated in various events like Paper Presentation, Quiz, J2EE workshop, Cipher Hunt, Optimum Procurator, Debugging and Multimedia Presentation. Prizes and certificates were distributed to winners. |

*Faculty member and participants during contest*
*Prize distribution L-R: Dr. Lourdhu Pushparaj, R Velutham, Dr. K Rama, and A Ezhilvanan, M Suresh Thangakrishnan*
*Prize distribution to students*
*L-R Dr. V Kumar, Dr. PSS Srinivasan, Mr. Mohit Bhalla and participants during workshop*
*Mr. R Shankar Prasad, Manager, Royal Bank of Scotland, Chennai addressed the gathering*
SPEAKER(S) TOPIC AND GIST

NATIONAL COLLEGE OF ENGINEERING, MARUTHAKULAM, TIRUNELVELI (REGION-VII)

Prof. A Mohamed Anwar, Prof. Dr. M Mohamed Sitheeq, Mr. S Mahesh Anand and Prof. Dr. S Kother Mohideen

9-10 October 2013: Two-days National Level Workshop using “MATLAB”

Mr. Mahesh Anand gave effective hands-on-training in MATLAB tool to implement the fundamentals and advanced concepts of Digital Image Processing.

NATIONAL ENGINEERING COLLEGE, KOVILPATTI (REGION-VII)

Mr. Alagarsamy Sundar and Dr. P Subburaj

6 September 2013: One day National Level Technical Symposium “NECSI’13”

Mr. Sundar asked students to improve Team Spirit and Communication Skills. He insisted that students should develop knowledge on different technologies rather than regular curriculum and should have capability to implement that knowledge. Paper presentation, Debugging, Collage, Technical quiz, animagic and Best manager were variety of events organized in the technical symposium.

NEHRU COLLEGE OF ENGINEERING & RESEARCH CENTRE (NCERC), PAMPADY, KERALA (REGION-VII)

Adv Dr. P Krishnadasi and Mr. Ani Prakash

4 to 16 November 2013: Faculty Development Programme on “Application Development using C# .NET”

C# .NET is emerging platform for developing various Mobile and PC based applications. Theoretical sessions and hands-on training were conducted during this FDP. Various Topics focused were Introduction to Visual Studio, Building blocks of C# and .NET Applications, Idea Generation, Database Connectivity, User Interface & Resources, Design and Apps Marketing & Google Play.

Inauguration

Following new Student Branches Were Opened as Detailed Below –

REGION I
- Maharaja Surajmal Institute, New Delhi
  Inaugural ceremony of CSI student branch was held on 25 November 2013. Dr. R K Vyas spoke about the objectives and activities of CSI on the occasion. Chief Guest Prof RK Datta delivered lecture on “How information and communication technology can help address global warming problem towards 2020”.

- Raj Kumar Goel Institute of Technology, Ghaziabad (RKGIT), Ghaziabad
  CSI-Student Branch was inaugurated on 16th November 2013 with lamp lighting before Goddess Saraswati. Prof Yogesh Mittal was present as Chief Guest. During the inauguration ceremony, a sponsored inter-institutional technical event Champion-Coder was organized in which 162 students from 16 institutions participated.

REGION VII
- Sri Ramkrishna Institute of Technology, Coimbatore
  The inaugural function of CSI Student Branch was organized on 17th October 2013. Chief Guest was Mr. Ranga Rajagopal. A project developed by final year CSE student Mr V Vimal Kumar on ‘Offline Video Service and Offline Mailing’ for the college was released on the occasion.

Please send your student branch news to Education Director at director.edu@csi-india.org. News sent to any other email id will not be considered. Low-resolution photos and news without gist will not be published. Please send only 1 photo per event, not more.
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<th>DATE</th>
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<th>CONTACT INFORMATION</th>
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<tr>
<td>January 11, 2014</td>
<td><strong>CSI-YITP Awards 2013</strong>, Regional Round-Region-II, Host Chapter-Kolkata</td>
<td>Mr. D P Sinha</td>
</tr>
<tr>
<td>February 8, 2014</td>
<td><strong>CSI-YITP Awards 2013</strong>, Regional Round-Region-VII, Host Chapter- Thiruchirappally (Trichy)</td>
<td>Dr. S Raviraman,</td>
</tr>
<tr>
<td>March 1, 2014</td>
<td><strong>ICSI-YITP Awards 2013</strong>, Regional Round-Region-VI, Host Chapter- Aurangabad</td>
<td>Mr. Mukund Kulkarni</td>
</tr>
<tr>
<td>March 5, 2014</td>
<td><strong>CSI-YITP Awards 2013</strong>, Regional Round-Region-III, Host Chapter-Ahmedabad</td>
<td>Mr. Sanjay Parikh</td>
</tr>
<tr>
<td>March 6, 2014</td>
<td><strong>CSI-YITP Awards 2013</strong>, National Round, Host Chapter-Ahmedabad</td>
<td>Prof. Bipin V Mehta</td>
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Computer Society of India
India’s largest technical professional association

Join us
and
become a member

I am interested in the work of CSI. Please send me information on how to become an individual/institutional* member

Name ____________________________ Position held__________________________

Address______________________________________________________________________

City ____________Postal Code _____________

Telephone: _______________ Mobile: _______________ Fax: _______________ Email: ________________________

*[Delete whichever is not applicable]

Interested in joining CSI? Please send your details in the above format on the following email address. helpdesk@csi-india.org
## CSI Calendar 2014

### H R Mohan
Vice President, CSI & Chairman, Conf. Committee
Email: hrmohan.csi@gmail.com

### Date | Event Details & Organizers | Contact Information
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#### January 2014 events

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<th>Date</th>
<th>Event Details &amp; Organizers</th>
<th>Contact Information</th>
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<tbody>
<tr>
<td>23-25 Jan 2014</td>
<td>International Conference on Systems Engineering and Emerging Systems ICSEES-14 At Coimbatore. Organized by : PSG College of Technology, Coimbatore &amp; University of Southern, Australia and Computer Society of India, Div V</td>
<td>Prof. Dr. A Chitra, Dept. of Computer Science and Engineering, Coimbatore <a href="mailto:ac_psg@yahoo.com">ac_psg@yahoo.com</a>/ <a href="mailto:ctr.psg@gmail.com">ctr.psg@gmail.com</a></td>
</tr>
<tr>
<td>31 Jan-1 Feb 2014</td>
<td>InfoSec2014 Organized by: Information Security Education and Awareness at Hyderabad <a href="http://www.infosec2014.in">www.infosec2014.in</a></td>
<td>Mr. I L Narasimharao <a href="mailto:ilnrao@yahoo.com">ilnrao@yahoo.com</a></td>
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#### February 2014 events

<table>
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<tr>
<th>Date</th>
<th>Event Details &amp; Organizers</th>
<th>Contact Information</th>
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<tbody>
<tr>
<td>18-19 Feb 2014</td>
<td>CSI-NSC At Chandigarh Engineering College (CEC), Landran, Mohali</td>
<td><a href="mailto:gaganpec@yahoo.com">gaganpec@yahoo.com</a></td>
</tr>
<tr>
<td>20-24 Feb 2014</td>
<td>National Conference on Innovations and Trends in Computer and Communication Engineering Organised by MET’s Institute of Engineering, Nashik <a href="http://metbhujalknowledgecity.ac.in/engineering/ITCCE.php">http://metbhujalknowledgecity.ac.in/engineering/ITCCE.php</a></td>
<td>Prof. Vaibhav Dabhade <a href="mailto:papers.itcce@gmail.com">papers.itcce@gmail.com</a></td>
</tr>
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#### March 2014 events

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<tr>
<th>Date</th>
<th>Event Details &amp; Organizers</th>
<th>Contact Information</th>
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<tbody>
<tr>
<td>5-7 Mar 2014</td>
<td>INDIACom – 2014: 8th INDIACom; 2014 International Conference on Computing for Sustainable Global Computing At Bharati Vidyapeeth’s Institute of Computer Applications and Management (BVICAM), New Delhi, Technically Sponsored by CSI Delhi Chapter, Region – I, Div – I, II, III, IV and V, IEEE Delhi Section, ISTE Delhi Section and IETE Delhi Centre Website: <a href="http://www.bvicam.ac.in/indiacom">http://www.bvicam.ac.in/indiacom</a></td>
<td>Prof. M N Hoda <a href="mailto:conference@bvicam.ac.in">conference@bvicam.ac.in</a></td>
</tr>
<tr>
<td>6-7 Mar 2014</td>
<td>Comprehensive Conference On Effective Integration Of Analytic Tools With Business Decision Needs Organised by K J Somaiya Institute of Management Studies and Research (SIMSR)</td>
<td>Prof. Chandan Singhavi <a href="mailto:chandans@somaia.edu">chandans@somaia.edu</a></td>
</tr>
<tr>
<td>8 Mar 2014</td>
<td>NSC – 2014: National Students’ Convention on Computing for Nation Development At Bharati Vidyapeeth’s Institute of Computer Applications and Management (BVICAM), New Delhi, Technically Sponsored by CSI Delhi Chapter, Region – I, Div – I, ISTE Delhi Section and IETE Delhi Centre</td>
<td>Prof. M N Hoda <a href="mailto:nsc@bvicam.ac.in">nsc@bvicam.ac.in</a></td>
</tr>
<tr>
<td>14-15 Mar 2014</td>
<td>COMNET 2014 - International Conference on Communication and Networks Organised CSI Coimbatore and CSI Div IV Theme: Next Generation Networks for Cloud and Mobility Venue : P.S.G. College of Technology, Coimbatore <a href="http://www.csi-cbe.org">www.csi-cbe.org</a></td>
<td>Prof. Chandan Singhavi <a href="mailto:chandans@somaia.edu">chandans@somaia.edu</a></td>
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#### April 2014 events

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<tr>
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<tbody>
<tr>
<td>11-13 Apr 2014</td>
<td>TAMC-2014: 11th Annual Conference on Theory and Applications of Models of Computation At Chennai, Organised by CSI Div II &amp; Anna University</td>
<td>Dr. T V Gopal <a href="mailto:gopal@annauniv.edu">gopal@annauniv.edu</a></td>
</tr>
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#### June 2014 events

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<tr>
<th>Date</th>
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<th>Contact Information</th>
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<tbody>
<tr>
<td>2–4 Jun 2014</td>
<td>IFIP Networking 2014 Conference At Trondheim, Norway, <a href="http://networking2014.item.ntnu.no/">http://networking2014.item.ntnu.no/</a></td>
<td>Prof. S V Raghavan <a href="mailto:sy.raghavan@nic.in">sy.raghavan@nic.in</a></td>
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**EXCLUSIVE PORTAL FOR STUDENTS LAUNCHED**

Student members and Student branches are the most important stakeholders of the CSI family. We are pleased to inform you that an exclusive portal for students has been launched. The same can be accessed through our main portal www.csi-india.org under the student’s corner link. Student branches themselves can now post the announcement of their events and event reports along with photographs. Student members can submit articles, apps, projects and benefit in many more ways. Going forward we intend to add other features such as internships, contests, placement facilitation and much more.

Senior CSI members have volunteered their time as mentors for making this portal a success. We urge you to use the same effectively. We have made a beginning and with your support intend to continuously improve and add more features. Do feel free to share your feedback through the feedback option to help us in this initiative.

This is your portal. Be part of this new beginning and help us make it one that provides immense value to you, our members.

RAJAN JOSEPH MINI ULANAT
DIRECTOR – EDUCATION
NATIONAL STUDENT COORDINATOR

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Invites Project Proposals from Faculty Members and Students
Under the Scheme of R&D Funding for the year 2013-2014

As India’s largest and one of the world’s earliest IT professional organizations, the Computer Society of India has always aimed at promoting education and research activities, especially in the advanced technological domains and emerging research fields. It is also committed to take the benefits of technological progress to the masses across India in particular to unrepresented territories. In order to promote research and innovation meeting the grass-root level ICT needs and emphasize the importance of joint research by faculty-students, the CSI has been providing R&D funding for last several years.

The CSI Student Branches and member institutions are requested to motivate the young faculty members and students (including undergraduate and postgraduate) to benefit from this scheme. The proposals (based on the ongoing or new projects for the academic year 2013-14) the following aim/objectives, expected outcome, indicative thrust areas for research funding may be submitted to:
The Director (Education), Computer Society of India, Education Directorate, CIT Campus, IV Cross Road, Taramani, Chennai 600113.

Last date for Receipt of Proposals: 31st January 2014

Aims and Objectives
☞ To provide financial support for research by faculty members, especially for developing innovative techniques and systems to improve teaching-learning and institutional management processes.
☞ To provide financial support to students for developing new systems catering to the needs of socially relevant sectors and/or involving proof of concepts related to emerging technologies.
☞ To facilitate interaction/collaboration among academicians, practitioners and students.
☞ To develop confidence and core competence among faculty/students’ through research projects.
☞ To foster an ambience of ‘Learning by Doing’ and explore opportunities of industry funding and mentoring for inculcating professionalism and best practices among students and faculty.
☞ To recognize innovation and present excellence awards for path-breaking projects through CSI YITP awards and industry associations, Govt. Agencies and professional societies.

Expected Outcome
✓ Identification of thrust areas, capability assessment, gap analysis, recommendations and future education and research directions.
✓ Integration of research methodologies into the university teaching-learning process and evolving a quality control mechanism for academic programmes and curricula.
✓ Strengthening of industry-institutes interaction through commercialization of technologies and products developed by students and faculty.
✓ Publication of research studies (ICT penetration, technological innovation, diffusion & adaptation), state-of-the-art reports and case studies of education/research initiatives.
✓ Identification of potential new and innovative projects of young faculty, researchers and students for possible business incubation.

Indicative Thrust Areas for Research funding

Last date for Receipt of Proposals: 31st January 2014

For further details and application form can be downloaded from the link of “Student’s Corner - CSI Education Directorate” at www.csi-india.org

Rajan T Joseph
Director (Education)
Computer Society of India
Education Directorate,
CIT Campus, IV Cross Road
Taramani, Chennai-600113
E-mail: director.edu@csi-india.org