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IT for masses

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Complaints of non-receipt of CSIC may be communicated to Mr. Ashish Pawar, 022-29261724, ashish@csi-india.org, indicating name, membership no, validity of membership (other than life members), complete postal address with pin code and contact no.
Dear Fellow CSI Members,

Nowadays use of images and videos has increased at a rapid rate. Images and videos are everywhere all around us. Started around 1920 from newspaper industry, digital image processing has now its impact in every walk of our life. The Image and Video processing involves techniques which range from storing and transmitting images and videos to analysis and extraction of information from images and videos including making them ‘better’ by removing or blurring unwanted parts or making objects more sharp or clear. Applications of image and video processing are found in various fields such as remote sensing, pattern recognition, security, surveillance, robotics, industries, medical sciences, biology, agriculture and entertainment etc.

It is said that “A picture is worth a thousand words” means that a picture contains a large amount of information. In order to get this information stored in images and video, process this information and for transmission a variety of efficient digital image and video processing techniques are required.

Keeping in mind the importance of image and video processing techniques, the publication committee of Computer Society of India selected the theme of CSI communications (The Knowledge Digest for IT Community) September issue as “Image and Video Processing”.

In first cover story of this issue “Object detection: A key component in image and video processing”, D.K. Singh has described the importance of object detection in images and videos and its techniques. Second Cover story “Automatic recognition of intriguing targets” by H. K. Kondaveeti and V. K. Vatsavayi explains the application of image and video processing in radar military surveillance. In next cover story D. Evangeline has described the progress of image segmentation techniques. In “Overview of semantic concept detection in videos” by N. J. Janwe and K. K. Bhyor process of assigning one or more labels to video segments and its advantages are explained. The cover story “Multimedia data challenges for digital India campaign” by R. Gupta, S. K. Muttoo and S. K. Pal gives challenges in the campaign due to multimedia data. The cover story “Image Processing” by T. Shah and C. Bhatt describes image fusion technique and its uses in Medical image processing.

In technical trends “Parallelized Hadoop video processing: challenges and applications”, S. Chitrakala has described parallel video processing, while in “Web inspection systems: an introduction”, A.S.S. Sarma has explained the technical applications of image and video processing in real life giving details of a system developed by his team at CEERI, Chennai in collaboration with SAIL.

The article on DevOps by V. P. R. Kumar and V. Babu gives introduction of DevOps software development life cycle approach and its advantages.

Now each issue of CSI Communications includes Industry interface which is helping in making relations of CSI with industry and getting sponsorship for various events. In this issue an exclusive interview of Mr. Pradeep Gupta, Chairman-cum-Managing Director of Cyber Media is also given.

This issue also contains Practitioners’ workbench, Crosswords, CSI activities reports, Calendar of events and announcement for CSI Chapter Elections.

The publication committee is happy to announce the publication of tri-monthly CSI Adhyayan in electronic version from the month of November 2015 for the benefit of our large number of student members. The same will provide a forum for creativity, contribution, exchanging ideas and views of students of CSI who shall be the significant contributor to the future IT development in the country in particular & in the world in general.

I take this opportunity to extend my sincere thanks to Dr. Vipin Tyagi, Guest editor for bringing this issue successfully with rich and quality content. I extend my gratitude to the entire ExecCom and particularly to Prof. M. N. Hoda and Dr. D. K. Mishra for their support in bringing this issue successfully.

On behalf of publication committee, I express my sincere thanks to all authors and reviewers for their contribution to the issue.

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

Prof. A.K. Nayak
Chief Editor
Dear Members,

Greetings!

During the third ExecCom meeting held on 8-9 August, 2015 at Delhi, Fellows and Past Presidents of CSI located at Delhi were invited for an interaction with the ExecCom members. Dr. Ratan K. Datta, Brig. SVS Chowdhry Dr. M.L. Goyal, Mr. Lalit Sawhney, Mrs. Nita Lal and Dr. S. S. Agarwal attended the meeting. During the interaction, esteemed fellows gave valuable suggestions to the ExecCom members regarding technical activities, conferences, conventions and publications. I appreciated their suggestions and assured them that the current ExecCom is working for the growth of CSI, overlooking some hurdles.

There are some chapters actively involved in conducting various activities for the members and the professionals. I have found the activity level of CSI, Mumbai Chapter impressive over the years. The training programmes, covering contemporary topics in the field of IT and Computer Science, are conducted by experts having rich experience. These programmes are well received by the members and professionals from Mumbai and other cities due to high level of content and expert faculty from India and abroad. This activity of Mumbai Chapter is bringing visibility of CSI. During the last quarter, 13 trainings program on topic related to IT Software/Hardware, Knowledge Forum Lectures on ‘Performance Modeling in Big Data’ and ‘Future of Enterprise Computing’ and a SPIN (Software Process Improvement Network) session were held on the topic of “Software Asset Management”. The Mumbai Chapter also organised a Navy Conference and Cyber Crime Control Conference besides many technical activities at student branches. The chapter has also planned its flagship event CSI-IT 2020. I am sure the activities conducted by Mumbai Chapter will inspire other chapters to offer similar programmes for the members and IT professionals. I request Mumbai Chapter to provide necessary support in conducting technical activities to other chapters.

Few SIGs of CSI are active in conducting technical activities. Recently CSI SIG BDA (Big Data Analytics) and CSI, Hyderabad Chapter conducted the first 3 days workshop on ‘Big Data Analytics’ at AIMSCS, University of Hyderabad. Prof. Saumyadippta Pyne, Dr. Ramana, Prof. Sudhakar and Mr. Chandra Dasaka under the guidance of Padma Vibhushan Prof. CR Rao successfully conducted this workshop benefitting the participants from leading organizations.

CSI, Ahmedabad Chapter and Division-IV are organizing “International Conference on Communication and Networks-ComNet-2015” with a theme “Issues and Challenges with IOT Revolution” on 26th and 27th December, 2015. Prof. Andrzej Rucinski, who represents a growing category of “global professors”, defining the role of academia in the global engineering era and developing global innovation, technology, and education solutions is keynote speaker. Dr. Sumit Chowdhury, a global thought leader in the field of Smart Cities, Telecom and Information analytics and the founder of Gaia Smart Cities is another speaker in the conference.

Activities by Chapters, SIGs and Student Branches are oriented towards learning and development of members and professionals. I look forward to continuation of similar activities by them.

The Computer Society of Sri Lanka is organizing 33rd National Information Technology Conference (NITC 2015) during 7th to 9th September, 2015 at Colombo. The theme of the conference is “ICT for Corporate & Social Revolution”. I am invited to deliver a keynote address in this conference on the topic “Impact of Social Media in Society”. It is reported that there are more than 850 registration and galaxy of speakers. This will give me an opportunity to interact with other similar professional societies participating in this event and promote CSI.

I am happy to inform that the National Final Competition of Young Talent Search in Computer Programming-2015 was successfully held at Rajalakshmi Engineering College, Chennai. Out of nine teams, La Martiniere for Boys, Kolkata secured first rank and Delhi Public School, Dwarka, New Delhi secured second rank. These teams will represent India at the SEARCC International Schools’ Software Competition 2015 at Colombo, Sri Lanka during 23rd to 25th October 2015. I thank the management of Rajalakshmi Engineering College for their continuous support, chapters for organizing regional rounds, staff members of Education Directorate, Chennai for excellent coordination and ExecCom members for the support. I also thank Dr. Suresh Satapathy, Chairman (Division-V) CSI to coordinate the event.

CSI Education Directorate is regularly conducting advanced training programmes jointly with National Institute of Electronics & Information technology (NIELIT), Government of India at Chennai. The level of participation is excellent. We hope to take these programmes at other cities with support from chapters.

During the year, few executives of CSI at HQ and Education Directorate left CSI which has affected administrative work to some extent. We are in process of filling-up the vacant positions and serve the membership in best possible manner.

I look forward to your active participation in upcoming events at Chapters including CSI-2015 at Delhi.

With best wishes,

Bipin V. Mehta
1. The ExecCom is moving forward in expanding CSI Membership and bringing in systems at different levels. Our Membership is increasing and every effort is being made to increase our reach among corporate and among the student community.

The Membership Committee under the leadership of Hony. Secretary Mr. Sanjay Mohapatra is working on increasing the CSI Membership. All members have been requested to bring in members and the Membership Fee has been rationalized. The Membership Fee is Rs. 7000/- + Service Tax of 14% for Life OR Rs. 10000/- + Service Tax of 14% for Life payable in 4 yearly installments.

Our target is 20% growth in the current fiscal. All Members are requested to please help.

For opening Student Branches, one can approach CSI Education Directorate in Chennai and contact CSI Promotions: csipromotions@csi-india.org and Mr. Kathiresan, Contact Ph.: 044-2254 1102/ 1103, Mobile : 09444896312.

2. CSI Web site is being developed and gradually links and data are being proliferated. It is expected to be fully operational in the next few months.

3. CSI Communications is now effective in communicating with our Members. All reports from CSI Student Branches and from Chapters are being included and Dr. Vipin Tyagi is coordinating this.

Members are requested to read the hard copy or the soft copy to get necessary information about our Society.

4. Complaints about non-receipt of hard copies, is being looked into and reasons are being found out.

5. Nomination Committee is working on ensuring that elections are held at the Chapter level in time and conducted as per schedule which has already been announced in CSIC August issue. All NC Members at the Chapter level are requested to adhere to the time schedule.

6. Every month, an interview with a senior IT professional is being organized and the summary is being published in CSIC. This is being done to bring CSI closer to Industry.

7. Efforts are on to strengthen the Special Interest Groups (SIGs) formed few years back but lamenting due to lack of support. SIGs have been aligned to the five Divisions as required as per Bye-Laws. The SIG Convener have been told to increase the scope for SIG Membership by adding members throughout India and to send reports for publication in CSI Communications.

8. Various training programs and conferences/ workshops are being held. More thrust is needed in improving the quality of CSI events and to increase participation. Preparations are on for conducting CSI Annual Convention CSI-2015 in Delhi during December 1-5, 2015.

A large number of papers have been received and the Program Committee is busy reviewing the papers.

9. A new list of Distinguished Speakers is being prepared by nomination and by selection from the applications. Applications have started coming from all over.

10. The journal CSI-Adhyaan exclusively for the CSI Student Community is going to be published and the Publication Chair Prof. A. K. Nayak is working on this.

11. IFIP Membership has been renewed and we are working on playing an important role in SEARCC.

12. Executive positions which are vacant are going to be filled up soon so that services to our members are improved.

Best wishes,

Dr. Anirban Basu
Excerpts of the interview with Mr. Pradeep Gupta, CMD of CyberMedia on August 7, 2015 with Dr. Anirban Basu, Vice President, CSI, and Mr. Sanjay Mohapatra, CSI Hony. Secretary on how CyberMedia and CSI can work together.

Can you elaborate on the current IT market in the country?
The ICT market continued its growth momentum in 2014-15. The domestic market grew in single-digit at 8-9% and the export market grew at the rate of 13-14%. The overall strength in the IT market definitely remains. The total ICT market (IT & Telecom) is about $200 bn in size. According to estimates, the biggest chunk is the software & services export market which was around Rs. 400,000 crore. Devices worth around Rs. 160,000 crore were sold, out of which Rs. 90,000 crore came from mobile phones. PCs, servers, notebooks, tablets, peripherals, and so on, contributed Rs. 70,000 crore.
The domestic software market stands at Rs. 30,000 crore, out of which Rs. 15,000 crore is comprised of system software including OS, IDBMS, etc., and Rs. 15,000 crore is ERP, SCM, CRM, etc. The IT services market is roughly about Rs. 70,000 crore comprising of eGovernance, data centres, enterprise software, enterprise services, and so on.

How do you see the growth of IT industry in the employment of Indian IT professionals?
There is a huge employment potential by the Indian IT industry in the domestic as well as exports segments. Nearly 3 lakh jobs are created by the industry every year. However, the market is facing an ongoing challenge of IT skills shortage. Most companies retrain interns for 6 to 12 months before they can be productive.
In this context, skill-based training is required to cover the entire spectrum of industry requirements. So whether we talk about software developers or call centre operators, different skill-sets are required for people working at different levels in the entire pyramid. Consequently, the IT industry needs to pay a lot of attention in bridging the existing skills gap by working along with educational establishments and training companies to chart requirements tailored for the industry.
This implies working out curricula in line with industry needs, a strong summer internship program, industry assisted labs in educational institutions, training on soft skills, candidate registry, certification by competent bodies, etc.

What, in your opinion, can be the role of the CSI in narrowing the IT talent gap?
Today, CSI reaches out to various colleges, universities, and it also has a very strong student membership. Thus, CSI can provide that bridge and be the body which ensures that industry requirements are met by the education system. CSI needs to work very strongly with the education community on the various actions that I spoke about just now. And if that role can be played by the CSI, it would indeed be a yeoman service to the nation.

How can CSI be more effective?
Earlier, CSI had a very strong connect with the industry but over the years that has weakened. For CSI to be more effective, it needs to start working closely with the industry. While it has a very strong connect with the educational system, the industry connect needs to be strengthened. If this is achieved, CSI can create the bridge by which industry can start getting ready manpower; it can play a very important role in connecting these two vital segments of the industry.

How can CyberMedia and CSI work together to support PM’s vision of ‘Digital India’ and particularly on skills development?
The PM’s Digital India mission has really created a “vision” for India towards becoming a connected society. PM Modi has talked about ubiquitous connectivity, providing devices, providing services to the citizens, hearing the voice of the citizens, and Make in India. These are the pillars on which the entire Digital India program is based.
CSI and CyberMedia can jointly play a role in two important areas: Skills development which I have already talked about. The other is nurturing innovation. There is a lot of innovative stuff happening in Indian colleges, institutes and Universities. Somehow, very few of these innovations get converted into actual usable products for the industry. CSI and CyberMedia can create a connect by which this lab-to-market gap can be bridged.
CSI CHAPTER ELECTIONS 2016-2017/2018

Dear CSI Members,

Under Chapter Bylaw 5.1.1 of the Computer Society of India, the Nominations Committee [NC] is required to invite appropriate groups of members to submit names of voting members for considering them for the various elective offices of the Managing Committee [MC] and Nominations Committee [NC].

Members are accordingly invited to submit names of candidates who are valid voting members of high professional standing, integrity and experience for the following offices of Managing Committee [MC] and Nominations Committee [NC].

For the term 2016-2017 (April 1, 2016 – March 31, 2017)
1. Vice-Chairman-cum-Chairman Elect - One Post
2. Nomination Committee (3 members) - Three Posts
3. Managing Committee: (4 / 6 / 8 members as per class/category of chapter)
   - Category A = (Chapters having more than 500 members) - 8 MC Members.
   - Category B = (Chapters having 250 - 500 members) - 6 MC Members.
   - Category C = (Chapters having less than 250 members) - 4 MC Members.

For the term 2016-2018 (April 1, 2016 – March 31, 2018)
4. Hon. Secretary - One Post

Formats for nominations are available on the link http://csi-india.org/communications/Formats%202016.pdf

- Start Date for call for chapter nominations: 15th September. 2015
- Last Date for receipt of chapter nominations: 10th October 2015

The nominations for Chapter elections should be sent to the Chapter NC. However, a copy of the nomination MUST be sent to CSI HQ and National NC at (chapterelections2015@csi-india.org) for record. For chapters without a valid NC, National NC will conduct the elections.

Chapter election process must be completed by 31st October 2015 i.e. the election results/slate must be communicated to CSI HQ by the chapter by this date. If the chapter opts to go for online voting with National ExecCom voting, all details of the nominees must be sent to CSI HQ/National NC by 31st October 2015. The election process in such cases would be completed by 31st January 2016.

CSI Nominations Committee 2015-2016

e-mail: nc2015_2016@csi-india.org

Dr. Anil Kumar Saini (Chairman)  Mr. Rajeev Kumar Singh  Prof. (Dr.) U. K. Singh

As is well-known, any society like ours is formed with a certain set of objectives and also, guidelines. From time to time, we prepare and update our vision, mission and make attempts to involve the members of the society through their activities. Regions and Chapters are formed for roping in more of elderly and younger persons. We try to address/focus regional/chapter issues, keeping in mind the national interests of the society, as a whole. Many chapters have organized and are organizing programmes of varied nature – be these international conferences, national conventions, regional competitions/meetings and/or local lecture meetings. Also, regions, formed primarily for geographical reasons, have started their activities to encourage the members with possible mix-ups and preferences amongst the Chapters in the Region, thereby increasing the level of activities in the Region. Region II is no exception. It is true the each Region has its own strengths and limitations, on various scores. After assuming the office of RVP-II, I have found Kolkata Chapter to be the only operative chapter; sadly, Patna, Siliguri, Durgapur, Guwahati all became inoperative. Somehow or the other, the ongoing activities at Patna and Siliguri with their members have made the Chapters operative. We are yet to find some group in Durgapur and Guwahati to revive them. We couldn’t make any dent in Agartala, as well.

Let’s hope, in near future, possibly in the fiftieth years of existence of ours, some volunteers will come up in those places to make some initiatives so as to form chapters flourishing with regional and national supports from our Society. Many of us, all over India, know the recent happenings of Kolkata Chapter, particularly in respect of adherence to centralized accounting system. Being termed as vibrant and recipients of may chapter awards, Kolkata is still in a position to increase the number of activities in this part of the country, apart from the troubles that it may inherit from time to time. As regards relatively new chapters like Patna and Siliguri, activities there are commendable. I have also heard about the Jamshedpur Chapter, a Chapter in the erstwhile Eastern Region, now in a different Region, which has been revived after a long time; it has built up its own legacy. History of CSI cannot be complete without this Chapter. I, as RVP-II, feel that the rising generation and family, much younger IT professionals, must actively participate in different programmes of the Society at all levels. The rationale of involving the professionals, in their right earnest, in societal programmes should not be understood at a much later stage. I do believe they can also provide a better advice than we, elderly people, even in fifties, can give. Lastly, I appeal and necessarily look forward to all members in this Region to contribute to effective functioning of the chapters, thereby serving and strengthening the Society in numbers and also for the cause, forged and undertaken over these years.

Devaprasanna Sinha
RVP-II
**Object Detection: A Key Component in Image & Video Processing**

**Introduction**

Detecting the presence of an object or more than one object in an image or a video has more or less become an essential processing step for both Image and Video. It runs from checking human presence in the images on social network and then recognizing them, to processing video (captured by robot eye) for hindering objects in robot navigation. Today, we can find its application in almost every segment of life, with more precise terms ‘Computer Vision’, ‘Robotic Vision’, ‘Human Machine Interface’ and ‘Virtual Reality’ too.

Focusing on some of the application domains, we can find it implacable for driver assistance system and auto driving[3]. A real time frontal view captured from camera can be processed for detecting vehicles running in front, and certainly a control system can be used for vehicle speed control and for making a slight turn to avoid accident. Robotics is other prime area involving computer vision. Robots used in industries for visual inspection of manufactured parts, shape & size measurement and defect detection as well. Robots in military, to autonomously handle warfare’s during military operations. Beside this robots can be used for human assistance too.

We also have a domain of medical imaging which seriously uses image processing for diagnosing various deficiencies in medically unfit person. Above all, the critical medical treatment (operations) in many cases, are nowadays based on these imaging techniques only. Then surveillance is one more application domain, having prominent role of image & video processing, since security concern is all-where seen. This concern for security could either be in society, market places, public places, or territorial & international borders too.

Next, complete discussion goes on Object Detection in image & video processing in-line with surveillance applications. Talking surveillance, CCTV is the thing that comes first in our minds. Wiki explanation to CCTV is video surveillance that uses of video cameras to transmit a signal to a specific place, on a limited set of monitors. Certainly, some security personnel’s sitting in control room where these monitors are placed, manually trace these video streams for catching any unwanted activity if happens. Logs are also made to check issues in future. Such a surveillance mechanism involves human need and intervention for checking CCTV video streams or footage. This happens to be a reative kind of security solution i.e. public/property loss in some cases can’t be avoided with such technique. On the other hand, if we can think for a system which is more proactive and least uses the man power (security personnel’s) could act as an appropriate and desirable replacement to the previous surveillance mechanism.

At the border (international), a proactive surveillance system can be designed to automatically identify the infiltration across the border fences and respond correspondingly. This can reduce the engagement of a huge number of military personnel’s who does patrolling day & night and in severe climatic/ environmental conditions of extreme cold, extreme hot, sand storms, and rain. The system should be such that it can catch any infiltration across the fences and respond as by raising alarms and even target focused firing too. First part in design of such system involves identifying/detecting human presence at the site and then checking its activity in order to respond. This requires placement of camera (on pan-tilt base) to continuously have watch on the site and then a software system which does video processing to detect human (intruder) and its activity.

**Object Detection**

Literature discusses many techniques which actually can be used for object detection, but each of these techniques are not enough robust to be used in every scenario. The type of scene and performance requirement (based on different parameters) could be a factor to decide any of the technique. No way, many a times the fusion of some of these techniques could provide a improved result. Here, I will discuss two broad categories in which almost 80% of the algorithms/researches for object detection lies. 1st is Object Detection using temporal frame differencing and background subtraction with some thresh-holding strategies. 2nd is Object Detection using Classification techniques based on object features.

Since, application of focus in our discussion is surveillance application, that too for intruder detection at international border site, the object we consider here will be the human object. And the prominent portion of the human body for any camera based surveillance is the face, since face characteristics can originally be captured while other body parts are generally covered with clothes. For this application, objective transforms to Face Detection.

**Background Subtraction:** Static part of the scene i.e. part of the video frames which is never changing is considered as background. And dynamic part is the moving object. Background subtraction can be done by background modeling. In an image if the color of the object is completely different than rest other part of image, then modeling is easy and simple thresh-holding can do the background subtraction. If it more than 1 color in the non object portion of image then a multi point thresh-holding/adaptive thresh-holding will do the background subtraction[2].

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1. [1] Driver Assistance System and Auto Driving
2. [2] Background Modeling

**Fig. 1: Surveillance scene**
\[(x,y) - B(x,y)] > T \text{ where, } T \text{ is threshold, } I \text{ is current frame and } B \text{ is background model.}

Three Frame Differencing: Pixel by Pixel difference of successive frame in the time domain will give a contour of the contour of the object boundary. This clearly shows the moving object, difference of the pixel values at static portion gives 0, which is black intensity.

\[|I_t(x,y) - I_{t-1}(x,y)] > T \text{ where } I_t \text{ and } I_{t-1} \text{ are frames at time } t \text{ and } t-1.

Feature based Classifiers: Opposite to pixel intensity based processing in previous techniques; here features are used as the attribute of the object characteristics. Features encode the ad-hoc domain knowledge that is difficult to learn using a finite quantity of training data. Color, intensity (contrast, brightness), texture can be thought as primary features while some other secondary features are also given, fusing primary feature information example Haar-like features, HOG features, SIFT features, CENTRIST etc.

The contrast variance between pixels or pixel groups is used to determine relative light & dark areas. Two or three such adjacent groups with relative contrast variance form a Haar-like feature[3], can be well seen in Fig. 2. HOG is Histogram of Oriented gradients, SIFT is Scale Invariant Feature Transform and CENTRIST is CENsus TRansform hISTogram. Haar-like features were specially designed for face by Viola & Jones.

Using these features generated for specific object, a classification model i.e. a classifier can be learned / trained. Classifiers those could be used in coordination are Artificial Neural Network, Support Vector Machine, Naive Bayes, Gaussian Model, and Gaussian Mixture Model etc. Some boosting algorithms or classifiers in cascade can also be used generate efficient classification model[4]. A cascade of classifiers at n stages is a designated tree (Fig. 3) which rejects all other patterns except the one with the objects. Stage 1 classifier is a weak classifier using just single feature to detect object. So rejection rate of samples is maximum at this stage. All selected samples are given to next stage classifier with few more features. This goes till last stage classifier where all of the features are used means it is the strongest classifier. Selected samples out of last stage are of detected object.

Experimental Results: Shown here are some outputs as a result of the above discussed two techniques when applied on a real-time video stream.

Conclusion
The role of image & video processing with object detection as needed component was discussed in the article. It well describes the wide ranging application domains and sub-domains. Technical details of some of the methods used or explored till date are discussed here, which could pave a way to easy learning / understanding of the newly researched methodologies in object detection domain. Further we can go for devising our own technique and can also explore their implacability in other applications too for improved results.

References

Fig. 2: Haar-like features
Fig. 3: Cascade of classifiers
Fig. 4: Object detection using frame differencing method
Fig. 5: Object detection using Haar Cascade classifier

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Introduction
A few decades ago, the main concerns of the image processing in remote sensing domain are basic phenomena like image enhancement, image restoration and image data compression. But these days, the requirements are beyond the traditional phenomena and moving into realms that are related to perception and cognition. At the same time, rapid response is gaining equal importance in advanced remote sensing applications such as intrusion detection, maneuvering target identification and automatic missile destruction in military surveillance. The main compelling reasons for the increasing importance of image processing in defense systems are (i) the need for better use of the outputs generated from the wide variety of sensors and (ii) the need for autonomous processing and decision making. In military patrol, high resolution imaging radars are used to capture the images of different targets such as missiles, ships, sub-marines, aircrafts, motor vehicles and aerospace objects day and night and in all weather conditions. These images are captured by the microwave radars because of the difficulties in image acquisition by optical imaging radars in extreme weather conditions like smoke, fog, cyclones and thunder storms. The microwave band radar images are quite different from the optical radar images and pose challenges to the researchers to develop accurate and robust algorithms and techniques to cope up with the problems of noise suppression, target segmentation, feature extraction and target identification. The following sections elaborate the issues, general solutions and their overheads related to the above problems and the future directions in this research area.

Difference between Optical and Microwave Images
- Microwave band images are utterly different from the optical images. Figure 1 depicts the sample microwave band images of a fighter jet aircraft.

- Optical images are less vulnerable to noise compared to microwave band images.
- Noise present in the optical images is additive in general. On contrary, the speckle noise present in microwave band images is multiplicative.

Problems Associated with Microwave Band Images
- Low Signal to Noise Ratio (SNR) and low Signal to Clutter Ratio (SCR)
- Blur due to jet engine modulation
- Clutter and noise
- Vertical and horizontal streaks

Steps Involved in Recognition of Targets
Typical steps involved in target recognition from the microwave radar images are data acquisition, Signal processing and image generation, image processing, feature extraction and target identification. Fig. 2 depicts the overall process involved in target recognition.

Data acquisition
Radar is an object-detection system. It is used to determine the direction of
motion, speed, and altitude of objects from a remote location. Imaging radar is a special kind of radar used for imaging. Typical imaging radar technology includes emitting electromagnetic waves, receiving the reflected signals, and using the acquired information to create a 3-D or 2-D image of a target. Figure 3 depicts the target data acquisition using radar.

The first step in target recognition is data acquisition. This is done by using high resolution imaging radars such as Inverse Synthetic Aperture Radar (ISAR).

**Signal Processing**

Sophisticated signal processing techniques such as 2D Fourier transform, Auto Regressive model (AR), Multiple Signal Processing (MUSIC) etc. are used to generate the target images. These target images are generated by on or off-line processing of the captured data. In former case, on-board automatic signal processing mechanisms generate the images and are transmitted to the ground receiver station and the signal processing is done in receiver station in later case.

**Image Processing**

The generated images are processed to remove the noise and to segment out the target from the unwanted background details. Fig. 4 depicts the sample radar images of different ship targets at arbitrary aspect and azimuth angles containing clutter and streaks before pre-processing.

**Noise suppression**

Microwave band images are prone to noise easily. Noise present in these images is due to following reasons: (i) Errors in image acquisition by the trained personnel due to focusing errors or by the problems in the acquisition system (ii) Using outdated signal processing techniques to generate the images and (iii) Due to transmission errors.

In general, the noise removal can be carried out in two steps. (i) Noise modeling and (ii) Subtracting the noise model from the images. In noise modeling phase, the noise present in the images is modeled/ represented by mathematical formulations and expressions. It is difficult to model the noise present in microwave band images because the noise and data are statistically independent to each other. Even though it can be represented by a complex model, it cannot be simply subtracted from the noisy image as the noise present in the radar images is speckle noise which is multiplicative, not additive. The filtering techniques used for the removal of additive noise cannot be applied directly to the multiplicative noise. As most of the noise filters existing today are additive noise filters the images must be converted to logarithmic domain to convert the multiplicative noise to additive noise.

**Frequency and time-frequency domains**

Frequency and time-frequency domains are more suitable for the processing of high frequency noise components than in spatial domain. Conversion of the images to the respective domains can be done by using Fast Fourier Transform (FFT) and Discrete Wavelet Transform (DWT).

Threshold based noise removal techniques are extensively used for noise filtering in radar images. In this approach, some threshold intensity value is determined by some statistical inferences. All the pixel intensity values above/below the threshold intensity are converted to zeros while other pixel intensity values are to one or to some specific value.

**Target Segmentation**

Segmentation is the process of dividing the image into different sub-parts or objects. Target segmentation is used to segment a specific region or object from unwanted background details. Target segmentation is also an important phase in target identification because the features describing the exact target are crucial in discriminating different targets.

Threshold based segmentation methods are used to keep the required details while removing the other details by using a threshold value determined using mathematical or statistical inferences. Careful selection of the threshold intensity segments out the target from unwanted details. Adaptive thresholding techniques perform better than traditional techniques as they depend on local variance of the pixel intensity values.

**Color based segmentation techniques**

Color based segmentation techniques used to segment the objects based on the intensities of different colors. This technique is used to segment out the high scatter parts or areas in the images of a given target. The detected high scatter parts are covered by the stealth paint to reduce the reflections.

Pattern classification and clustering of the pixels into sets of distinct classes based on intensity values or image properties are also used to extract the target from other sets of pixels.

**Feature Extraction**

After target segmentation, discriminative features are extracted from the segmented targets. Image features are defined as the discriminative primitive...
attributes or characteristics of an image. These features are generally known as target descriptor vectors. Target descriptor vectors are extracted from the target images captured at different elevation angles and different azimuth angles (aspect angles).

Features extraction techniques are of two types. They are target description techniques and target representation techniques. Target description techniques are used to encode the inner and outer details of the target using local and global description techniques. In target representation techniques, some statistical and geometrical measures are used to represent the targets. Even though there is a large difference between target description and representation, the two words are used interchangeably for simplicity in most of the cases.

Most of the feature extraction techniques are statistical measures of the distributed data. For example mean, variance, area, circumference and ratios of individual statistical measures. Hu’s invariant moments, Zernike and Lagrange’s moments are also used as the features. Boundary representation techniques like Fourier descriptors are also used as target descriptors.

Target identification

High-level expertise in image processing and video analysis is required in target detection applications for object detection and classification. For target detection, classification of detected objects is also important besides the object detection.

Classifier model is built from the features obtained from the feature extraction module. Neural network classifiers are the mostly used in the classification of ISAR images. Random ensemble metrics, SVM are also widely used classifiers.

The classifier model is used to identify the targets present in test images. Robust identification depends on the classifier model built in this phase. The accuracy of the target identification depends on the noise removal techniques.

Trade-offs or Limitations

• While preprocessing the images, target information may lost due to selection of unsuitable noise removal mechanisms. Care must be taken in order to retain the discriminative information for the target identification in noise removal and target segmentation.
• High dimensional features are more discriminative as they carry more information but they introduce additional computational overheads in the classification phase. Low dimensional feature vectors reduce the classifier complexity but they carry less discriminative information compared to high dimensional vectors. Low dimensional, high discriminative feature vectors are desired for the optimal utilization of computational resources for the classification decision.
• It is very hard to develop object detection and classification algorithms which works fine for the applications prone to harsh weather, physical and geographical conditions.
• Matching different appearances of the same object at different azimuth and elevation angles make it difficult to detect and classify an object as a target.
• Detection of multiple objects in an image affects the performance of real time operations to a large extent.

Conclusion and Future Directions

In critical military surveillance operations, the time available for the evaluation of the captured data, reporting and the implementation of countermeasures is very short. The military operations involved in identifying the maneuvering targets and weapon direction and their destruction largely fail if all the evaluation cannot be completed within such a short span. Now-a-days high capabilities of parallel and multi processing systems are breaking the speed barriers of massive high resolution image processing and attracting the attention of scientists and researchers. Defense Advanced Research Projects Agency is promoting the use of reconfigurable computing systems in military-imaging systems for executing the high computational tasks. Once deployed, such adaptive computing systems can be easily extended and upgraded. Several universities, research agencies and commercial projects are heavily involved in solving problems and trying to improve the processing and decision making capabilities in military image-processing applications such as pattern matching and automatic target recognition. In the near future more robust autonomous surveillance systems are going to conquer the traditional surveillance approaches and offer high security and protection.

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Introduction
Image Segmentation\(^{[1]}\), one of the significant steps in Image Processing is the process of partitioning the digital image into two or multiple homogenous regions. Mathematically speaking, the image \(R\) is partitioned into \(n\) sub-regions \(R_1, R_2, R_3, \ldots, R_n\) such that and when. This segmentation is used in medical image analysis for surgical planning, lesion quantification, identification of tissue abnormalities apart from object detection video surveillance, pattern recognition and many more applications.

Classification of Image Segmentation Methods
Image Segmentation Methods can be broadly classified under three heads: Pixel-based, Edge-Based and Region Based Segmentation\(^{[2]}\) methods part from Model based methods.

- **Pixel-based (Histogram-based) segmentation** is a process by which the digital image is divided into two or more more than two) histogram peaks. This method is the widely used segmentation technique in which the threshold value is manually chosen and experimented on the image to evaluate the effectiveness of the technique. One can employ bio-inspired algorithms\(^{[3,5]}\) to choose the threshold intensity.

Thresholding\(^{[1]}\) methods can be based on two approaches - either parametric or non-parametric. While the parametric approach involves estimation of probability density function to model every class, the non-parametric approach employs posterior criteria thereby eliminating estimation of such parameters. Between-class variance, entropy maximization, preservation of moments and estimation of error rates are some of the criterion based on which threshold values are estimated to perform effective segmentation.

Otsu’s thresholding method\(^{[2]}\) intends to determine single or multiple threshold(s) by maximal inter-class variance or minimal intra-class variance. Entropy of an image is a measure that provides the spread of intensity values across the image. Entropy is zero when all the intensities of the image are same and maximum when all the intensities are equally spread across the image. The concept of entropy finds its roots in Information Theory given by Shannon. The recent image segmentation techniques employ Kapur’s Entropy\(^{[6]}\) and Tsallis Entropy\(^{[7]}\) for better results. While Otsu’s algorithm can be extended to multi-level thresholding, the extension of Kapur’s Entropy and Tsallis Entropy to perform multi-level thresholding consumes much computational time. Since images with similar histograms may yield the same threshold value while performing thresholding, the second-order statistics of the image i.e., Gray-level Coherence Matrix (GLCM)\(^{[4]}\) could be used to record the transitions between gray levels.

**Edge based Image Segmentation Methods**
Two homogenous regions in an image may be separated by an edge. Detection of edge involves detection of sharp discontinuities within the image. Edge Detection methods employ filtering, enhancement and detection methods. Most of the edge detection methods involve the use of Roberts Cross Operator, Sobel Operator or Prewitt Operator. Canny Edge detector\(^{[3]}\) is a multi-stage algorithm that attempts to detect edges in the image.

Region based Image Segmentation Methods
Region based Segmentation also called as Similarity based Segmentation attempts to find out the closed region in an image. Such methods are broadly classified as region splitting, region merging and region growing. Region growing methods start with selection of seed points within the image. Usually, seeds are selected from the entire range of gray levels or from objects of interest. These seeds are recognized along with its similar neighbors as a region. Region merging and splitting methods try to identify homogenous parts in the image. Watershed Segmentation algorithm is one such example of the aforementioned method.

**Model based Image Segmentation**
Deformable models can find out the edges or regions in an image with the help of image forces and external constraint forces acting upon the images. Deformable models can be classified into parametric and geometric deformable models. While parametric models employ Lagrangian formulation, geometric models employ Eulerian formulation. A significant parametric model called Active Contour Model (ACM) or Snake\(^{[7]}\)
strives to find the edges of a 2D object or specific regions. The stopping criterion of the model determines whether these contours are region based or edge based. Apart from segmentation, such contours are widely used in object tracking and shape recognition. Geometric models like level set attempt to transform curves to higher dimensional scalar functions using distance transformation.

Conclusion

Though thresholding is the widely used segmentation method, computational complexities increase when level of thresholding is increased. Selection of seed points in Region-based methods consumes more time. Though Edge-based methods process very less amount of data on comparison against the other methods, achievement of high quality is quite impossible in most cases. So, it is advisable to employ any Region-based method in combination with the Edge-based method. Parametric models focus on identification of only single Region of Interest (ROI) and not multiple ROIs. Current research in image segmentation focuses on developing automated hybrid segmentation method and employing optimization algorithms to reduce time.

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Overview of Semantic Concept Detection in Videos

**Abstract:** Recent technological developments in the field of multimedia storage, compression techniques and networking are resulting into huge amounts of rich video archives. To facilitate browsing, searching and retrieval of these video data, automatic video semantic concept detection techniques are required. This is also called high-level feature extraction or semantic indexing. The role of semantic video concept detection technique is to assign one or more semantic labels to the video segment, based on predefined concept list.

**Introduction**

Video semantic concept detection also known as high-level feature extraction or semantic indexing is the process of assigning labels (semantic concepts) to video segments, based on predefined concept list. This task is important for several video processing applications like concept-based video indexing and retrieval, concept-based annotation and summarization.

Many people communicating via mobile phones or internet, their obvious medium of choice is video. Digital video is leading to huge repositories of small and large videos with diverse visual content. To facilitate browsing, searching and retrieval of these videos, automatic semantics detection technique is required for deriving the meaning or interpretation for a video portion called semantic concepts. The objective of this method is to detect semantic concepts on the basis of the visual appearance of a video segment. The example semantic concepts are a person, car, bus, aeroplane, vehicle, indoor, outdoor, sports, forests and mountains etc as shown in Fig. 3. These semantic concepts are also called “high-level” features. On the basis of the visual appearance, we human beings interpret the semantic meaning for a video segment. But it is not the case with automatic semantic detection techniques. The semantics are expressed by extracted low-level features from the video segment. There is a difference in semantics of these two representations. This is called "semantic gap". The main challenge of semantic concept detection technique is to understand the video content by minimizing the semantic gap between the video signal and visual content interpretation. The mapping we require is in between the low level features that we extract and the higher level semantic concepts. The role of concept detection is to build such mapping functions with the help of machine learning techniques.

**Basic Concept Detection System**

The pipeline of a typical video concept detection system is shown in Fig. 1. The main building blocks of state-of-the-art system are as follows:

1. Video segmentation or Shot boundary detection
2. Key-frame extraction
3. Low-level feature extraction for key frame
4. Building classifier
5. Score Fusion

A brief description of above steps is given below.

**Video Segmentation (Shot Boundary Detection)**

For retrieval of automatically detected semantic concepts at a fine level, video segmentation is required in which video sequences need to be partitioned into video shots, which is a video segment grabbed by a continuous camera action and consist of one or more related frames. The components of a video clip after segmentation are shown in Fig. 2. Shot exhibits strong content correlations between frames. Hence, shots are considered to be the basic units in concept detection. Generally shot boundaries are of two types, a cut or abrupt boundary, where the transition between two consecutive shots occurs between two consecutive frames and gradual transitions where boundary is stretched over multiple frames. The examples are dissolve, fade-in and fade-out. The shot boundary detection methods extract the low-level visual features from every two consecutive frames and compute the similarity and detect boundaries where similarity is less than the threshold.

**Key Frame Extraction**

Often the frames in the same shot are very similar to each other; therefore the frames that best represent the contents of a shot are selected as key frames. Mostly, the middle frame of a shot is taken as a key-frame, assuming that middle segment of a shot contains key contents, but many more other techniques do exist by which a key frame is identified. It is not necessary that a shot is always represented by a single frame; in some cases; however, multiple key frames are required to represent a single shot. The approaches like unsupervised clustering can be used, where frames in a shot are clustered depending on the variation in shot content and then select frame nearest to cluster centre as a key frame. Each cluster gives
us a unique key frame. So a single shot can have multiple key frames. The choice of a key frame may also depend on the object or the event we are looking for. Whichever frame that best represents the object or the event can be chosen as a key frame.

**TRECVid Data sets and Feature Extraction**

To provide a platform for research community working in the area of video processing, the Text Retrieval Conference Video Retrieval Evaluation, popularly known as TRECVid, is organized on annual basis. Since 2001, the TRECVid conference has been sponsored by an US agency, working under the department of commerce, the National Institute of Standards & Technology (NIST). As the volume of research increased, TRECVid has been separated from TREC after 2003. For researchers, it provides large video data sets collection each year e.g. TRECVid2015 data set for the year 2015, along with a task list. It focuses its efforts to promote advances in video analysis and retrieval, based on the common video data sets and a standard set of queries. It also provides ground truth data like a list of shots and a list of key frames for genuine researchers on request. The URLs for TRECVid and NIST have been provided in references.

The aim of feature extraction is to derive a compact representation for the video shot. In concept detection system, a key frame/s represents a shot. And this key frame is described using text, audio or visual features and/or their combinations.

A video has both auditory and a visual channel and it is clear that the dominant information is present in the visual stream. We summarize here the visual features which are frequently used in many concept detection methods. As mentioned earlier, the major bottleneck for automated concept detection system is to minimize the semantic gap between low level feature representation we extract from video and high-level human interpretation of the data. Hence, chosen visual features need to represent the wide diversity in appearance of semantic concepts. If we vary the viewpoint, lighting and other conditions in the scene recording will deliver different data, whereas the semantics has not been changed. These variations induce the so-called sensory gap, which is the lack of correspondence between a concept in the world and the information in a digital recording of that concept. Therefore, we need visual features to be minimally affected by the sensory gap, while still being able to distinguish concepts with different semantics. We require invariant visual features, such that the feature is tolerant to the accidental visual changes caused by the sensory gap.

Visual features are of three types, i.e., color features, texture features, and shape features; and we will discuss them along global level, region level, keypoint levels, and their temporal extensions.

- **Global**: We often summarize the information in the entire key frame to represent a visual feature, called global measure. Most commonly, these measures are in the form of histograms.
- **Region**: Descriptors that suffer less from the irreversibility of global measures rely on segmentation or partitioning. A partitioning uses a fixed set of rectangles, or one fixed rectangle in the middle of the frame, and a further partitioning of the remaining space in a fixed number of equal parts.
- **Keypoint**: Keypoints were used as an efficient means to capture the essence of a scene by detecting the information-rich pixels in a frame, such as ones representing spots, edges, corners, and junctions. While effective for many computer vision applications, keypoints proved to be very useful for concept detection by two recently proposed consecutive operations, SIFT and vector quantization procedure on such points. The first operation, Scale-Invariant Feature Transform descriptor, which measures the region around a keypoint and describes each region using an edge orientation histogram.
- **Because of its invariant nature with respect to intensity, color, scale and rotation, it exhibits superior performance. The second operation i.e. vector quantization procedure, clusters the edge orientation histograms into a data structure called codebook. In this codebook, each cluster represents a visual codeword. The distribution of the frequencies of the code words is used as feature vector for a key frame.
- **Temporal**: All of the above features are important for video data. We all know that a video is a collection of sequentially ordered frames, and it can be represented by many of the representations used for key frames. Extracting temporal features allow us to analyse the motion pattern of a moving object and camera movement, we can also track some regions from a scene. For segmentation we have, in addition, to color- and texture-based grouping of pixels, motion-based grouping which groups pixels if they move in the same direction with the same speed. Important, these additional information sources enhance the interpretation of the video, but due to their expensive computational costs, the use of temporal features has not become common in concept-based video retrieval.

**Building Classifier**

Automatic video concept detection in segmented video is a machine learning problem. In any machine learning algorithm, given an m-dimensional feature vector $y_i$ of a video shot or a representative key-frame $i$, our objective is to get a measure, which tells whether a shot $i$ belongs to a class of semantic concept $C_j$ or not. We can have many feature extraction techniques to choose from, to get $y_i$, and various supervised machine learning techniques to learn the mapping between $C_j$ and $y_i$. In supervised machine learning, in the first phase, we have to train the machine i.e. classifier by supplying a set of optimal input feature vectors, and in second phase, the classifier specifies a probability $p(C_j | y_i)$ for each semantic concept to each test sample. In automatic video concept detection...
detection methods, the two main factors which play a crucial role in the performance of a classifier are the extracted features and the supervised machine learning model.

**Supervised Learning**

Here, we will discuss general methods that may exploit multimedia features to find the concept of a video clip. We focus on the supervised learning paradigm, i.e., learning a concept detector based on training examples. The supervised learning paradigm is most suitable for concept detection problems because the number of concepts in predefined concept list is fixed. The number of classes, the classifier will be trained for; will be equal to the number of concepts in concept list. As this number i.e. no of classes are already known, supervised learning is preferred over unsupervised learning. The objective of a supervised learning is to train a classifier for a certain task and with limited amount of training data. This measure improves the performance of a classifier when classifying test patterns not used during training. Poor generalization ability is commonly attributed to the overfitting, which indicates that the classifier parameters are too optimized on the training data and curse of dimensionality, where the total features used are very large compared to the set of training samples used. Hence, a supervised learning method needs to maintain a balance between the numbers of (invariant) features to use, while simultaneously avoiding over-optimization of parameters. Moreover, the concept detection system should be designed in such a way that, the imbalance between the positive and negative training examples must be properly handled. Support Vector Machine (SVM) framework has become very popular and the default choice in most concept detection schemes because it has proven to be the most efficient machine learning techniques for concept detection.

**Feature Fusion**

Naturally, robust concept detection can be achieved by fusing many features we extract from video data. The most important decision here to take before fusing features is what features to include in the first place. For feature fusion to be effective, here interpreted as leading to increased concept detector accuracy, some form of independence of features is required. We identify two general approaches in the literature to achieve independence. The first approach relies on the so-called unimodal features, where the features are extracted from a single modality, e.g., the audio stream, only. The second approach relies on multimodal features, where features are extracted from multiple modalities, for example, the speech transcript and the visual content. After feature combination, both unimodal and multimodal fusion techniques depend on supervised learning for semantic concept classification. Most unimodal feature fusion approaches rely on visual information. As different visual features describe different characteristics of a key frame, color, texture, shape, and motion can be considered statistically independent from a conceptual point of view. We present in this section, the last block of Fig. 1 i.e. score fusion.

**Score Fusion**

As shown in figure 1, the pipeline for a typical concept detection system, the final phase is score fusion, in which the concept scores from N classifiers get combined using any of the score fusion methods like average, linear or max and final concept detection score is obtained for a given test example. The two basic feature fusion methods available are early fusion and late fusion. In score fusion block, in figure 1, late fusion scheme has been implemented. The block diagram of the other fusion approach i.e. early fusion is shown in Fig. 4.

In early-fusion, we combine all feature vectors of all modalities into one larger vector and the concept detector is trained using this vector. As shown in Fig. 4, the feature fusion takes place before training.

Mean Average Precision (MAP) is the most popular evaluation measure used to measure concept detection efficiency for given concept detection methods. Some methods can also use Precision and Recall values.

Semantic concept detection in videos is a challenging research problem and is gaining a lot of attention of the research community working in the areas of image processing and machine learning.

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Multimedia Data Challenges for Digital India Campaign

Background

Digital India Campaign\(^1\) launched by Honorable Prime Minister of India – Shri Narendra Modi, indeed attracted the India Incorporation towards the Government functioning and transforming India into a digital economy. With already a major hub of the Information Technology Sector, the need for connecting all corners of India will be a major task for the Government and India Inc.

Digital India aims at providing digital infrastructure to all the citizens of the country at affordable cost. This will empower the people of this country with digital world and thus help them accessing government services in a more transparent and accountable manner. Through digital campaign, the citizens would also be able to manage their identity in India through digital mode with all the major documentation work getting online.

Digital India Campaign will have major pillars in the form of Infrastructure, service delivery, increased efficiency, optimized processes and jobs creation. The infrastructure development under the scheme will be through broadband highways and Internet access programs for public. Optical fiber network connecting the villages for internet will form an essential part of the digital infrastructure. Services of the government will be improved as electronic mode will lead to quick delivery of services from government with removal of touts. Better transparency will mean that trust of citizens on government will flourish leading to more and more citizen contribution in government functioning. Process optimization through early harvest programs and electronic delivery of services through E-Kranti will mean the nation’s resources are utilized in better manner. And with the campaign, number of IT related jobs will mean that skill development program and capacity building are supported too through the campaigns.

Lots of applications have already been launched under the Digital India movement from Government side to interact with citizens and to get their contribution. Portals like Digital India, MyGov, Swachh Bharat and Aadhaar card applications are already running successfully. Digitization is happening through both web mode and mobile application mode. Early harvest programs includes attendance in government department through biometrics inclusion, all universities to be equipped with WiFi connectivity, mail server and system to be secured, Electronic greetings to replace the traditional greetings within the department and inclusion of Information Technology based platform for the Messages. Moreover, digitization of large number of government records is going through scanning of the important government documents like land records. This is creating huge amount of digital data.

If the digital India campaign progresses with its planned approach, the impact seen after 5 years will be tremendous. It is estimated that within the 5 years of launch of Digital India Campaign, India is expected to cover 0.4 million Internet Access points for general public, Net zero imports achievable by 2020, universal connectivity of phone along with 0.25 million villages getting broadband connections across the country.

Data Challenges of the Campaign

Digital India Campaign is destined to cover lot of applications in India but it is equipped with lots of challenges from technology side\(^2\). They are discussed as follows.

Database designing & optimization: With the inclusion of so many applications and access to huge amount of data, its storage will be a major challenge. Government’s cloud service under the name of “MeghRaj” has been launched but correct schema will determine the efficiency of the application. Textual data storage can still be managed, but the issues will arise out of the multimedia data in the form of audio, video and images.

Big Data Processing: The amount of data generated from Digital India Campaign is bound to be in zeta-bytes given the population size of the country. Distributed processing and storage has to be considered but the result of the data processing has to be necessarily combined in order to fetch the fair results. Thus big data processing will play a huge role in the campaign and that too with the multimedia data getting into consideration big time.

Data Transfer: The data transfer through the optical fibers and other channels at adequate speed will again be of big challenge to the success of the campaign. Through the video and images launch, government is planning to reach out to the majority of the population in the country however, their quality transmission at optimum speed will have to be taken care of.

Data Security: As the size of the data increases, the security related aspects for the data increases too. Network hacking via packet capturing or database attacks are the prominent hacking moves by the intruders. There could also be regular anomalies in the system due to regular intrusions. Sensitive information and secretive work needs to be protected or else digital India campaign might lead to a failure resulting in the huge data and revenue losses to the government.

Multimedia Data Concerns

The amount of multimedia data is increasing and will result into specific challenges while managing the Digital India Campaigns.

Storage: With multimedia data taking such large space on the memory disks, it would be essential to store them at BLOB files rather than normal files. The scanned documents will require to be compressed to be stored at first instance with various compression algorithms and applications available for the optimization. Currently digitization of land records is being done across various states by scanning the government documents for which the output produced is images. These images are not optimized and are stored on to disks with such large size only. Storage needs to be efficiently utilized for lesser memory cost.

Searching: Multimedia data’s searching is always an issue for the data management team. Unless the documents are scanned under searchable PDF mode, the JPEG or similar format images will be difficult to search with respect to a particular text. With digitization of so many documents, searching within the images poses a big challenge for the data handling team as only meta-data like file name and description would be useful/ available for the search. Search within normal text data is much easier as compared to search within.
multimedia data.

Security: Storing the multimedia data in a secured way is another big challenge for the government under the campaign. Data can be hacked, duplicated and can be used by other private agencies or individuals. The sensitive information can be leaked leading to loss of data or even revenue associated with it. Even their transmission over internet is tricky option for the campaign to consider.

Sentiments: Through the various campaigns, Government is trying to judge the sentiments of the citizens through polls, opinions, surveys, contests, etc. Even through the unstructured data using comments, the government is trying to understand the sense and mood of the public towards various policies and government initiatives. Through, multimedia data, this will be very difficult task as multimedia data behaves differently as compared to textual data.

Solutions to Multimedia Data Challenges

With rising multimedia data challenges, there could be various approaches that could prove to be beneficial for the government.

The multimedia data i.e. video and images needs to be compressed and then stored on the disk rather than storing them in original form. Initially they should be stored as BLOB files but if not possible due to more technical nature of the format, the scanned images can be compressed using high end compressing algorithms like JPEG2000, JPEG-XR, or using Hierarchical Prediction and Context Adaptive Coding[11]. These image compressions should be lossless so that the data can be retrieved fully whenever required. Transfer of a compressed file will also results in lesser bandwidth requirement over the network channels.

Text extraction can be performed on real time basis through which the searching functionality will get boosted for the image data. Similar approach can be taken for video and audio data too. Text line extraction can be performed from both binary image data and gray scale or colored images[4].

From multimedia data security point of view, there are three techniques that can be implemented for the data processing – Cryptography, Steganography and Digital Watermarking. Lightweight cryptographic solutions and chaos based processing will provide security to both storage and transfer[6] [7]. From authentication point of view, Digital watermarking would be the best approach for safeguarding the data[8] [9] [10]. It will help the owner of the documents, which is government in the digital campaign, to claim the ownership over the multimedia files without conflicts. Similarly, some of the sensitive information can also be hidden inside other multimedia files through steganography[11].

From analytics point of view, the image and video based sentiment analysis can be carried out on the multimedia data on public forums like mygov.in and Facebook and twitter channels related to government functionality[12] [13]. This will help in gaining the insights about citizens and contributors which are continuously interacting with the government over various different issues.

Conclusion

Multimedia data challenges prevail for the government to handle through the campaigns. Multimedia data is quite different from the normal data which is not bounded within a particular range for the values. Moreover, the metadata associated with the multimedia data is also important as compared to the normal textual data. Therefore, specific challenges of Digital India program have to be dealt with specific requirement and that too from Multimedia data point of view. Storage, Searching, Security and Sentiments will be important components of the campaign to be handled for every type of data. Normal data can be managed well, but multimedia data will require critical care given the fact that its usage will rise exponentially with the Digital Indian Campaign.

References

Image Processing

Image Processing - a term that started with some very minimal focus or probably as a niche research subject and served as a fun element is now entire faculty of research which is expanding its wings in all the possible dimensions. With Flipkart’s move to appoint Krishnendu Chaudhary as the head of Image Science for augmenting neural networks and image processing to give a paradigm shift to Flipkart’s shopping experience speaks volumes on how seriously organizations are taking this faculty of computer science. The simplest and earliest image processing tool that we could, probably, lay our hands-on was MS-Paint. Among several possible definitions on and around image processing, the one that can be primatively put would be - some ‘processing’ that you do on ‘image’. But, with the years through maturity, evolution of concept, software and hardware at our disposal, humongous amount of data collected in image format the term ‘processing’ has grown to have a very wide scope. And so is true for ‘image’. Rudimentarily it may mean a two-dimensional photograph or a sketch but not anymore. Image can be 2D or 3D or even more dimensional, rotational or translational or stationary, so on and so forth - you get the point.

Here, in this article – we shall try to focus on 3D images (which are technically called surfaces and volumes) which are obtained from the latest method of data collection and process it in very desirable way. Furthermore, some APIs and popular graphics tools in the process are given.

These days we see advent in lot of laser-sensing and sound-sensing technologies to capture real-world objects or phenomena. This technology is basically a 3D scanner which uses laser to scan a 3D object to capture its surface, contour, probably color and build a 3D model of the same for us on which we can work on i.e. ‘process’. The data is collected in terms of point cloud (a set of very large number of points plotted on 3D grid). Usually, triangles are then drawn on these points and when points and the triangles are put together, it forms a surface as a whole.

Fig. 1 shows a rabbit which was 3D scanned and the points were plotted in 3D space. Later these adjacent points were connected to form triangles and we can see how it created entire surface to form the rabbit. Traditionally, this is a standard dataset which is used for 3D image processing (technically called surface processing).

The dataset is available over the web and is named Stanford Bunny Dataset. If you take a close look at these datasets it is like a long list. First half of the file is the 3D coordinates of the points that should be plotted and second half is a triplet of these points which should be connected to form triangles (the link to dataset is available in the reference section). Fig. 1 is the actual bunny that was 3D scanned – or laser sensed. These set of triangles that form the surface eventually, is called a ‘Mesh’. Now, we can color and put a perspective projection on the mesh and the surface seems to make more sense as in Fig. 2(a).

From Fig. 3 it is obvious, that more the points we plot, and more the triangles we form, the surface starts getting more and more details. Less triangles means less details and more means more.

Let us take a tangent here, briefly. These surfaces are majorly (and debatably) divided into two surfaces - Hard Surfaces and Organic Surfaces. The definitions are different and many. We choose to explain the concept rather than adding one more definition to the argument. Hard surfaces are the ones that cannot alter their shape - like a statue, TV, rock, etc while organic surfaces are the ones that can change their shapes - like this Stanford Bunny.

Since this is clear, we will work on this mesh. And aim, that we worked with, was simple – we wanted to remove the noise from the surface to make it really smooth and (if you may say so) cute. If we create the original image from the dataset, we see a lot of noise due to hair of the bunny. The Fig. 4(a) shows there is lot of distributed noise on the surface if notice closely. We want to remove this and make it really clean and smooth as in Fig. 3(b). Now, if you can see this process is really important for virtually any object that was remote sensed. The noise can be induced through variety of reason like environment, measurement error, instrument error, etc. The very obvious application which requires this smoothing critically is the CT Scan, MRI or ultrasound imaging. The surfaces generated by these medical imaging technologies need to noise free and very clear – but not smoothed out so much that the detail that is required is washed out. Hence, we need be careful of that too. Blurring should be done carefully. The edges and corners are of prime interest for any surface; and these should be preserved. Let us look at one approach to do it.

Since, these edges are important to us – it gives rise to two types of smoothing. This smoothing is called Diffusion. And that is because we diffuse the noise, which you will see when we describe the algorithm, and due to this diffusion the
object gets smoothened out. There are two main types of diffusion concerning our purview right now – Isotropic and Anisotropic. Look at the figure below – This is the dataset of human face captured from MRI data. The original image, as expected, has some noise due to facial hair or skin pores, whatever (Fig. 4a).

When we use the isotropic diffusion the cheeks and forehead are smoothened just perfect – but the eyes, eyebrows and lips seems blurred out. This makes some loss of information evident on lips and eyebrows (Fig. 4b). Now if you look at the third image, it is anisotropic diffusion where these critical edgy features are perfectly preserved without compromise on the smoothing that we want for the cheeks and forehead (Fig. 4c).

The approach that we have selected and implemented is non-iterative approach. There are conventional approaches that are iterative – in the sense that with each iteration you get smoother surface than the previous iteration and finally at some point to get the best one. We chose a Non-iterative approach that was suggested by Jones et. Al[1].

The paper that we chose to implement is, in fact, a direct extension of the iterative approach but with some changes. Without getting into much of the mathematical details of geometry of the mesh, let us explain the concept from high level perspective. There are two Gaussian parameters that we input to the algorithm – one is called spatial Gaussian and other called influence Gaussian. These two parameters guide the smoothing function to smooth the surface. There is an advantage compared to other iterative approaches as this will be a single-pass method and hence algorithm directly produces the result. In the iterative counterparts we need to check the convergence of the series of models produced after each iteration and when a satisfactory convergence is found, we stop and that will give us the final result. Just for sake of mention, the authors of the paper suggest using Robust Error Norm to identify the new potential position of the vertices.

We have implemented the algorithm in C and C++ as that is the closest we can get to display the output in OpenGL. OpenGL is a graphics library that takes care of graphics output like meshes, animations, simulations, etc. It is open source and can be integrated with nearly all the possible programming languages. Specifically, the libraries we used were GLU, GLEW, GLUT and GTS. We also used MeshLab package on widows to get the confidence of the output compared to original mesh.

We organized these vertices in form of a tree as traversing the tree data structure is simpler compared to any other. Given the different values of sigma_f (spatial Gaussian) and sigma_g (influence Gaussian) we get different amount of diffusion and smoothing. The results are shown in Fig. 5. Lastly, we also show the confidence, though not quantified, about smoothing. This confidence is basically super-imposing two meshes - the original on the smoothed one. The dark areas that you see are the ones that are smoothed and lighter are the ones that are preserved. It is quite clear that the areas near the eyes, ears, leg and neck – the areas where the edges should be prominent – are preserved perfectly. And the same thing can be verified in the final output too – that these areas are perfectly sharp as they need to be.

Fig. 7 shows another output of the Venus Head dataset. The areas near eyes, eyebrow and hair are clear while cheeks, chin, forehead etc. are smoothened to near perfection. Also a damage seen on left cheek remains prominent enough to be identified as damage. You can also see the confidence for the same.

Why is Image Processing so Important?
The recent news highlights and developments that show the importance of image processing – be it 2D or 3D or whatever – so important in today’s context and industry are:

Flipkart made a special appointment of Krishnendu Chaudhary (former Googler) as their head of Image Science wherein he will work with Neural networks and image processing to bring Flipkart’s shopping experience an edge over others. Kickstarter, a crowd-funding initiative, is raising funding for PymImageSearch Gurus online course that will teach candidates solve real world image processing problems with Python. The campaign creator is also an author of the book for the same. The campaign is being funded really well, as of now. This gives an evident insight that people are interested in computer vision and spending no-benefit money for it too.
The number of APIs as the solution for several computer vision problems are being developed freely and the number is on rise. Here you can see 50 such APIs - http://www.datasciencecentral.com/profiles/blogs/50-face-recognition-apis

Range sensing is made so simple by Arduino. You can make a range-sensor with Arduino project all by yourself. If such instruments are on rise, then imagine the amount of image data that will be out there and the processing algorithms that would be needed in very near future for various purposes. You can learn to make your own radar at - http://howtomechatronics.com/projects/arduino-radar/

There is one more palpable option for the 3D scanners that we talked about. A start up in Australia – Eora – built a 3D scanner which can be powered by iPhone. It is expensive as USD 20,000 but imagine what if that gets cheap. The algorithm that we just saw in this article could be a part of Eora’s iPhone app for obvious reasons.

Furthermore, Apple was granted 49 patents recently out which many were for 3D scanner/projector. Now, we know that Apple would have already optimized or probably created a better version of this algorithm to unimagined extents but this can give you a feel, how important would this dimension of computer science – called computer vision – will be for next generation technologies.

References


**Fig. 7: Venus Head Dataset – (a) Original Mesh, (b) Perfectly smoothed mesh and (c) Confidence**

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The members must provide the following details along with the request:

1. Member’s Name
2. Membership No.
3. Old Communication Address with registered email-id (with CSI) and Mobile no.
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Please send the request with any one of the following document/s duly signed by the member for updating database at CSI HQ either by registered post at CSI HQ OR through email to CSI HQ with copy to RVP for necessary correction / change in details at: hq@csi-india.org

The following documents would be accepted for change request:-

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Sanjay Mohapatra
Hon. Secretary

Prof. A. K. Saini
Chairman, Nomination Committee
Multimodal Medical Image Fusion for Computer Aided Diagnosis

Introduction
Medical imaging has encountered extensive developments owing to its capability to attain data pertaining to human body for the purpose of diagnosis. Medical imaging techniques aid to create visual representation of the internal structure of human body which can be deployed for many useful clinical applications. The development of multiple medical image sensor modalities such as X-ray, Magnetic Resonance Imaging (MRI), Computed Tomography (CT), Positron Emission Tomography (PET), Electrocardiography (ECG), Ultrasound etc. has also initiated the requirement of image processing techniques to digitally manipulate the image quality (based on the wide range of applications). These include operations like filtering, enhancement, segmentation, registration and classification. Each of the individual medical modality contains the information related to a particular organ of the body. It is noteworthy that the information provided by different medical imaging modalities is complementary in nature. That is, none of the single modality is capable of reproducing the visual representation of all the relevant diagnostic information. For instance, CT scan deals with the demonstration of the extent of disease and provides information of denser or particularly hard tissues with less distortion; while MRI contains the information regarding soft tissues with less distortion. Hence, for precision in diagnosis a radiologist needs to analyze different modalities simultaneously during medical investigations. Even the computer aided diagnosis methodologies incur voluminous overloads by processing and extracting features from different images of the region of interest.

Fundamental Concept of Medical Image Fusion
Image processing techniques applied to these medical images are generally constrained to visually improve the attributes of an individual image only. For example, if contrast enhancement is performed on the CT and MRI scans, then also only contrast of the region/tissues (under observation in an individual scan) will improve. But, eventually, the problem for examining different modalities simultaneously still prevails. This calls upon the need for a sophisticated image processing technique, which could serve to merge the necessary medical information from the individual source images. The phenomenon of integrating the response(s) acquired from distinct sensors to extract the most significant information into a single one has been termed as ‘Data Fusion’. In the similar context, ‘Image Fusion’ is a phenomenon that retrieves the complementary attributes of two or more sensor images into a solitary image for better visual representation; as single sensor is not efficient to portray a scenario or region of interest. Source images may vary in terms of resolution, nature of sensor, image capturing technique as well as time for capturing the image. The key idea is to nurture the information content of images and also to minimize the noise in the fused one. It is necessary that the fused image should be more precise in representing the minute details as well as the complementary features from the input source images. Thus, the magnitude of visual information restored (from the input sources images), provides a quantified measurement of the image fusion performance. There are many utilities of integrating the complementary information from multiple source images as firstly, it provides representation of images that is coherent with the machine perception and human visual system. Secondly, redundant data and noises occurring in the source images are reduced thereby providing enhanced image for researches. Thirdly, image fusion encompasses the reduction of the storage capacity by merging data of multiple parent images into a single fused image. This gives prominence towards the development of multimodal image fusion systems for medical images for a better computer-aided analysis as well as diagnosis.

Multimodal Image Fusion
The general block diagram explaining the medical image fusion scheme is outlined in the Fig. 1. The procedural flow in this scheme demands a mandatory pre-processing step, requiring registration of the source images. It is therefore necessary that the images under evaluation must be properly registered, i.e. geometrically aligned. Image registration is a procedure to exploit the correlation of traits between the source images. It is performed by mapping points from one image to corresponding points in another image. In addition, the pre-processing stage also involves conversion of RGB image into a grayscale image. The pre-processed images are then decomposed into sub-bands using various multi-resolution techniques or filter banks. Images contain information at different details of scales or levels, known as resolution. Analyzing the image at only one resolution is not sufficient enough to identify all the details present in the image, be it coarse or fine. In order to resolve this, an image is decomposed into various resolution levels/bands such that the smaller details of the images are analyzed at the high
resolution and the larger details of the image are analyzed at small resolution levels/bands. The obtained sub-bands may be completely or selectively combined using the appropriate fusion rule. This is followed by reconstruction or synthesis of the fused sub-bands back into the original form. The selection of the filter banks and the fusion algorithm is dependent upon the nature of application and the specific requirements pertaining to object restoration in the final image.

The illustration below explains the fusion responses demonstrated in Figs. 2 and 3 respectively in order to provide a closer view of the fusion paradigm from point of view of both the image processing as well as bio-medicine. MRI proves better than CT-scan in terms of soft tissues contrast; which leads to an improved visualization of lesions and lymph nodes. Similarly, T1-MRI image provides anatomical structure details of tissues so it is referred as ‘Anatomy Scans’ and T2-MRI provides details of abnormal tissues so they are referred as ‘Pathology Scans’. The aforesaid source images are shown in Figs. 2 and 3 respectively along with subsequent fused image showing the combination of complementary information of each of the modality. A CT scan contains the information related to demonstration of denser tissues while MRI is superior in soft tissue discrimination. In Figs. 2(a) and 3(a), yellow encircled area shows details of denser tissues while red circled area shows soft tissues in Figs. 2(b) and 3(b) respectively. Fused images in Figs. 2(c) and 3(c) contain the information of both denser as well as soft tissues.

Hence, one may assimilate here that either of the medical imaging modalities are not properly suited to provide a complete representation with in terms of relevant diagnostic content and details in a single image. This escorted the necessity for medical image fusion by combining the complementary features of multimodal source images.

### Classification of Multimodal Image Fusion Methods

Image fusion algorithms can be broadly categorized into spatial and transform domains. Spatial domain fusion algorithms manipulate the pixels directly thereby producing spatial distortions in the fused image. This drawback acts as a negative factor for further operations such as classification problem of the fused image. In transform domain, the fused image is first converted into frequency domain followed by application of image fusion algorithms. Beside this, image fusion methods can be further categorized into three, namely: Pixel level, Feature level and Decision level fusion. This categorization is explained in the succeeding paragraphs.

(a) **Pixel Level Image Fusion Algorithms:** This is the lowest level of image fusion which can be done in both spatial and transform domains. Pixel level image fusion (also known as signal level fusion) deals with the information content corresponding to individual pixels of the source images. This type of fusion generates an image in which each pixel is estimated selectively or wholly from pixels in source image as shown in Fig. 4.

(b) **Feature Level Image Fusion Algorithms:** This level of fusion is also referred to as object level fusion. Here, the source image is divided into various regions depending upon the features like edges, textures, boundaries etc. and then fusion is done. Features used can be extracted either by calculating separately from source images or by simultaneous processing of the images. In this process, the feature extraction is initially carried out on each of the source images; fusion is then performed based on the extracted features. Fig. 5 shows the block diagram representation of feature level image fusion scheme where the features of image 1 shown by yellow arrows and the features shown with red arrows in image 2 are clearly depicted in the fused image.

(c) **Decision Level Image Fusion Algorithms:** This is the highest fusion level also known as symbol level image fusion. This fusion level is a description of ‘fusion by decision’. Decision level represents probabilistic decision information based on the voting or fuzzy logic, employed on the output of feature level processing on the images.
Conclusion

Image fusion aims at integrating information from various sensor modalities to yield a composite image which could be incorporated for better interpretation and analysis of the region of interest. The need of virtuous clinical diagnosis has gained the interest of researchers towards medical image fusion. Fusion of biomedical images minimizes the redundancy & artifacts, optimizes the storage & archiving and enhances the accuracy of the computer aided diagnosis systems. Multimodal fusion is used by radiologists and medical experts as it has strengthened image-guided medical assessments and diagnosis of life threatening diseases. Beyond medical imaging, fusion algorithms find applications in remote sensing, surveillance system and target tracking.

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Fig. 5: Block diagram demonstrating the ‘Feature Level Image Fusion’

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Prof. A. K. Nayak
Chief Editor
Parallelized Hadoop Video Processing: Challenges and Applications

Introduction
Every day, a large amount of video content is generated by various cameras installed all over the world for different purposes. Even within a single organization, the amount of video content that is generated is huge. In addition, the common man has resorted to videography in order to preserve the memories of his time on earth. In days of old, these videos were monitored by a human being to identify interesting events. But the efficiency of a human monitor drops with an increase in time. It has been noted that after 22 minutes, a human may not identify up to 95% of the interesting events on the screen. So, it becomes necessary to automate this process.

Video analytics has been gaining popularity and is widely applied in surveillance, monitoring and tracking. But the conventional techniques that are currently used have a hard time dealing with the volume of data generated. In order to overcome the issues posed by this sheer volume, big data approaches can be adopted, making processing faster while maintaining efficiency.

A platform, that to most people is synonymous with big data, is Apache Hadoop’s MapReduce framework. In addition to providing a simple and powerful environment for parallel processing, Hadoop makes provisions for users to store their data in a distributed manner using the HDFS. Together, they allow the programmer to focus on the task at hand without having to worry about things that are common to all parallel processing tasks (e.g. storage of data, splitting the files, fault tolerance, etc.). Processing videos on this framework would make real time analysis possible and dispense timely results.

Architecture
Using Hadoop to process videos can seem a little tricky at first. But it isn’t all that different from processing any other kind of data on the framework. The basic rules of Hadoop still apply. The video that is obtained is stored in the distributed file system in chunks of 64 MB (by default) and is automatically stored across the various machines on the cluster. The replication factor dictated the number of copies of each chunk that is made, thus ensuring fault tolerance. The video is then split into a number of frames and fed to the mappers, which performs the functions as defined by the programmer. The output of the mapper is sorted and combined and items with the same key are sent to the same reducer. The final result is then stored back on to the distributed file system. The input and output to both the mapper and reducer are always key value pairs.

Just as in any MapReduce problem, the programmer only has to decide the following:
1. Input to the mapper
2. Output of the mapper which will then constitute the input to the reducer
3. Output of the reducer
4. Processing to be done in the map phase
5. Processing to be done in the reduce phase

Architecture for Parallelized Video Processing using Map-Reduce is shown in Fig. 1, where GOP represents Group of Pictures (typically corresponds to 15 video frames).

Whole bit stream of video file has a sequence header “Seq Header” containing details about picture attributes followed by information pertaining to GOP.

In order to facilitate a better understanding of MapReduce in the context of video processing, consider the example of monitoring surveillance footage to detect anomalous behaviour. In general, the videos are to be analysed and individuals and objects are to be identified. Once this is done on one particular frame, they are tracked through the course of the video for as long as they remain within the camera’s line of sight. The behaviour of the entity in question is compared against a pre-constructed dictionary to determine if it constitutes a state of alarm.

Multiple cameras may be fitted in various locations and will each be continuously recording and transmitting data. This data is stored as it arrives on the HDFS. When processing starts, the timestamp and a frame itself will form the input key-value pair to the mapper. Within the mapper itself, background subtraction and feature extraction are done. The features that have been extracted can be used to uniquely identify an object in the video. So, this feature set can be used as the output key of the mapper and the value will be the frame. This means that all the frames which contain a specific person or object can be isolated. Frames with the same key values are then sent to the same reducer. In the reducer phase, the actual classification of the object or person as suspicious or normal is done.

Map Reduce Job for Classification of an Object is shown in Fig. 2 where timestamp1 is a video with 10 frames
- The feature1 is recognized on frames 3 through 6, on different mappers
- The Combiner handles the occurrences from the second Mapper, condensing them into one run
- The reducer condenses all the occurrences across all Mappers into one record

![Fig. 1: Architecture for parallelized video processing using map-reduce](image)
Challenges

Challenges pertaining to Video Processing using Hadoop, which need attention of global community of researchers are as follows:

Implementation Challenges
- Adapting to compressed data format
  One of the main challenges is deciding how to deal with compressed videos. Compression schemes that were developed years ago are completely unsuitable for parallelized computation. The videos must first be converted into a Hadoop friendly format.
- Not all Applications can fit into Map reduce Framework
  Another hurdle would be to determine a MapReduce implementation for existing video analytics algorithms. While most problems are MapReducible, not all applications can fit into this framework. Once a problem is determined to be MapRedducible, it is completely up to the programmer to decide exactly how it should be done and will vary from one person to the other.

Technology Challenges
- Processor Efficiency
  While Hadoop’s processing, works in memory the intermediate results are stored on the disks. This considerably slows down the processor.
- Correlating video data with other structured data sources
  This is crucial because once the structured insights are extracted from the video dataset, joining with other data sources can generate deeper insights from data sources.
- Lack of multiple data source support
  Current implementations of the Hadoop MapReduce programming model only support one distributed files system; the most common being HDFS. A complete implementation of the MapReduce programming model should be agile enough to provide a data access capability offering simultaneous support for multiple distributed file systems.

Applications

Video Processing using Hadoop has a wide variety of applications. Common use cases include:
- Surveillance and security
  Anomaly Detection in Surveillance video:
  Crowded places such as airports and railway stations are fitted with a number of security cameras. The video feed from these cameras can be analysed and suspicious behaviour can be isolated. Alarms or alerts may be sounded to signal such an event.
- Trajectory Analysis
  Tracking multiple objects in Big Data video archives and building a high level summarization e.g. Moving Trajectory time series
- Video Categorization for user generated contents
  Finding out trending videos in youtube by topic modelling and drawing more meaningful insights.
- Event detection in online videos
  Videos captured by common people at the time of crises is often uploaded on to the internet. These videos can be analysed and the series of events leading up to the crises can be reconstructed. This can provide law enforcement with plenty of information.
- Behaviour and profiling of customers
  Potential customers are monitored using store front cameras. Their interests in various displays and the store arrangement is studied and their hesitance or insistence of buying product is observed.
- Manage employees and increase efficiency.
  Cameras fitted in work areas can be used to monitor employees to determine the time duration when employees are most efficient and also monitor their various habits. These can be analysed to decide when breaks in the work are could be provided or other provisions to boost their performance.

The above is only a short list and many more such applications are realizable.

Conclusion

In closing, it is to be noted that Hadoop is an ideal starting point in parallelizing video analytics. This endeavour is mostly limited only by the programmer’s ability to think of a problem in terms of map and reduce phases. With the unparalleled popularity of Hadoop, it is unlikely that video analytics will remain untouched by the spreading interest in big data for very long.

References

Machine Vision
Machine Vision (MV) technology is used to provide imaging-based automatic inspection process control, and robot guidance in industry. A machine vision system can perform well and be very cost effective with high precision, consistency, and flexibility. The major components of a vision system are the lighting, filters, lens, camera, frame grabber / Image processing unit, vision processor, computer, and image analysis software.

Web Inspection Systems
Web products refer to materials that are produced in the form of long continuous sheets and packaged as rolls or blocks. Automated quality assurance is an important component of modern manufacturing. Web processing is used in industry, e.g., metals, papers, plastics, textiles. Web materials can be categorized into uniform and patterned materials. Examples of uniform materials include metals, film, paper, and various plastics. Patterned web materials can be divided into regular patterns (e.g., printed textiles, printed currency) and random textures (e.g., non-woven materials). The overall quality of web materials is critically influenced by the quality of web surface and presence of surface defects. The surface defects mainly result from imperfections in raw materials and manufacturing processes. Some common defects arise due to web form of manufacture and while other defects are specific to a web material and a manufacturing procedure.

A online web surface inspection system inspects the web material surface and detects & classifies any surface defects. This helps in inspecting the web material for any defects and hence, improving the quality of production. The detection and classification of the surface defects help in identifying the cause of the defect and immediate procedural correction that is needed to avoid further defects. Machine vision based on-line web surface inspection systems are undergoing major improvements due to advances in various enabling technologies. Development of these systems are also quite challenging and still the focus of active research.

Typical Web Materials
Advantages of using a web inspection system:
- Faster running speed
- Reduced waste
- Improved product quality
- Consistent and predictable

The Challenges in Online Web Inspection Systems Development
Harsh environmental conditions: In industries like steel manufacturing industry the environmental condition in the plant is very harsh. Specific to steel industry the temperature is of the range of 1000°C. Under such conditions a normal inspection system could burn into flames and fail. Hence, a cooling system will have to be introduced to maintain normal temperature around the system components.

Easy installation: It is very important for the web inspection system to be easily installed. Easy installation ensures conservation of time, energy and also money. For an inspection system to be commercially successful this factor plays a vital role.

Handling very high web speeds: The speed of the conveyer belt on which the web has to be inspected is very high as the production rate has to be maintained according to the market demand. Under such circumstances the inspection speed of the system has to cope up with the web speed.

High data throughput rates: throughput rate is the rate at which the data is obtained by inspecting the high speed web. To maintain the production speed without any lag the data acquisition, processing and output data rates must be high. As technology is developing high speed processors are being developed which may win over this challenge.

High defect detection resolution: high resolution of the cameras are very important for ensuring 100% defect detection. The defect size can range within...
1um to 1mm. these kinds of defects require high resolution withholding systems.

Sophisticated algorithms and faster processing: Real-time analysis requires sophisticated algorithms for defect detection and classification. Fast processing is very necessary for maintaining optimum throughput rate.

Handling large number of defect classes, inter-class similarities and intra-class diversities: defect classification is a major challenge for a web inspection system. There are a number of ways in which defects can be classified but to choose the perfect classifier is far more difficult. During classification a classifier has to deal with large number of classes. Not only is the number high but there are also the factors like inter-class similarities and intra-class diversities which are to be dealt with. Hence, sophisticated defect classification algorithms are needed for 100% accuracy.

Dynamic defect populations requiring continuous learning capabilities: Systems which allow automatic extraction of classification rules, automatic selection of defect features and defect classifiers using the training material and utilize multiple-classifier voting scheme for final classification are needed because of the present industrial demands. They should also allow automatic training of classifiers using user-supplied example images to neglect trivial, inconsequential pseudo defects and to judge different levels of defect severity depending on the user needs. Non-homogeneousness may occur in any form, hence it is very important for the system to have continuous learning capabilities.

Various interfering factors influencing inspection: There are various external factors which affect inspection of the material on the conveyor belt. One of which is noise. Noise interference in the data acquisition process leads to inaccuracy and hence it is very important to introduce noise removal algorithms in processing. Inaccurate defect detection can lead to wastage and loss in the production market which is obviously not favorable.

Other challenges: Customization requirements and financial viability play a vital role in market value of the product being manufactured in the plant.

Web inspection systems have to ensure 100% inspection of the defects and also automatic grading of the product quality. Defect reduction enhanced by inspection systems help in ensuring customer satisfaction. Flexibility and robust performance is a major requirement expected in the present day web inspection systems. Financial viability is a factor which is the counter part of high standard inspection system. An optimization has to be done to balance the financial aspects of the industry and installation of the system.

**Application of Web Inspection Systems**

**Metal web inspection system: Example Defects**

![Defects](image1.jpg)

**Paper Web inspection system: Example Defects**

![Defects](image2.jpg)

**Nonwovens Web Inspection System: Example Defects**

![Defects](image3.jpg)

**Plastics foil inspection system: Example Defects**

![Defects](image4.jpg)

**Online Surface Inspection Module for Hot rolled Steel Strips**

CSIR-CEERI Centre, Chennai has successfully developed an online surface inspection module for inspection of hot rolled steel strips in collaboration with R&D Centre for Iron and Steel (RDCIS), SAIL, Ranchi under a collaborative project on “Development of Online Surface Inspection Module for Hot Rolled Steel Strips” sponsored by Department of Information Technology, MCIT, New Delhi. The project involved successful development of techniques for synchronized high-speed imaging of fast-moving red-hot steel strips, algorithms for defect detection & defect identification, image acquisition & analysis software and real-time implementation on an advanced vision processor hardware platform. The project was executed in three stages. The first stage experiments were conducted at CEERI, Chennai and RDCIS, Ranchi.
In the second stage prototype unit was fabricated at Bokaro steel plant and tested at plant for top surface inspection. In the third stage, the collaborating agency, RDCIS, is taking steps to utilize the developed technology towards the development of a complete surface inspection system for hot-rolled steel strips.

The developed module illuminates the steel strip surface with stroboscopic lighting, captures images of a portion of the strip width in synchronization with the strip movement, detects surface abnormalities, identifies real defects like scratch, blister, rolled-in-scale & pseudo-defects like water droplets, and provides results under real-time constraints. The module and its functionality have been successfully demonstrated at Bokaro Steel Plant to the sponsoring agency.

Mr. A. Sada Siva Sarma is working as a principal scientist at CSIR-CEERI Chennai Centre and pursuing research on Machine Vision Systems and Web Inspection Systems hardware and software and their Online Real Time Implementations. Recently, he had successfully completed a project on “Development of online Surface Inspection Module for Hot Rolled Steel Strips”. He had been deputed to Germany on DAAD fellowship and carried advanced research on speech data bases and acoustic-phonetic studies. He was the recipient of Sir C. V. Raman award for the best paper on “Acoustic-Phonetic Analysis of Hindi Consonants” published in Acoustical Society of India in 1993. He can be reached at sarmasarma@rediffmail.com.
Introduction
DevOps is the practice of operations and development engineers participating together in the entire service lifecycle, from design through the development process to production support. It is a shift from the traditional method of operating IT by merging developers of applications with how those applications are deployed and run.

DevOps approach based on lean and agile principles in which business owners, development, operations, and quality assurance departments collaborate to deliver software in a continuous manner that enables the business to more quickly seize market opportunities and reduce the time to include customer feedback. This approach speeds up and sustains the application release cycle that is planned, developed, tested and delivered. Organizations can continuously release better software and services faster, at lower cost and with less risk.

DevOps focuses on simple concepts—such as automation, reusability and iterative improvement—built on a foundation of a shared culture that promotes collaboration.

DevOps movement emphasizes communication, collaboration and integration between software developers and IT operations. DevOps essentially extends the continuous development goals of the agile movement to continuous integration and release.

What DevOps is not?
- DevOps is not just PR
- One resource does not do everything
- DevOps is not a technology movement
- DevOps needs Systems Administrators
- DevOps cannot be bought

Why DevOps?
Organizations are under pressure to produce higher-quality code faster with less time available for QA. Statistics show that software projects are not living up to the challenge. Up to 50% of applications released to production are later rolled back. 51% of projects are over budget and often lack critical features. 60 - 80% of the cost of software development is rework.

Innovative companies know that software is the way to new efficiencies, differentiated products and services from the competition. These businesses are finding ways to quickly develop and deploy revenue generating projects on time and under budget.

IT managers have long bemoaned the tension between “change-the-business” (development) and “run-the-business” (operations) IT teams and their activities. The focus on the developer/operations collaboration enables a new approach to manage the complexity of real world operations, assuring software runs with minimum of problems.

Gartner, Inc. expects strong growth opportunities for DevOps toolsets, with the total for DevOps tools reaching $2.3 billion in 2015, up 21.1 percent from $1.9 billion in 2014. By 2016, DevOps will evolve from a niche strategy employed by large cloud providers to a mainstream strategy employed by 25 percent of Global 2000 organizations.

E-commerce websites, Mobile Apps and PC applications have the need for rapid and multiple application releases – These are some of the areas of highest adoption of DevOps.

What CIO’s are Doing about it?
For decades, CIOs have applied methods and adopted tools that lead to stability, because when an IT deployment goes badly, businesses lose customers and risk long-term reputational damage. CIOs can lose their jobs. So business units had to live with a rate of business process innovation that was tethered to the plodding pace of IT's waterfall software development life cycle (SDLC). These IT systems methodologies are rigorous, but slow and linear.

Speed versus stability is a paradox for IT. Pushing for both at the same time seems contradictory, but the IT organization must strive to achieve this goal if the enterprise is ultimately to become more anti-fragile—that is, less vulnerable to catastrophe.

So, CIO’s key ask is to accommodate a fast-changing business environment while ensuring stability in IT deliverables. CIOs need to automate their largest, current pain point or risk point, and then iterate.

CIO’s action plan
- Address the IT skills gap
- Establish an agile and DevOps

Fig. 1 : DevOps as the intersection of development, operations and QA (Source: Wikipedia)

Fig. 2: DevOps goes beyond continuous integration & delivery (Source: Collabnet)
blueprint
• Invest in technical tools
• Software management approaches
• Infrastructure
• Automate the processes
• Remove barriers (Streamline the process)
• Building Cross-functional teams

How DevOps can bring Value?
DevOps can maximize the predictability, efficiency, security and maintainability of Operational processes
• Minimize lead time and maximize flow of work to production
• Recognize and eliminate junk work, delays and hand offs
• Improve system reliability and cut operational costs
• Build in feedback loops from production to development

• Standardize and automate steps as much as possible
This translates into,
• Faster time to market (Reduced cycle times and higher deploy rates)
• Increased quality (i.e., increased availability, increased change success rate, fewer failures, etc.)
• Increased organizational effectiveness (e.g., increased time spent on value adding activities vs. waste, increased amount of value being delivered to the customer).

How DevOps Works?
In traditional project SDLc there will be three stake holders like development, operations and the QA.
• On regular basis development team will check in the code.
• Developers will get the latest code and builds the deliverables.
• Inform the operation team to create the environment.
• Then deploy the application for the testing team.
• Once everything is tested properly and ready to go, Operations team is instructed to deploy the application onto next level of server. Release Note and configurations to be done are provided along with the deployable.
The above mentioned process can be done just on the click of a button by “DevOps”
DevOps make the deployment easy with less time and without manual intervention except for approval process (or check-gates). All the steps are automated at each level including the configurations to be set on each server. These are well tested and checked-in into the repository. During the deployment, these files are used by the automation tools and executed the related tasks like test cases, builds, server configuration, environment specific configurations, etc. As there is very less manual intervention, the chances of tasks going wrong is minimized. And as everything is automated, communication latency will be reduced from hours or days to few minutes.

For DevOps transformation, the starting point should be constructing tool-chain. The term ‘tool-chain’ not only refers to actual tools used during development, but also to middleware components such as the application databases. These may require upgrading or implementing a number of additional middleware components to support DevOps best practices.

DevOps Transformation
Journey for adoption of DevOps practices from the current state to a future state to achieve the set project/organization goals building blocks of the journey

- **Culture** - People matter the most in DevOps. If all stakeholders are not sharing the same vision, goal and mindset, DevOps will not be successful.
- **Process** - Once the culture is setup, development, testing and operation practices need to be modified to achieve the goals. More importantly, teams need to collaborate.
- **Automation/Tools** - DevOps is not about automation but a successful DevOps implementation will rely heavily on automation & tools. These are decided depending on the goals and processes agreed in point 1 & 2.
- **Measure/Share** - Measure progress and Share learning’s. Step 1, 2 & 3 are iterative in nature keeping the maturity model into consideration. Measurement is a key aspect which drives future iterations of continuous improvement.

Steps to DevOps Transformation
IGATE’S Experience with DevOps
Figure below explains the three stakeholder’s tasks that are automated and deployed to the multiple environments without any latency using IGATE’s DevOps platform.

The continuous integration servers like Jenkins, constantly monitor source code repositories and as soon as new changes/commits are detected, they initiate a new build cycle. The build cycle actually involves code compilation and, in addition, may involve various tests and code analysis. If the process encounters errors, it may notify the build master or the appropriate function that may have checked in broken/invalid code.

Developers check out code into their private workspaces. When done, the commit changes to the repository (TFS). The CI server monitors the repository and checks out changes when they occur, builds the code and runs unit and integration tests. The CI server releases deployable artifacts for testing, assigns a build label to the version of the code it just built. The CI server informs the team of the successful build / failure. In case of failures, the teams fix the issue at the earliest opportunity and continue to continually integrate and test throughout the project.

On each successful build Jenkins will create a branch in TFS with build number and checks-in the version of codebase, reports generated for code compliance and all types of test cases executed. We can deploy the application to many environments like QA, Integration, UAT and pre-production at a time.

Challenges in DevOps Adoption
- Cultural change, as DevOps is fairly new concept, ensuring that the various teams understand the advantages and breaking the silos to work together has been initial problem i.e. change of mindset. Overcoming the ever-going tiff between Developers and Operations teams.
- Since the team is new to various operations tools, faced challenge to integrate the tools.
- Hardware and network support for whole DevOps stack is complicated.
- Multiple products available for each phase / activity - so choosing the right product becomes time consuming or requires product & vendor evaluations.
- Team will have to have knowledge of different products - OS, Database, monitoring tools etc., which will not be available in a single project team. It requires a cross functional teams.

Conclusion
DevOps is a practice and collaborative...
effort to get the product to market with greater speed. Frequent deployments and continuous feedback from customers/ stakeholders/end-users will help the product to improvise at short intervals. DevOps comes with challenges of its own like plethora of tools to be integrated for each of the SDLC phases, changing the mindset of teams and ensuring collaboration across cross functional teams. IGATE’s DevOps platform addresses these challenges by providing a proven methodology for implementing DevOps with seamless adaption to customer requirement using commercial or open source tools stack. In the journey towards adoption of DevOps, IGATE’s DevOps platform enables customers to adopt cultural changes, process changes, tools for automation and collaboration/shared metrics collection for iterative improvement over time.

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<thead>
<tr>
<th>Acronyms</th>
<th>Definitions</th>
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<tr>
<td>DevOps</td>
<td>Development and Operations</td>
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<tr>
<td>CI</td>
<td>Continues Integration</td>
</tr>
<tr>
<td>CD</td>
<td>Continues Delivery</td>
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<tr>
<td>QA</td>
<td>Quality Assurance</td>
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**Singleton Design Pattern**

Design Pattern, in general demonstrates the generic solution to a common problem in a particular context. In Software Engineering, there are various design pattern categories (Creational, Structural and Behavioral) which further include specific design patterns. Creational design pattern category includes Singleton, Builder, Factory method, prototype and Abstract factory. Structural design pattern category includes Composite, Decorator, Facade, Flyweight, Adapter, Bridge and Proxy. Behavioral design pattern category includes Observer, Interpreter, Chain of Responsibility, Command etc.

Singleton Design Pattern means to create one and only one copy of the object of a class. Subsequent object creation will hold the copy of previously created object. Change in any of the objects gets reflected in all its copies.

Singleton Design Pattern can be created when there is a need to restrict the class to be instantiated only once. There can be many such examples. Let say, one may need to implement the Logger application where a log is generated as per the date and time and written in the file. In this scenario there is no need to create multiple instances of Logger class else the file will be created each time with new instance. Implementation of Singleton Design pattern using C++ is discussed code snippet below.

While implementing Singleton Design Pattern in C++, class constructor has to be private so the object creation from outside class is restricted. There is a static member function of the class which is responsible for instantiating the class and check that only first time object is created, rest of the time copy of the first object should be distributed. In the main function two objects are created, first and another. First object is holding a fresh copy of the object created and another holds the same copy created earlier.

Code written below is exhibiting the singleton design pattern in C++ and implemented in DEV C++ IDE version 5.4.2 with MingGW Compiler and GNU General Public Licence.

```cpp
#include <iostream>
using namespace std;

class Singleton
{
    int value;
    static int objCount;
    static Singleton *singleObject;
    Singleton()
    {
        value=0;
    }
    public:
        static Singleton* createObject();
        void display();
        void setValue();
};

int Singleton :: objCount=0;
Singleton* Singleton :: singleObject=NULL;
Singleton* Singleton :: createObject()
{
    if (objCount==0)
    {
        objCount=1;
        singleObject=new Singleton;
        return singleObject;
    }
    else
        return singleObject;
}

void Singleton :: setValue()
{
    value=90;
}

void Singleton :: display()
{
    cout<<endl"- Value is :: ";
    int main(int argc, char* argv[])
    {
        Singleton *singleObject=Singleton ::
        createObject(); //Creates first and only copy of
        the object
        cout<<endl"First Object";
        singleObject->display();
        Singleton *anotherObject=Singleton ::
        createObject(); //Returns the same object created
        earlier
        cout<<endl"Another Object :::");
        anotherObject->display();
        anotherObject->setValue();
        cout<<endl"First Object :::");
        singleObject->display();
        cout<<endl"Another Object :::");
        anotherObject->display();
        return 0;
    }
```

**Output**

Output shows that both objects refers to the same copy created first time. While changing the “value” to 90 using setValue() method for the first object and displaying it using another object, it prints the property “Value” as 90 which was changed for first object. It shows that class exhibits the singleton design pattern and creates one and only one copy of its instance.

**Explanation of Output**

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Practitioner Workbench

Programming.Tips() »

SIVP: SCILAB Image and Video Processing Toolbox

Introduction
Scilab is free and open source, user friendly, numerical and computational software. It is widely used in various streams of science and engineering for developing and testing mathematical algorithms and image processing applications. Scilab supports various functionalities like Aerospace, Data Analysis and Statistics, Graphics, Image Processing, Linear Algebra, Signal Processing etc. Scilab can be downloaded from the http://www.scilab.org.

The SIVP is an Image and Video Processing toolbox, which can be downloaded from http://sivp.sourceforge.net website. It has various features like Image I/O (Supported formats: PNG, BMP, JPEG, TIFF, PBM, PGM, PPM, SR), Video I/O, Spatial transformation functions, image arithmetic functions, image analysis and statistical functions, morphological operations, and color space conversions.

Digital Images
Images stored in digital forms. A digital image is a representation of a 2-D finite set of digital values, called picture elements or pixels. Images can be Grayscale or Color (RGB), specified as a matrix of size MxNx3 (MxN for grayscale)\(^0\), where M is number of rows, N is number of columns and 3 is number of channels. And for gray image number of channel is 1

Working with Scilab
Sample images used in all examples are available in default directory (To check default directory use pwd command). If images are stored other than default directory then use full image file path.

Reading and displaying image
\[
\text{im} = \text{imread('lena.jpg')}; \\
\text{imshow(im)}; \\
\text{imread()} \text{ will read the image into im variable i.e. matrix and imshow()} \text{ will display image using im variable.}
\]

Converting color image to grayscale image
\[
\text{im} = \text{imread('lena.jpg')}; \\
\text{img = rgb2gray(im);} \\
\text{imshow(img)}; \\
\text{rgb2gray()} \text{ converts color image to gray image. Dimension of color (RGB) image should be MxNx3 and dimension of output image (gray) is MxN.}
\]

Fig. 2: Grayscale image

Converting color/grayscale image to binary image
\[
\text{im} = \text{imread('lena.jpg')}; \\
\text{imbw = im2bw(im,0.5);} \\
\text{imshow(imbw)}; \\
\text{im2bw()} \text{ converts color / grayscale image to binary image.}
\]

Fig. 3: Binary image

Writing an image
\[
\text{im} = \text{imread('lena.jpg')}; \\
\text{img = rgb2gray(im);} \\
\text{imwrite(img,'lena_gray.jpg');} \\
\text{imwrite()} \text{ is used to create a image file after making any changes in original image file. Above command will create a new image file 'lena_gray.jpg' in current directory.}
\]

Knowing size of image in pixels
\[
\text{im} = \text{imread('lena.jpg')}; \\
\text{[M,N] = size(im)} \\
\text{M=225 and N=225}
\]

Resizing image
\[
\text{im} = \text{imread('lena.jpg')}; \\
\text{ima = imresize(im, 0.5);} \\
\text{imb = imresize(im, 1.5);} \\
\text{imshow(ima);} \\
\text{imshow(imb);}
\]

Fig. 4: Resizing Image

Fig. 5: Cropped image

Crop an image
\[
\text{im} = \text{imread('lena.jpg');} \\
\text{subim = imcrop(im, [50, 50, 100, 100]);} \\
\text{imshow(subim);} \\
\text{imcrop()} \text{ crops the input image with coordinates 50,50 – top left corners and 100,100 – width and height}
\]

Negative of an image
\[
\text{im} = \text{imread('lena.jpg');} \\
\text{imc = imcomplement(im);} \\
\text{imshow(imc);}
\]
imcomplement() makes the negative of an input image. Dark pixel becomes lighter and light pixel becomes darker.

This can also be done with simple program as follows:

**Program: Negative of an image**

```matlab
Im = imread('rice.jpg');
imshow(im);
[m,n]=size(im);
for i=1:m-1
    for j=1:n-1
        imn(i,j)=256-1-im(i,j);
    end;
end;
imshow(imn);
```

Flip an image

```matlab
im = imread('lena.jpg');
// horizontal flip
I2 = flipdim(im,2);
// vertical flip
I3 = flipdim(im,1);
// horizontal+vertical flip
I4 = flipdim(I3,2);
```

**Edge Detection:**

Edge detection is used to detect edges of objects in an image.

```matlab
im = imread('lena.jpg');
img = rgb2gray(im);
imshow(img);
e1 = edge(img,'sobel');
imshow(e1);
e2 = edge(img,'canny');
imshow(e2);
```

**References**

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**About the Author**

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Brain Teaser

Crossword »

Test your knowledge on Image and Video Processing

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

CLUES

ACROSS
1. An European video standard.
4. Unwanted electrical signal.
8. Rapid and small changes in an image.
9. The difference in luminance that makes an object distinguishable.
10. An adjustable opening in the lens.
13. Undesirable video display effects.
16. A file format that contains bitstream and metadata.
17. A property of color.
18. Combination of camera and recorder.
20. One million pixels.

DOWN
2. The color information contained in a video signal.
3. A filter type.
5. The attribute of a color that expresses the degree of departure from a gray of same lightness.
6. Process to select a particular area of the image.
7. A process when one video signal is faded and second appears.
11. A graphic programming environment.
15. Special effect when the picture is held as a still image.
19. The pattern of parallel horizontal scanning lines.

Did you know about 5D movies and theatres?

5D movies combine the features of 3D and 4D movies. 3D movies provide visual effects on the screen. 4D movies additionally provide hall effects like chair movement in the theatre, vibrations, sways, and sometimes water spray. But 5D movies additionally provide hall effects like smoke, rain, smell etc. Based on the features provided multimedia companies use the terms like 6D, 7D, 9D, 10D, XD etc.

Rashid Sheikh
Associate Professor, Sri Aurobindo Institute of Technology Indore

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

Congratulations!

All nearly Correct answers to August 2015 month’s crossword received from the following reader:

Er. Aruna Devi  Chartered Engineer, Surabhi Softwares, Mysore

Solution to August 2015 crossword

CSI Communications | September 2015 | 39
Report from CSI Vellore Chapter

The CSI Vellore Chapter and Student Branch organized a technical coding competition called **Yuvana**, on 11th August, 2015 at the Silver Jubilee Tower, VIT University. The event comprised of three rounds where the participants had to code and perform certain tasks. Participants in teams of two participated in all the rounds - a coder & an expert-coder per team, working in tandem. Around 120 students participated in the event; prizes were distributed to winners by Prof. Govinda. K, RVP VII.

CSI Vellore Chapter organized a Guest Lecture on “Innovation and Knowledge Management” on 18/08/2015. K. Subramanian, Ex-director from IGNOU explained about new innovations in IT and how knowledge management is helpful for organizations. This event was coordinated by Prof. G. Jagadeesh, Prof. K. Govinda and Dr. S. Arun Kumar around 150 participants attended the guest lecture.

Report from CSI Haridwar Chapter

On 7 July, 2015 CSI Haridwar Chapter in association with Gurukul Kangri University organized an awareness program on Govt. Of India Initiative, Digital India Week at FMS, GKV. Under the program a session of Lectures was organized to convey the mission and objectives of Digital India by Dr. Pankaj Madan and Dr. Mayank Aggarwal. Dr. Aggarwal also demonstrated how to use E-Hospital and Digital Locker Facility practically. After making the audience aware about digital India program, a quiz was conducted on Digital India Initiative.

Experts from PNB Mr. Lohani, Idea Mr. Anand and NIC Mr. Ravi also apprised about various initiatives like Digital Data, Cyber Crimes etc. The Program was presided by Hon’ble VC, GKV Sh. Surendra Kumar and Sh. VK Sharma, Registrar, GKV was Special Guest. Dr. Sharma told about the Long journey of digitization of Gurukul. The program witnessed a gathering of about 150 participants. At the end of the program prizes / certificates were given to first three winners of the quiz.

On 1 August, 2015 CSI Haridwar Chapter in association with Gurukul Kangri University organized a lecture on Cloud Economics and Business Model. Mr. Mahendra Nath Dubey, One Mobile, Bangalore delivered a talk. He not only explained the Architecture of Cloud Computing but also explained how user is billed, in very simple words. He explained the concept of Vendor Lock in and how business is flourishing using the technology. The program was attened by about 50 students. Dr. Mayank Aggarwal, Secretary CSI Haridwar chapter thanked Mr. Dubey for delivering his talk. Dr. M. M. Tiwari, Mr. Nishant, Mr. Vipul Sharma and others witnessed the program.

**Why Join CSI:**

1) To be a part of the distinguished fraternity of famous IT industry leaders, brilliant scientists and dedicated academicians through Networking.
2) Professional Development at Individual level.
3) Training and Certification in futuristic areas.
4) International Competitions and association with International bodies like IFIP and SEARCC.
5) Career Support.
6) CSI Awards.
7) Various Publications.
Report by RVP Region VI (Maharashtra & Goa)

Prof. S S Sane, Regional Vice president for CSI Region VI (Maharashtra & Goa) visited and attended the AGM of CSI Nagpur chapter at VNIT Nagpur on 22nd July 2015. Members present for the meeting and the RVP VI requested Prof. N S Chaudhary, Director VNIT Nagpur to take charge of CSI Nagpur chapter. Prof. N S Chaudhary shared his memorable events with CSI in the past and accepted request. He and RVP VI appealed all members from Nagpur to organize useful activities such as seminars, workshops, conferences for both the professionals and students. It was also decided that the persons from managing committee of CSI Nagpur to visit various student branches in and around Nagpur to spread awareness of CSI and encourage students and professionals to join CSI.

Prof. S R Sathe, Dr. Manali Kshirsagar, Prof. Deepti Shrimankar, Prof. V P Mahatme, Prof. Manoj Bramhe, Mr. Rahul Gade, Persistent systems, Nagpur, Prof. Shital Raut, Ms. Poonam Sharma, VNIT Nagpur were nominated to work as OBs, NC and MC of CSI Nagpur.

The meeting ended with vote of thanks.

Report from CSI – Tiruchirappalli Chapter

The Computer Society of India – Tiruchirappalli Chapter organized an International Workshop on “Image Processing Research with MATLAB” on 31st July & 1st August 2015 in Technical Collaboration with the IEEE Podhigai Sub-section and IEEE Signal Processing / Computational Intelligence / Computer Joint Societies Chapter (SIPCICOM) of Madras Section at Bharathidasan University Technology Park (BUTP), Khajamalai Campus, Tiruchirappalli – 620 023, Tamil Nadu.

Dr. Gopinath Ganapathy, Convener of the Workshop and Director, Bharathidasan University Technology Park, Tiruchirappalli inaugurated the workshop on the first day and delivered the keynote address. In his talk, he said that image processing is considered to be one of the most rapidly evolving areas of research and technology today with growing applications in almost all disciplines. Medical image analysis, computer vision, satellite image processing, document image analysis, biometrics, remote sensing, space exploration, etc. were some of the applications of Image Processing, he mentioned. Earlier, Dr. T. Abdul Razak, Organizing Secretary of the Workshop and Secretary, CSI Tiruchirappalli Chapter welcomed the gathering. He also introduced the resource person to the participants.

Dr. Justin Varghese, Associate Professor, College of Computer Science, King Khalid University, Abha, Kingdom of Saudi Arabia, assisted by Mr. Omer Bin Hussain, and Mr. Mohammed Riazuddin, both lecturers from the same university conducted the workshop on both days. The workshop consisted of six sessions including extensive hands-on training on various exercises using Matlab. The major topics covered during these sessions include - Image Processing Applications and Areas, Enhancement in Spatial domain, Filtering, Image Restoration, Image Transforms, Image Enhancement in Frequency domain, Image Compression, Segmentation, Representation, Recognition and Research Methodology in Image Processing.

The Valedictory function was held at the end of the second day at 5:30 p.m. Er. G.S. Raghunathan, Chairman, CSI-Tiruchirappalli Chapter presided over the function. Dr. S. Ravimaran, Vice Chairman, CSI-Tiruchirappalli Chapter distributed the certificates to participants. Er. N. Rajasekaran, Treasurer, CSI-Tiruchirappalli Chapter proposed a vote of thanks.

Around 70 participants including faculty members, research scholars and PG students both from India and abroad attended the workshop. They actively interacted with the resource person and derived benefits from the workshop. The success of the workshop was clearly evident from the feedback given by most of the participants during the valediction.
Report from CSI SIG-BDA

CSI SIG BDA and Hyderabad Chapter conducted the first Three day Workshop on BIG DATA ANALYTICS in CR Rao Advanced Institute of Mathematics, Statistics and Computer Science (AIMSCS) University of Hyderabad Campus, Hyderabad. The course content on Big Data Analytics for workshop was prepared by Prof. Saumyadipita Pyne, Dr. Ramana, Prof Sudhakar and Mr. Chandra Dasaka under the guidance of Padma Vibhushan Prof. CR Rao. Eleven participants from different organizations such as TCS, Insurance Information Bureau of India (IIB), Karvy Analytics Ltd and Hewlett Packard Global Soft Limited have participated in it.

Mr. Raju K. RVP -V CSI India delivered the welcome address. Workshop was inaugurated by Mr Kalidindi Raju, Director -Cloud, Hewlett Packard. Resource persons from IIIT, Central University, Osmania University, AIMSCS Hyderabad and from Corporate Maventus Group shared their extensive knowledge on the topics covered during the workshop i.e. Introduction to Big Data Analytics, Basic Statistics and Data Mining, Hands on Experience of R -Programming and Hadoop and final day of the workshop discussion and Knowledge sharing sessions on Big Data Applications. Valedictory was addressed by Shankar Kambhampaty (Director - Chief Technology Officer (CTO) for major Financial Services account at CSC India. Mr. Chandra Dasaka, Director-Mobile Digiconverse Private Limited, briefed about the Workshop details and Dr. DV Ramana, Wissen Infotech, Hyderabad provided the Workshop Summary and Prof Sudhakar, Challapalli CEO Raskey Software Solutions Concluded with the Vote of Thanks. The workshop was highly appreciated by the participants.

Report from CSI Bhopal Chapter

A guest lecture on the topic “Stress Management” was organized at Sagar Institute of Research and Technology at the Dept. of Mgmt. studies under the CSI Bhopal Chapter. The speaker was Dr. Vinay Mishra, Counselor and Psychologist from BSSS College, Bhopal. Dr. Ganga Agnihotri, Dr. Kanchan Bhatia (HOD, MBA) Prof. V.P. Singh (Adviser, MBA ) and Prof. Rajesh K Shukla (Secretary, CSI Bhopal Chapter) were present on the occasion.

Guidelines of Sending CSI Activity Report

- Student Branch activity Report : send to: sb-activities@csi-india.org with a copy to admn.office@csi-india.org and director.edu@csi-india.org
  The report should be brief within 50 words highlighting the achievements and with a photograph with a resolution higher than 300 DPI.
- Chapter activity Report: send to: chapter-activities@csi-india.org
  The report should be within 100 words highlighting the objective and clearly discussing the benefits to CSI Members. It should be accompanied by a photograph with a resolution higher than 300 DPI.
- Conference/ Seminar Report : should be sent by Div Chairs and RVPs to: conferences@csi-india.org
  The report should be brief within 150 words highlighting the objective and clearly discussing the benefits to CSI Members. It should be accompanied by a photograph with a resolution higher than 300 DPI.

Dr. Vipin Tyagi, Guest Editor (dr.vipin.tyagi@gmail.com) will be coordinating publishing of reports of these activities.
1. **CSI - IT Mission Talk Series**

   Computer Society of India, Trivandrum Chapter and Kerala State IT Mission jointly organized CSI - IT Mission Talk Series which contains 5 Technical talks relevant to Common Public with the sponsorship of Canara Bank. The talks series were held at Lions Hall, Lions Club Building, Jawahar Nagar, Thiruvananthapuram as detailed below:

   a) Inauguration of CSI-IT Mission Talk Series and Panel Discussion on ‘Will Net Neutrality be a Reality’ (8 May 2015)

   b) CSI-IT Mission Talk on ‘Computers in Drug Design’ (22 May 2015) by Dr. Achuthsankar S. Nair, Head, Department of Computational Biology and Bioinformatics & Director, Quality Assurance Cell, University Kerala.

   c) CSI-IT Mission Talk on ‘Media & Information Technology – A Holistic Approach’ (5 June 2015) by Mr. S. Biju, Assistant Executive Editor, Asianet News. Mr. Vishnukumar S, Secretary, CSI Trivandrum Chapter welcomed the gathering. The talk was attended by 23 participants from different organizations and educational institutions. Mr. Basanth Kumar B.S., Secretary, Trivandrum Management Association proposed the vote of thanks.

   d) CSI-IT Mission Talk on ‘e-Governance and Common Man’ (24 June 2015) by Dr. Nirmala Padmanabhan, Associate Professor, St. Theresa’s College. Shri. P. H. Kurian IAS, Principal Secretary, Department of IT, Government of Kerala delivered the keynote address on the topic.

   e) CSI-IT Mission Talk on ‘Support of IT in the Growth of Indian Art & Culture’ (10 July 2015) by Dr. Rajashree Warrier, Director, UTTARIKA, Centre for Performing Arts.

2. Technical talk on ‘Managing Expectations’ (17 June 2015) by Mr. Manikantan O.S., Vice President, Envestnet Inc. Thiruvananthapuram

3. Technical talk on ‘Internet of Everything’ (1 July 2015) by Mr. Srinivasan Ravindarn, Sr. Consultant, ICFOSS, Govt. of Kerala

4. National workshop on ‘Digital Forensics – Foundation, Frontiers and Challenges’ (15 July 2015) in association with Kerala State IT Mission, ICFOSS Government of Kerala and Kerala State Council for Science, Technology and Environment was organized at Mascot Hotel Thiruvananthapuram. The lead resource person of the Workshop was Dr. K. Rama Subramaniam, Group CEO of Valiant Technologies Group with offices in India, Sri Lanka, UAE and Mauritius. He is the current Global Chair of International Institute of Certified Forensic Investigation Professionals, Inc. (IICFIP) and serves on the board of Information Security & Digital Forensics Research Foundation, USA (ISDFRF).

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**Report from CSI Patna Chapter**

A one day seminar was organized jointly by Converged Data Technology, CISCO and CSI, Patna Chapter on 9th June 2015. The seminar was inaugurated by Prof. U.K. Singh, DG, IIBM, Patna & Fellow, CSI. Prof. Arun K. Sinha, Former VC, Patna University was present as the Guest of Honour. Prof. A. K. Nayak, Chairman (Publication Committee) CSI and Director IIBM, Patna welcomed the guests, speakers and delegates present in the seminar. Mr. Shantaram Shinde, President, Converged Data Technology, spoke on converged infrastructure, Infrastructure as a service including the complete concept of Public Cloud, Private Cloud and Hybrid Cloud. His presentation was followed by Mr. Sachin Wagnaker of Converged Data Technology. The CISCO presentation was made by Ms. Anuradha Sastry Vedula of CISCO, New Delhi. Mr. Shailesh Kumar Srivastava, Technical Director, NIC made an industry presentation comprising of various cloud application. Prof. Shams Raza, Past Chairman of CSI Patna Chapter presented the concluding remark where as Prof. Alok Kumar, Vice Chairman of CSI Patna Chapter proposed the vote of thanks. The seminar was coordinated by Sri Purnendu Narayan, Hony. Secretary of CSI Patna Chapter.

The International Conference and Digital Engineering Centre for Offshore and Domestic Enterprises (DECODE) IT park were inaugurated by Shri K.T.Rama Rao, Hon'ble Minister for IT & Panchayat Raj, Govt. of Telangana. The minister said that India was making good strides in the fields of IT & Computer Science and emphasized the need for more intensive research in these areas so that it can become number one in these fields in the world. He said that in the days to come Telangana State will occupy the prime place in IT in India and world over. In this context he mentioned that Mr. Sathya Nadendla, CEO, Microsoft who hails from India brought glory to our country. He urged the students to be innovative and congratulated Chairman - Sardar T. S. Kohli, Vice-Chairman - Mr. G. S. Khali and the Managing Director Dr. H. S. Saini of Guru Nanak Institutions for organizing the 3rd International Conference at GNI and opening an IT park for the benefit of students as well. The Souvenir brought out on this occasion was released by the Hon'ble minister.

Shri P. Mahender Reddy, Minister for Transport, Govt. of Telangana and other representatives of the people from the region participated in the inaugural function. Earlier, Mr. P. Srinivas, Consultant for GNI’s IT park said that Guru Nanak Institutions IT Park (DECODE) at Guru Nanak Institutions Technical Campus was designed to provide incentives to mid-range and upcoming companies; to set up their centers here and was also intended to provide employment to passed out students and part-time employment to students studying. About 6000 students attended this function. Dr. B. Veeranna, Director, GNITC proposed a vote of thanks.

The plenary session of the 3rd International Conference was chaired by Mr. Lloyd Sanford, CEO, Top Blue Logistics, U.S.A. Prof. Bipin Mehta, President, Computer Society of India, Mr. Prasanth Gupta, Microsoft, Dr. Raghu Babu Reddy –IIIT, Hyderabad, Mr. Ravi Shankar, IIEE, Dr. A. Govardhan, SIT, INTU, Hyderabad as Guests of Honour. Mr. Raju Kanchibotla, Reg. Vice-President (Region-V, CSI) and Mr. K.M. Raidu, Member, MC, CSI-Hyd., and Dr. B. Veeranna, Director, GNITC, were invited guests on this occasion.

Mr. Lloyd Sanford, emphasized on the role of Science and Technology and Supply Chain Management. He urged that the system should be upgraded to enhance the upcoming results and affordable value change strategies and e-commerce. Prof. Bipin Mehta mentioned that innovations are a continuous process and should be encouraged for competitive advantage. Dr. A. Govardhan emphasized on the three concepts of Learn, Unlearn, and Relent. While Vol 4(2) of the Jrl. Innovations in Computer Science and Engineering (ICICSE) was released by Mr. Lloyd Sanford, Vol. 5(1) was released by Prof. Bipin Mehta, President, CSI and the Proceedings of the Conference were released by Mr. Prasanth Gupta, Microsoft.

CSI ExecCom conveyed its greetings for the success of the Conference. There were about 500 delegates registered for this Conference. Dr. S. Sreenath Reddy, Principal, Guru Nanak Institute of Technology proposed a hearty vote of thanks. The valedictory Session was chaired by Mr. G. S. Kohli, Vice-Chairman and Dr. H. S. Saini, Managing Director. Dr. B. Veeranna, Director, Dr. D. D. Sarma, Co-Chair, ICICSE - 2015, Dr. Masood Ahmed & Prof. Dev Sekhar, Heads of CSE Dept.G NITC, Dr S.S.Rawat, Head, CSE, GNIT also addressed the participants. Best paper presentation awards were given to four students of various engineering colleges. Dr. Rishi Syal, Dean Academics & Training proposed a Vote of Thanks.

Dear CSI Members,
Please send the membership renewal form along with respective membership fees to avoid the discontinuation of your membership.

Like Computer Society of India on Facebook: https://www.facebook.com/CSIHQ for updates.
RVPs, Divisional Chairpersons, Chapter OBs and Student branch coordinators may send the activity reports,Photographs, or any other information to update on the page to nourine@csi-india.org.
The National Final Competition of Young Talent Search in Computer Programming 2015 was held on Sunday the 30th August 2015 at Rajalakshmi Engineering College, Chennai. Nine teams from different parts of the country, selected through their respective regional competitions, qualified for participation and all the nine teams participated. Accommodation and logistics for the team members and accompanying teachers were arranged by CSI Education Directorate. Rajalakshmi Engineering College, Chennai were the sponsors of the competition and provided venue, break-fast, lunch and transportation. Prof. P. Kumar, Dept of IT, Rajalakshmi Engineering College & Past Chairman, CSI Chennai Chapter coordinated the event. Prof. S Venkatakrishnan, former Director (Education), CSI Education Directorate, Mr. K Bhaskaran, Chairman, CSI Chennai Chapter & Mr. Pramod Mooriath, Past Chairman, CSI Chennai Chapter were the judges. The judges were assisted by Mr. Bhuvaneswaran, Mr. Rajesh Kannan & other staff and students of Rajalakshmi Engineering College. Arrangements were made to display the current scores of all teams.

The following top two teams won the first and second positions and qualified to represent India at the SEARCC International Schools' Software Competition 2015 which will be held in Colombo, Sri Lanka between 23rd & 25th October 2015

<table>
<thead>
<tr>
<th>Winner</th>
<th>School Name &amp; Address</th>
<th>Team Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>La Martiniere for Boys</td>
<td>Mr. Animesh Fatehpuria</td>
</tr>
<tr>
<td>Team-A</td>
<td>11, Loudon Street</td>
<td>Mr. Devang Maskara</td>
</tr>
<tr>
<td></td>
<td>Kolkata – 700017, West</td>
<td>Mr. Shiv Agrawal</td>
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<td></td>
<td>Bengal</td>
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<tr>
<td>Second</td>
<td>Delhi Public School</td>
<td>Mr. Rajat De</td>
</tr>
<tr>
<td>Team-B</td>
<td>Sector 3, Dwarka</td>
<td>Mr. Anubhav Baweja</td>
</tr>
<tr>
<td></td>
<td>New Delhi 110078</td>
<td>Mr. Sidhant Bansal</td>
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</table>

The prizes were presented by Mr. H R Mohan, Immediate Past President to the winners at a function organized after the competition. Prof. P Kumar welcomed the gathering. Mr. K Bhaskaran spoke on the occasion and appreciated the winners. Prof. S Venkatakrishnan advised the students for successful performance at the SEARCC International competition. Mr. H R Mohan spoke in length about the CSI initiative from the beginning in the SEARCC competition. Mr. Pramod Mooriath proposed the vote of thanks and appreciated the arrangements provided by the college. He also thanked the Management, Principal and staff of Rajalakshmi Engineering College for ensuring excellent co-ordination and support for the event. He also appreciated the services of all CSI staff.

M Gnanasekaran
Manager (Administration)
CSI Education Directorate
## From Student Branches

### (REGION-III)

<table>
<thead>
<tr>
<th>IPS COLLEGE OF TECHNOLOGY &amp; MANAGEMENT, GWALIOR</th>
<th>PACIFIC COLLEGE OF ENGINEERING, UDAIPUR</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.jpg" alt="Image" /> Mr. Sanjay Pandey, Technical Director, NIC during a Seminar on DIGITAL INDIA</td>
<td><img src="image2.jpg" alt="Image" /> 22-8-2015 – during Academia Industry Interaction</td>
</tr>
<tr>
<td>11-8-2015</td>
<td>22-8-2015</td>
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### (REGION-V)

<table>
<thead>
<tr>
<th>CMR TECHNICAL CAMPUS, HYDERABAD</th>
<th>NBKR INSTITUTE OF SCIENCE AND TECHNOLOGY, VIDYANAGAR</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3.jpg" alt="Image" /> 30-7-2015 – during Guest lecture on Awareness Program on CIVIL Services &amp; Groups Exams</td>
<td><img src="image4.jpg" alt="Image" /> 8-8-2015 – during Paper Presentation contest</td>
</tr>
<tr>
<td>30-7-2015</td>
<td>8-8-2015</td>
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### (REGION-V)

<table>
<thead>
<tr>
<th>STANLEY COLLEGE OF ENGINEERING &amp; TECHNOLOGY FOR WOMEN, HYDERABAD</th>
<th>VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image5.jpg" alt="Image" /> 29-7-2015 – during one day workshop on IBM Bluemix</td>
<td><img src="image6.jpg" alt="Image" /> 27-7-2015 – Mr. Vivek Kulkarni, Mr. Mohan Raidu, Mr. Raju Kanchibhotla, Mr. Shashank, Dr. Gopichand, Dr. Venkateswara during Student Branch Inauguration</td>
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<tr>
<td>29-7-2015</td>
<td>27-7-2015</td>
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### (REGION-V)

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<tr>
<th>STANLEY COLLEGE OF ENGINEERING &amp; TECHNOLOGY FOR WOMEN, HYDERABAD</th>
<th>NBKR INSTITUTE OF SCIENCE AND TECHNOLOGY, VIDYANAGAR</th>
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</thead>
<tbody>
<tr>
<td><img src="image7.jpg" alt="Image" /> 20 to 22-7-2015 – during National Level workshop on Programming with C</td>
<td><img src="image8.jpg" alt="Image" /> 31-7-2015 – during Debugging Contest</td>
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<td>20 to 22-7-2015</td>
<td>31-7-2015</td>
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<td>LATE G N SAPKAL COLLEGE OF ENGINEERING, NASHIK</td>
<td>LATE G N SAPKAL COLLEGE OF ENGINEERING, NASHIK</td>
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<tr>
<td>21-7-2015 – Prof. Gond, Prof. Wankhade &amp; Mr. Tanmay Dikshit during Seminar on Cyber Forensics and Network Security</td>
<td>17-7-2015 – Prof. Wankhade, Mr. Prashant Kale, Faculty members and Winners during Poster Presentation Competition on Digital India Week</td>
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<tr>
<td>IMRD, SHIRPUR</td>
<td>TAGORE ENGINEERING COLLEGE, CHENNAI</td>
</tr>
<tr>
<td>14-8-2015 – during expert talk on “IT Experience Sharing”</td>
<td>17-8-2015 – New Student Branch Inaugurated by Mr. Kathiresan, Sr. Manager (Promotions), CSI ED and felicitated by Dr. Kasinatha Pandian, Principal &amp; staff</td>
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<td>NANDHA COLLEGE OF TECHNOLOGY, ERODE</td>
<td>NANDHA COLLEGE OF TECHNOLOGY, ERODE</td>
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<tr>
<td>10-7-2015 – during Academic Seminar on IT Trends – A Business Centric Views</td>
<td>22-7-2015 – during Industrial Seminar on Big data Analytics</td>
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<tr>
<td>NATIONAL ENGINEERING COLLEGE, KOVILPATTI</td>
<td>EINSTEIN COLLEGE OF ENGINEERING, TIRUNELVELI</td>
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<tr>
<td>5-8-2015 – Mr Jerart Julus, Dr. Shanmugavel, Dr. Shantharajah &amp; Mr. Sangili Pandi during Student Branch Inauguration &amp; release of Annual Report</td>
<td>14-8-2015 – Prof. Suresh thangakrishnan, Dr. Ramar, Mr. Mathivanan &amp; Ravikumar during prize distribution for the event on quiz programme</td>
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<td>(REGION-VII)</td>
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<tr>
<td><strong>SCAD COLLEGE OF ENGINEERING AND TECHNOLOGY, CHERANMAHADEVI</strong></td>
<td><strong>VELAMMAL ENGINEERING COLLEGE, CHENNAI</strong></td>
</tr>
<tr>
<td>13-8-2015 – Prof. Harold Robinson, Prof. Balaji, Rev Fr Ajan Charles, Mr. Daniel Prakash, Prof. Petchimuthu &amp; Prof. Jeena Jacob during Student Branch Inauguration</td>
<td>17-7-2015 – Dr. Venkatalakshmi, Dr. Rajalakshmi, Mr. Muthusamy Sadaiappan, Dr. Duraipandian &amp; Dr. Vijaya during Student Branch Inauguration</td>
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<th>(REGION-VII)</th>
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<tbody>
<tr>
<td><strong>SASTRA UNIVERSITY, THANJAVUR</strong></td>
<td><strong>SASTRA UNIVERSITY, THANJAVUR</strong></td>
</tr>
<tr>
<td>8-8-2015 – during workshop on Google apps and apps scripts in Education</td>
<td>31-7-2015 – Swami Buddhatmananda Saraswathi during Guest Lecture on Youth Empowerment</td>
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<th>(REGION-VII)</th>
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<tbody>
<tr>
<td><strong>ER PERUMAL MANIMEKALAI COLLEGE OF ENGINEERING, HOSUR</strong></td>
<td><strong>SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE, GOBI</strong></td>
</tr>
<tr>
<td>14-8-2015 – Dr. Anirban Basu, Vice President, CSI during Guest Lecture on Big Data Analytics with IoT</td>
<td>31-7-2015 – during Workshop on Web Development Using Angular Java Script</td>
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<tbody>
<tr>
<td><strong>VALLIAMMAI ENGINEERING COLLEGE, CHENNAI</strong></td>
<td><strong>JAMAL MOHAMED COLLEGE, TIRUCHIRAPPALLI</strong></td>
</tr>
<tr>
<td>7-8-2015 – Mr. H R Mohan, Dr. Vanathi, Ms. Meenakshi, Dr. Abdul Rasheed &amp; CSI Coordinators during Guest Lecture on Big Data &amp; Opportunities</td>
<td>31-7-2015 &amp; 1-8-2015 – during International Workshop on Image Processing Research with Matlab</td>
</tr>
</tbody>
</table>
**Academic Awards 2015**

**Call for Applications**

Computer Society of India has been honouring academic excellence through Academic Awards every year. The awards will be presented during the CSI Annual Convention to be held from 2nd to 5th December, 2015 at New Delhi. Applications are invited for the following awards for the period from July 2014 to June 2015 from the accredited student branches who meet the criteria and are currently in good standing.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Award</th>
<th>Criteria</th>
<th>To be submitted by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Best Accredited Student Branch Award</strong></td>
<td>Good standing – during the award year and currently, large student strength &amp; large number of activities as defined in the specified form</td>
<td>SBC Student Branch Counselor (SBC) with necessary recommendation from Regional Student’s Coordinator (RSC) and approval from Regional Vice President (RVP)</td>
</tr>
<tr>
<td>2</td>
<td><strong>Largest Student Branch Award</strong></td>
<td>Continuous good standing for the past 3 years with highest 3 years averaged strength</td>
<td>Decided by Awards Committee</td>
</tr>
<tr>
<td>3</td>
<td><strong>Best CSI International Students Event Host Award</strong></td>
<td>Institutional member hosted maximum students competition participated by minimum 10 foreign students</td>
<td>SBC with necessary recommendation from RSC and approval from RVP</td>
</tr>
<tr>
<td>4</td>
<td><strong>Highest Sponsorship of CSI Events Award</strong></td>
<td>Institutional member extending maximum support for CSI events during the award year</td>
<td>SBC with necessary recommendation from RSC and approval from RVP</td>
</tr>
<tr>
<td>5</td>
<td><strong>Longest Continuous SBC Award</strong></td>
<td>Longest continuous tenure as SBC over the last 3 years</td>
<td>SBC with necessary recommendation from RSC and approval from RVP</td>
</tr>
<tr>
<td>6</td>
<td><strong>Faculty with maximum publishing in CSI Publications</strong></td>
<td>Publishing maximum articles in CSI publications, Digital Library during the award year</td>
<td>Self with necessary recommendation from RSC and approval from RVP</td>
</tr>
<tr>
<td>7</td>
<td><strong>Paper Presenter at International Conference for Faculty</strong></td>
<td>Presentation of paper at prestigious International Conferences during the award year</td>
<td>Self with necessary recommendation from RSC and approval from RVP</td>
</tr>
<tr>
<td>8</td>
<td><strong>Students with maximum publishing – CSI publications</strong></td>
<td>Publishing maximum articles in CSI publications, Digital Library during the award year</td>
<td>SBC with necessary recommendation from RSC and approval from RVP</td>
</tr>
<tr>
<td>9</td>
<td><strong>Highest Committed Accredited Student Branch Activist Award</strong></td>
<td>Most active CSI Volunteer from the Student Branch during the award year</td>
<td>SBC with necessary recommendation from RSC and approval from RVP</td>
</tr>
<tr>
<td>10</td>
<td><strong>Best Ph.D. Thesis Award</strong></td>
<td>CSI member, who submitted a high-quality thesis (Thesis quality to be evaluated by a panel of eminent research scientists) leading to acceptance for Ph.D. degree by a recognized University</td>
<td>Research Scholar (who got the Ph.D. during the award year) / the Research Supervisor / Current Employer</td>
</tr>
</tbody>
</table>

The applications for the awards are invited only from the CSI members or from CSI Accredited CSI Student Branches in good standing during the current year as well as during the Award year. Applications are invited via email - awards@csi-india.org as specified in the forms, latest by 6th October 2015.

**H. R. Mohan**  
Chairman – Awards Committee

**Prof. M. N. Hoda**  
Member

**Prof. Durgesh Mishra**  
Member

**H. S. Mishra**  
Member
<table>
<thead>
<tr>
<th>Date</th>
<th>Event Details &amp; Contact Information</th>
</tr>
</thead>
</table>
| Sept 2015    | **National level project competition "Innovations 2015"** at SIES Graduate School of Technology, Nerul, Navi Mumbai (in association with CSI Mumbai Chapter Division VI)  
Contact Information: Dr. Alka Mahajan principal@siesgst.ac.in, Prof. Deepti Reddy reddy.deepti78@gmail.com                                                                                     |
| Oct 2015     | **International Congress on Information and Communication Technology (ICICT-2014)** at Udaipur (in association with CSI Udaipur Chapter, Div-IV, SIG-WNs, SIG-e-Agriculture and ACM Udaipur Chapter)  
Contact Information: Dr. Y C Bhatt drycbhatt@hotmail.com, Amit Joshi amitjoshiudr@gmail.com                                                                                     |
Contact Information: Mr. Shashi kant Gupta shashikantgupta@itmuniversity.ac.in, Deepak Motwani deepakmotwani@itmuniversity.ac.in                                                                       |
| Dec 2015     | **International Conference on Computational Intelligence and Communication Networks (CICN 2015)** [www.cicn2015.info](http://www.cicn2015.info)  
Contact Information: Dr. Santosh Vishwakarma santoshscholar@gmail.com                                                                                                                     |
| Jan 2016     | **Third International Conference on Information systems Design and Intelligent Applications (INDIA 2016)** at Anil Neerukonda Institute of Technology and Sciences (ANITS), Vishakapatnam, Andhra Pradesh in association with CSI Div-V, [www.conference.net.in/india2016](http://www.conference.net.in/india2016)  
Contact Information: Prof. Pritee Parvekar, pritee2000@gmail.com, Prof. S C Satapathy, sureshsatapathy@ieee.org                                                                 |
| March 2016   | **Second International Conference on ICT for Competitive Strategies (ICICS-2016)** at Udaipur. (Organized by ACM Udaipur Chapter, in association with CSI Udaipur Chapter)  
Contact Information: Mr. Amit Joshi amitjoshiudr@gmail.com                                                                                                                                     |

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**Guest Editor - Dr. Vipin Tyagi**

Dr. Vipin Tyagi, Guest editor for September Issue of CSI Communications, is working as faculty in Dept. of CSE at Jaypee University of Engg and Technology, Raghogarh, Guna (MP) India. He is Regional Vice President of Computer Society of India of Region 3. He is also associated with CSI Special Interest Group on Cyber Forensics. He has about 20 years of teaching and research experience. He is a senior life member of Computer Society of India. He was President of Engineering Sciences Section of the Indian Science Congress Association for the term 2010-11, and recorder for the term 2008 - 2010. He is a Life Fellow of the Institution of Electronics and Telecommunication Engineers. He is actively associated with professional societies like CSI, IETE, ISCA, Indian Society of Remote Sensing, IEEE etc. He was nominated by Indian National Science Academy (INSA), New Delhi under international collaboration to visit Czech Republic, for two weeks in May 2012. He has published more than 100 papers in various reputed journals, advanced research series and has attended several national and international conferences in India and abroad. He is Principal Investigator of research projects funded by DRDO, MP Council of Science and Technology and CSI. He is serving CSI Communications as Guest Editor since May 2015 issue.

He is an expert in the area of Cyber Security, Cyber Forensics and Image Processing. He can be reached at dr.vipin.tyagi@gmail.com
INDIACom-2016

10th INDIACom; 3rd 2016 IEEE International Conference on
“Computing for Sustainable Global Development”
(16th - 18th March, 2016)

Organized by

Bharati Vidyapeeth’s Institute of Computer Applications and Management (BVICAM), New Delhi

Technically Sponsored by

IEEE Delhi Section

Supported by

Computer Society of India (CSI), Divisions - I, II, III, IV & V and Region - I, Institutions of Electronics and Telecommunications Engineers (IETE), Delhi Centre, Indian Society for Technical Education (ISTE), Delhi Section, Institution of Engineering and Technology (UK), Delhi Local Networks and Guru Gobind Singh Indraprastha University (GGSIPU), New Delhi

Paper Submission Deadline: 10th November, 2015 [No Further Extension]

Paper Submission Link: http://bvicam.ac.in/indiacom/submitPaper.asp

Conference Website: http://bvicam.ac.in/indiacom/

Announcement and Call for Papers

Information and Communication Technologies (ICT) play an important role in enhancing the effectiveness, efficiency, growth and development of education, healthcare and modernization of a Society. Foreseeing the importance and impact of the above and encouraged by the resounding success met with the past nine editions of INDIACom since its inception in the year 2007; we hereby announce INDIACom-2016, which aims to invite original, unpublished and full length research papers in the field of, primarily, Computer Science and Information Technology and, generally, all interdisciplinary streams of Engineering Sciences, having central focus on sustainable computing applications, which may be of use in enhancing the quality of human life and contribute effectively to realize the nations’ vision of sustainable inclusive development using Computing. INDIACom-2016 is an amalgamation of four different tracks organized parallel to each other, in addition to few theme based Special Sessions, as listed below:-

- **Track #1: Sustainable Computing**
- **Track #2: High Performance Computing**
- **Track #3: High Speed Networking & Information Security**
- **Track #4: Software Engineering & Emerging Technologies**
- **Track # 5: Theme Based Special Sessions**

Instructions for Authors

Authors from across different parts of the world are invited to submit their papers. Authors should submit their papers online at http://www.bvicam.ac.in/indiacom/loginReqSubmitPaper.asp. New authors should first sign up and create an account on http://www.bvicam.ac.in/indiacom/addMember.asp to log in and submit paper. Only electronic submissions will be considered. Paper submission, as E-Mail attachment, will not be considered.

Important Dates

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submission of Full Length Paper</td>
<td>10th November, 2015</td>
</tr>
<tr>
<td>Submission of Camera Ready Copy (CRC) of the Paper</td>
<td>25th January, 2016</td>
</tr>
<tr>
<td>Paper Acceptance Notification</td>
<td>12th January, 2016</td>
</tr>
<tr>
<td>Registration Deadline</td>
<td>01st February, 2016</td>
</tr>
</tbody>
</table>

Accepted Papers will be published in IEEE Xplore, which is indexed with world’s leading Abstracting & Indexing (A&I) databases, including ISI, SCOPUS, DBLP, EI-Compendex, Google Scholar, etc. Further details are available at www.bvicam.ac.in/indiacom. All correspondences, related to INDIACom-2016, must be addressed to:

Prof. M.N.Hoda
General Chair, INDIACom-2016
Director, Bharati Vidyapeeth’s Institute of Computer Applications and Management (BVICAM)
A-4, Paschim Vihar, Rohtak Road, New Delhi-110063 (INDIA)
E-mails: conference@bvicam.ac.in, indiacom2016@gmail.com
Tel.: 011-25275055 TeleFax: 011-25255056, 09212022066 (Mobile)
CSI-2015
50th Golden Jubilee Annual Convention on Digital Life
(02nd – 05th December, 2015)
Hosted by: Computer Society of India (CSI), Delhi and NCR Chapters
Convention Website: http://www.csi-2015.org/

Announcement and Call for Registration and Participation

On the sound foundation of previous 49 editions of CSI Annual Conventions, held regularly every year, in different cities of the country, Computer Society of India (CSI), takes pride in announcing its 50th Golden Jubilee Annual Convention; CSI-2015 to be held at New Delhi, the national capital of the country. CSI-2015 will be an amalgamation of the following ten different tracks organized parallel to each other, in addition to few theme based Special Sessions:-

<table>
<thead>
<tr>
<th>Track # 1:</th>
<th>Track # 6:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT Based Innovation</td>
<td>Big Data Analytics</td>
</tr>
<tr>
<td>Track # 2:</td>
<td>Track # 7:</td>
</tr>
<tr>
<td>Next Generation Networks</td>
<td>System and Architecture</td>
</tr>
<tr>
<td>Track # 3:</td>
<td>Track # 8:</td>
</tr>
<tr>
<td>Nature Inspired Computing</td>
<td>Cyber Security</td>
</tr>
<tr>
<td>Track # 4:</td>
<td>Track # 9:</td>
</tr>
<tr>
<td>Speech and Language Processing for Human-Machine Communications</td>
<td>Software Engineering</td>
</tr>
<tr>
<td>Track # 5:</td>
<td>Track # 10:</td>
</tr>
<tr>
<td>Sensors</td>
<td>3-D Silicon Photonics &amp; High Performance Computing</td>
</tr>
</tbody>
</table>

CSI-2015 will be held at India International Centre (IIC), Lodhi Road, New Delhi (INDIA). The convention will provide a platform for technical exchanges amongst scientists, teachers, scholars, engineers and research students from all around the world and will encompass regular paper presentation sessions, invited talks, key note addresses, panel discussions and poster exhibitions.

Over 1300 papers, from all across the country and abroad, have already been received. Paper submission process has been closed on 17th August, 2015, strictly as per the last date announced. Accepted papers shall be published by Springer in AISC series, which is indexed with world’s leading Abstracting & Indexing (A&I) databases, including ISI, SCOPUS, DBLP, EI-Compendex, Google Scholar, etc. in the form of Convention Proceedings, both, Soft Copy as well as Hard Copy. Over two dozens of leading experts, in their respective field have already confirmed to be the Speakers during the convention. Over 2000 delegates, from all walks of life, including top researchers, teachers, Govt. Officers, technocrats, industry leaders, representatives of the regulatory agencies and other stake holders are expected to attend the convention. Convention is fortunate to have the blessings of the following top visionaries, in their respective field.

<table>
<thead>
<tr>
<th>Chief Patron</th>
<th>Patrons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Padmashree Dr. R. Chidambaram</td>
<td>Prof. S. V. Raghavan</td>
</tr>
<tr>
<td>Principal Scientific Advisor (PSA), Govt. of India</td>
<td>Scientific Secretary, Office of the PSA, Govt. of India</td>
</tr>
<tr>
<td>Chair, Programme Committee</td>
<td>Chair, Organizing Committee</td>
</tr>
<tr>
<td>Prof. K. K. Aggarwal</td>
<td>Dr. Gulshan Rai</td>
</tr>
<tr>
<td>Chancellor, KRM University, Gurgaon and Former Founder Vice Chancellor, GGSIP University, New Delhi</td>
<td>National Cyber Security Coordinator, Govt. of India</td>
</tr>
<tr>
<td>Chair, Finance Committee</td>
<td>Mr. Satish Khosla</td>
</tr>
<tr>
<td>Managing Director, Cognilytics Software and Consulting Pvt ltd.</td>
<td></td>
</tr>
</tbody>
</table>

Registration Fee Details and Sponsorship Opportunities
Available at Page no. 31

For more details, please refer the convention website at http://www.csi-2015.org/

All correspondences, related to CSI-2015 must be addressed to
Prof. M. N. Hoda
Secretary, Programme Committee (PC), CSI – 2015
Director, Bharati Vidyapeeth’s Institute of Computer Applications and Management (BVICAM)
A-4, Paschim Vihar, Rohtak Road, New Delhi - 110063 (INDIA)
Tel.: +91-11-25275055 Fax: +91-11-25255056 Mobile: +91-9212022066
E-Mail IDs: mca@bvicam.ac.in; csi2015.delhi@gmail.com; Visit us at http://www.csi-2015.org/