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DEPARTMENT OF COMPUTER ENGINEERING

Techniz

SIES GRADUATE SCHOOL OF TECHNOLOGY

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INDEX

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To be a centre of Excellence in Computer Engineering to fulfill the rapidly growing needs of the Society.

MISSION

- To Impart quality education to meet the professional challenges in the area of Computer Engineering.
- To create an environment for research, innovation, professional and social development.
- To nurture lifelong learning skills for achieving professional growth.
- To strengthen the alumni and industrial interaction for overall development of students.

PEO

- Practice Computer engineering in core and multi-disciplinary domains.
- Exhibit leadership skills for professional growth.
- Pursue higher Studies for career advancement

PSO

- To apply computational and logical skills to solve computer engineering problems.
- To develop interdisciplinary skills and acquaint with cutting edge technologies in software industries .

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Message from HOD's desk

Dr. Aparna Bannore
HOD - CE

Dear Reader,

I am delighted and congratulate the TECHNIZ team for their brilliant and original efforts. I wish to sincerely thank you for submitting your articles and therefore contributing to the success of TECHNIZ.

Without innovation, there would be no progress, and we would be forever repeating the same patterns.

This is an opportunity to appreciate the role of science, technology and innovation in development of the country. It is my sincere hope that all the articles will significantly contribute to long term dream and to ensure that benefit to the development and improving quality of life.

I wish all the readers Best of Luck & a bright future ahead, filled with joy and success.

Message from Faculty Incharge

Prof. Anindita Khade
Faculty Incharge

We are glad to introduce Issue 4 of the departmental magazine of Computer Engineering Department of SIES GST , Techniz. Techniz is all about technology that inspires students to do something, that leaves an everlasting mark in the world of technology. Thus,it is our job to ensure inspiring technological developments are being brought to the students of SIESGST, by the students and faculty members of SIES GST itself.

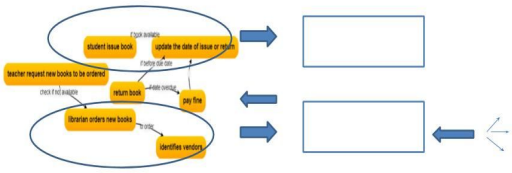
I think, we retained most of the members from the team behind the previous issue. Everything right from the collection of articles upto the final edits were quite smooth. I worked closely with the team to ensure that everything was done according to the deadlines. The work was performed in a very professional manner. Thanks to the team of Techniz for their commendable job.

I would also like to thank each and every member of Techniz without whose support this would not have been possible. I hope that you all enjoy reading this magazine.

Expert-Novice approach towards Software Design

Dr. Deepti Reddy

Software design is a complex process in which the designer has to deal with uncertainties such as, the problem domain may be unknown to the designer, the requirements may not be clearly stated and multiple solutions may exist. For example, in the problem " Design library record-keeping system",
the designer may not have prior experience in designing software for the library. Next, the problem is broadly defined and the designer may have to break the problem into subproblems and think of alternative ways to solve each sub-problem. Another important skill to design a good quality solution is to monitor and evaluate if the solution satisfies all the given requirements by going back and forth between problem-solution space.
Based on various expert studies in software design (Adelson, 1985; Guindon, 1990; Tang, 2008; 2010), the experts' approach to solving the software design problem- *"Design a library record keeping system"* is illustrated. The expert initially explores the problem space by simulating various scenarios and using various representations like diagrams, tables, list, etc., as shown in figure 1.2. This process helps them to derive new requirements and constraints which are not stated in the problem. In solution space, multiple solutions exist as the data can be represented in various ways, like flat data model (arrays, linked list), hierarchal data model (B-trees), network model (graphs), entity-relation model and object-relation model. Similarly, the operations can be implemented using various algorithms (linear search, binary search, etc.).
The designer has to choose appropriate data structure representation and algorithms by critically evaluating the options based on the criteria (reliability, cost, execution time) and constraints (high reliability, low execution time) applicable to the given problem domain (Tang, 2010; Guindon, 1990). The experts reduce the solution space by doing trade-off analysis of solutions against the selection criteria to select the single solution. They go back and forth between problem-solution spaces, for example, after generating a solution, they test the solution against achieving the stated constraints and



in the process go back to problem space to generate new requirements.

The novice approach to solving the problem *"Design a library record keeping system"*, will be that they tend to focus on one of the salient requirement in the library, *search a book*, and tend to write a program to achieve the requirement without thinking of other related requirements such as, *librarian issues a book*, *update book status*, etc.. They lack the ability to understand the problem as a whole from the perspective of various stakeholders involved, which leads to incomplete problem formulations (Adelson, 1985). In solution design, novices tend to select the design option without searching and evaluating from all available design options, which may affect the solution quality (Tang, 2010). They also have difficulty in identifying the selection criteria and constraints, which leads to the premature selection of design options.

One issue in software design is that the quality of the design is heavily dependent on the expertise and experience of the designer (Adelson, 1985; Tang, 2008). The solution is to explicitly coach novices in learning the skills of expanding and reducing problem-solution space systematically.

The online learning environment was designed and developed named Fathom which is equipped with the pedagogy and cognitive tools to teach-learn expand-reduce skills. The expert designers are adept at applying various cognitive skills in problem-solution space and co-evolve both problem and solution space in an interleaved manner. In problem space, the designers who do initial problem exploration by simulating various problem scenarios can identify more problem statements and constraints. In solution space, the process of identifying alternative solutions and decision making based on selection criteria helps to design effective solutions (Tang, 2008). However, novices have difficulty in solving design problems as they think at programming level and reduce early to the solution design, which affects the quality of the design in many ways like defining the problem too narrowly, solving the wrong problem, failure to see how various sub-problems relate to one another, and anchor on the single solution without explicitly evaluating other alternative (Carmen, 2007).

Dr. Deepti Reddy
Associate Professor, CE DEPT

VIRTUAL AND AUGMENTED REALITY

The recent appearance of low cost virtual reality (VR) technologies – like the Oculus Rift, the HTC Vive and the Sony PlayStation VR – and Mixed Reality Interfaces (MRITF) – like the Hololens – is attracting the attention of users and researchers suggesting it may be the next largest stepping stone in technological innovation. However, the history of VR technology is longer than it may seem: the concept of VR was formulated in the 1960s and the first commercial VR tools appeared in the late 1980s. For this reason, during the last 20 years, 100s of researchers explored the processes, effects, and applications of this technology producing 1000s of scientific papers. What is the outcome of this significant research work? This paper wants to provide an answer to this question by exploring, using advanced scientometric techniques, the existing research corpus in the field. We collected all the existent articles about VR in the Web of Science Core Collection scientific database, and the resultant dataset contained 21,667 records for VR and 9,944 for augmented reality (AR). The bibliographic record contained various fields, such as author, title, abstract, country, and all the references (needed for the citation analysis).

The network and cluster analysis of the literature showed a composite panorama characterized by changes and evolutions over the time. Indeed, whether until 5 years ago, the main publication media on VR concerned both conference proceeding and journals, more recently journals constitute the main medium of communication.

Similarly, if at first computer science was the leading research field, nowadays clinical areas have increased, as well as the number of countries involved in VR research. The present work discusses the evolution and changes over the time of the use of VR in the main areas of application with an emphasis on the future expected VR's capacities, increases and challenges. We conclude considering the disruptive contribution that VR/AR/MRITF will be able to get in scientific fields, as well in human communication and interaction, as already happened with the advent of mobile phones by increasing the use and the development of scientific applications (e.g., in clinical areas) and by modifying the social communication and interaction among people.

Looking chronologically on VR and AR developments, we can trace the first 3D immersive simulator in 1962, when Morton Heilig created Sensorama, a simulated experience of a motorcycle running through Brooklyn characterized by several sensory impressions, such as audio, olfactory, and haptic stimuli, including also wind to provide a realist experience (Heilig, 1962). In the same years, Ivan Sutherland developed The Ultimate Display that, more than sound, smell, and haptic feedback, included interactive graphics that Sensorama didn't provide. Furthermore, Philco developed the first HMD that together with The Sword of Damocles of Sutherland was able to update the virtual images by tracking user's head position and orientation (Sutherland, 1965). In the 70s, the University of North Carolina realized GROPE, the first system of force-feedback and Myron Krueger created VIDEOPLACE an Artificial Reality in which the users' body figures were captured by cameras and projected on a screen (Krueger et al., 1985). In this way two or more users could interact in the 2D-virtual space. In 1982, the US' Air Force created the first flight simulator [Visually Coupled Airbone System Simulator (VCASS)] in which the pilot through an HMD could control the pathway and the targets. Generally, the 80's were the years in which the first commercial devices began to emerge: for example, in 1985 the VPL company commercialized the DataGlove, glove sensors' equipped able to measure the flexion of fingers, orientation and position, and identify hand gestures. Another example is the Eyephone, created in 1988 by the VPL Company, an HMD system for completely immerging the user in a virtual world. At the end of 80's, Fake Space Labs created a Binocular Omni Orientational Monitor (BOOM), a complex system composed by a stereoscopic-displaying device, providing a moving and broad virtual environment, and a mechanical arm tracking. Furthermore, BOOM offered a more stable image and giving more quickly responses to movements than the HMD devices. Thanks to BOOM and Data Glove, the NASA Ames Research Center developed the Virtual Wind Tunnel in order to research and manipulate airflow in a virtual airplane or space ship. In 1992, the Electronic Visualization Laboratory of the University of Illinois created the CAVE Automatic Virtual Environment, an immersive VR system composed by projectors directed on three or more walls of a room.

Virtual Reality Applications...

Since its appearance, VR has been used in different fields, as for gaming (Zyda, 2005; Meldrum et al., 2012), military training (Alexander et al., 2017), architectural design (Song et al., 2017), education (Englund et al., 2017), learning and social skills training (Schmidt et al., 2017), simulations of surgical procedures (Gallagher et al., 2005), assistance to the elderly or psychological treatments are other fields in which VR is bursting strongly (Freeman et al., 2017; Neri et al., 2017). A recent and extensive review of Slater and Sanchez-Vives (2016) reported the main VR application evidences, including weakness and advantages, in several research areas, such as science, education, training, physical training, as well as social phenomena, moral behaviors, and could be used in other fields, like travel, meetings, collaboration, industry, news, and entertainment. Furthermore, another review published this year by Freeman et al. (2017) focused on VR in mental health, showing the efficacy of VR in assessing and treating different psychological disorders as anxiety, schizophrenia, depression

, and eating disorders

There are many possibilities that allow the use of VR as a stimulus, replacing real stimuli, recreating experiences, which in the real world would be impossible, with a high realism. This is why VR is widely used in research on new ways of applying psychological treatment or training, for example, to problems arising from phobias (agoraphobia, phobia to fly, etc.) (Botella et al., 2017). Or, simply, it is used like improvement of the traditional systems of motor rehabilitation (Llorens et al., 2014; Borrego et al., 2016), developing games that ameliorate the tasks. More in detail, in psychological treatment, Virtual Reality Exposure Therapy (VRET) has showed its efficacy, allowing to patients to gradually face fear stimuli or stressed situations in a safe environment where the psychological and physiological reactions can be controlled by the therapist (Botella et al., 2017).

Augmented Reality Concept

Milgram and Kishino (1994), conceptualized the Virtual-Reality Continuum that takes into consideration four systems: real environment, augmented reality (AR), augmented virtuality, and virtual environment. AR can be defined a newer technological system in which virtual objects are added to the real world in real-time during the user's experience. Per Azuma et al. (2001) an AR system should: (1) combine real and virtual objects in a real environment; (2) run interactively and in real-time; (3) register real and virtual objects with each other. Furthermore, even if the AR experiences could seem different from VRs, the quality of AR experience could be considered similarly. Indeed, like in VR, feeling of presence, level of realism, and the degree of reality represent the main features that can be considered the indicators of the quality of AR experiences. Higher the experience is perceived as realistic, and there is congruence between the user's expectation and the interaction inside the AR environments, higher would be the perception of "being there" physically, and at cognitive and emotional level. The feeling of presence, both in AR and VR environments, is important in acting behaviors like the real ones (Botella et al., 2005; Juan et al., 2005; Bretón-López et al., 2010; Wrzesien et al., 2013).

Augmented Reality Applications..

Although AR is a more recent technology than VR, it has been investigated and used in several research areas such as architecture (Lin and Hsu, 2017), maintenance (Schwald and De Laval, 2003), entertainment (Ozbek et al., 2004), education (Nincarean et al., 2013; Bacca et al., 2014; Akçayır and Akçayır, 2017), medicine (De Buck et al., 2005), and psychological treatments (Juan et al., 2005; Botella et al., 2005, 2010; Bretón-López et al., 2010; Wrzesien et al., 2011a,b, 2013; see the review Chicchi Giglioli et al., 2015). More in detail, in education several AR applications have been developed in the last few years showing the positive effects of this technology in supporting learning, such as an increased-on content understanding and memory preservation, as well as on learning motivation (Radu, 2012, 2014). For example, Ibáñez et al. (2014) developed a AR application on electromagnetism concepts' learning, in which students could use AR batteries, magnets, cables on real superficies, and the system gave a real-time feedback to students about the correctness of the performance, improving in this way the academic success and motivation (Di Serio et al., 2013). Deeply, AR system allows the possibility to learn visualizing and acting on composite phenomena that traditionally students study theoretically, without the possibility to see and test in real world (Chien et al., 2010; Chen et al., 2011).

As well in psychological health, the number of research about AR is increasing, showing its efficacy above all in the treatment of psychological disorder (see the reviews Baus and Bouchard, 2014; Chicchi Giglioli et al., 2015). For example, in the treatment of anxiety disorders, like phobias, AR exposure therapy (ARET) showed its efficacy in one-session treatment, maintaining the positive impact in a follow-up at 1 or 3 month after.

As VRET, ARET provides a safety and an ecological environment where any kind of stimulus is possible, allowing to keep control over the situation experienced by the patients, gradually generating situations of fear or stress. Indeed, in situations of fear, like the phobias for small animals, AR applications allow, in accordance with the patient's anxiety, to gradually expose patient to fear animals, adding new animals during the session or enlarging their or increasing the speed. The various studies showed that AR is able, at the beginning of the session, to activate patient's anxiety, for reducing after 1 h of exposition. After the session, patients even more than to better manage animal's fear and anxiety, ware able to approach, interact, and kill real feared animals.

Prof. Anindita A Khade
Assistant Professor, CE DEPT

OUR ALUMNI

What is React?

Vipul Singh Raghuvanshi
Web Developer at Media.net
Alumni Batch 2019

React is a Javascript library developed by Facebook. It is created for building fast and interactive user interfaces for web and mobile applications.

It is an open-source, component-based, front-end library responsible only for the application's view layer. In Model View Controller (MVC) architecture, the view layer is responsible for how the app looks and feels. React divides the UI into multiple components, which makes the code easier to debug. This way, each component has its property and function.

React keeps a lightweight representation of the actual DOM in the memory, and that is known as the Virtual DOM. Manipulating actual DOM is much slower than manipulating Virtual DOM because nothing gets drawn on the screen. When the state of an object changes, Virtual DOM changes only that object in the actual DOM instead of updating all of the objects.

When I joined my company Media.net as a fresher, I had truly no idea about react. When introduced to React, my reaction was "What is the requirement of it?". But as the time flew, I realized the awesomeness of react. For a small change in our webpage, we need not render the whole web page again, but we should only render that part of the page. Though it can be achieved through simple javascript but it makes our app so complex. Keeping all the components of the page independent makes our source code clean and less complicated. That's what we achieve in React. There are so many extensions we can do in React. There is an awesome state management library for React i.e Redux. Redux keeps the states of all our components together in a global store. React at first look seems to be difficult, but digging into it makes things more interesting.

Reference: https://reactjs.org

Real-time video surveillance system for detecting malicious actions and weapons in public spaces

Mahadevan Narayanan, Suyash Jaju , Akash Nair

In today's world we have thousands of surveillance cameras that work round the clock. These cameras are installed at railway stations, ATM's, streets and all the public spaces that one must have come across in their day to day life. A wide variety of malicious events take place even in these locations. Security personnel have to monitor these footages continuously round the clock. But humans are not perfect, they do not have a perfect vision nor the ability to concentrate for longer span. Hence it is very obvious that at some point something abnormal might happen that the security personnel might fail to notice. The definition of abnormal event differs from one situation to another. We are proposing an automated system using deep learning and pose detection to detect unusual events in such scenarios. Such a system have wide applications in many industries. There is an increasing demand for developing an automated surveillance technique that is fast and accurate in real-world applications. The main aim is to alert the authorities while the crime is being committed in a certain premise. Currently very few techniques are available which lack accuracy. But using pose estimation techniques for human action recognition along with detecting weapons, we can observe fast and accurate results.

The task of video surveillance boils down to sub-tasks of human action recognition and by identifying a sequence of such actions in a video sequence, we can predict if any malicious activity is taking place. Now there are a lot of different actions performed by people and recognizing it using a computer poses a variety of challenges such as background clutter, partial blockage, viewpoint, lighting and appearance. Let's first discuss more about actions and currently

available methods for detecting the actions. The goal of human action recognition is to identify actions from video sequences. Hence human action recognition models aim to classify input video sequences into its underlying action category. Human actions can be broadly categorized into: (i) Primitive actions (ii) Gestures (iii)Human-to-human or human-to-object interactions (iv) Behaviors (v) Group actions

From the above classification of human actions, we can infer that for a video surveillance model we need to track any one or a combination of these actions to build a robust system. Now we see available solutions to the problem of action recognition.

According to a research paper [9] where a number of techniques for action recognition were studied, we found out a broad category of solutions and their advantages and disadvantages. We can classify methods for human action recognition into two categories- unimodal and multimodal methods. This classification is based on the nature of data they use for prediction.
Unimodal human action recognition methods identify human actions from data of one modality or source which in our case is video sequence. Most of the current methods represent human actions as visual features extracted from images or videos and classify the action using classification algorithms. Unimodal approaches are appropriate for detecting human actions based on features like motion. These methods can be classified into four types (i) Spatiotemporal (ii) Stochastic (iii) Rule/attribute based (iv) Shape based. Each of these makes use of specific attributes of human action recognition.

Spatiotemporal Methods: These methods focus on predicting actions based on space-time features or on trajectory matching. An action is considered as a set of trajectories of body parts extracted from a video frames and leveraging on this clue, the models are trained on the pattern of movement for each action of body parts. The downsides of using optical flow or motion are- the model becomes sensitive to noise and struggle in detecting more people and complex actions

Stochastic Methods: Stochastic methods recognize actions by using statistical methods. Hidden Markov model (HMMs) which is one of the stochastic techniques can be used to predict sequence of states producing human actions. Each of the human actions are described by using a feature vector, which basically concatenates the information about location, velocity of subject etc.

and these features are encoded in a stochastic model. The disadvantage of using this method is that they require more computational power and are not suitable for recognizing complex actions. And hence these methods are impractical for real time applications

Rule-Based Methods: Rule based or attribute-based methods predicts events by modeling an action using sets of attributes or rules that describe an action or event. Each action is considered as a set of primitive rules/attributes, which enables the construction of a descriptive model for human action recognition. The disadvantage though is detection of complex actions as it decomposes complex activities into smaller tasks. Also, one might face problems with long video sequences.

Shape-Based Methods: Shape-based methods represent actions by modeling the motion of human body parts and creating a skeleton model for each body. As a human skeleton consists of body parts connected to each other, we first detect these human body parts from videos. This problem is considered as a part of the action recognition process. Many algorithms convey a wealth of information about solving this problem which can be effectively used to track a plethora of actions.

Although there are some disadvantages in this method too, as most of the action detection is based on skeleton tracking, some inaccuracies in it might vary the action detection significantly. But due to comparatively low cost required in action detection, this method can be used for real time applications. The features of human skeleton are concise, intuitive, and easy for differentiating different human actions. Thus, we chose the human skeleton as the base features. So, for our surveillance application shape-based method provides an effective way to detect abnormal actions in video sequences.

Multimodal methods of action recognition make use of features from varied sources. Basically, these methods take into factor the features like atomic actions, gestures, emotional state, psychological factors, audio cues, personality, facial expressions and many such high-level features from multiple input sources to identify human actions. Predicting human actions using these features will prove to be beneficial but classifying the low-level features like movements and high-level features like emotions is extremely challenging.

And generating such information is not an easy task. Hence for our use case we eliminate multimodal solutions and focus only on unimodal solutions available. Although keeping in mind that a better and more accurate surveillance system can be developed using multimodal methods in future when the solutions to the mentioned problem is found.

Component of the system and Functionality

Pose estimation techniques is the first step in human action recognition using shape-based techniques, where we identify skeletal structure of human body parts in order to process the actions. So, we searched for different state of the art pose estimation techniques that were available. The three popular techniques were: a) Openpose; b) Densepose; c) Wrnch AI

Openpose is a library for real time multi person key point detection written using C++. It uses OpenCV and Caffe. The main advantage is that the system's computational performance on body key point detection is not affected much by the number of identified persons in an image. After comparing the three we see that Openpose has several advantages over other two as it requires less computing power that DensePose and is freely available unlike WrnchAI. Hence, OpenPose serves the purpose of real time detection and provides a good trade-off between speed and accuracy. Once the pose estimation is done, we will train a model to obtain actions from the motion of coordinates of the skeleton obtained from openpose.

We will classify a set of actions as threat. As of now following actions are considered: People counter, Wave, Walking or Running, Sit, Stand, Jump, Kick, Punch and Fall detection. For the initial phase we will be restricted to detecting these actions and proceed with detecting more complex actions. Complex action under the domain of surveillance may include crowd panic, fighting, vandalism, or human to object interaction. The objects can be weapons such as guns or knives. But it is very difficult to detect the human interaction with these objects. Hence, we will detect these objects using a separate object detection algorithm which will detect weapons in real-time video feed.

Using the set of actions and weapon detection module, we can predict malicious action and abnormal behavior in different scenarios. These predictions will be done by another CNN and LSTM based model which will then produce an output showing whether the video sequence is malicious or not considering inputs from action detection module and weapon detector module. For example, if the weapon detector recognized a gun in the video sequence and the people start running then these actions most likely lead to occurrence of an unfavorable event and the CNN model will predict it based on such inputs from the two models. The rate of frames for these two modules should be kept same for the purpose of synchronization.

As the binary value of threat indicator can prove to be fluctuating in case of output variations in action recognition and weapon detection, we propose a scale of threat indicator. A threat scale from 1 to 5 where 1 representing least threat or safe to 5 representing severe threat or danger can more convincingly tackle the problem of false positives in short video frames.

The basic idea is that if for example in a set of 5 video frames the action recognition output can be predicted wrong for 2 of these frames which will affect the end result if the output is binary (Threat or not threat). So, in order to reduce the effect of these minor errors we consider a short duration of video sequences consisting of few frames and if for each of these short duration of video sequences, the action recognition model predicts abnormal action then the threat scale will increase from 1(safe) and progress till 5(danger) if the model keeps on detecting threats in ensuing set of video frames. And if false positives are detected in these frames then the threat scale will first increase and then come back to its original value. This concept can be used for real-time surveillance system.

Now let's study the two building blocks of the video surveillance system:

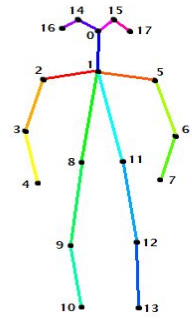
1) Pose detection algorithm- Open Pose
2) Weapon detection- Object detection algorithm

Open Pose working: The working of open pose pipeline for pose estimation is as follows:

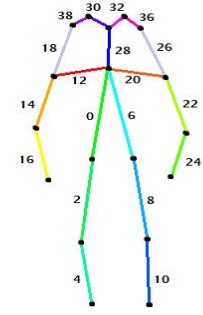
Parts and pairs: A body part is an element of the body, like neck, hands or legs. A pair is a set of two parts or as shown in figure 1 it is a connection between parts

Heatmap: A heatmap or confidence map is a matrix that shows the confidence in the form of a value that if a certain pixel contains a certain body part of one or multiple people in a video frame. There are 18(+1) heatmaps associated with a person representing each one of the points in the body's skeletal structure as in the figure 1. Position of each body part in this skeleton is extracted out of these 18 matrices.

Part Affinity Fields: PAFs (Part Affinity Fields) is a matrix that gives information about the orientation and position of body parts. For each body part there exists is a PAF in both 'x' and 'y' direction. And there are total 38(19 x 2) PAFs associated with every pair and indexed as shown in figure 1. (A couples of parts is considered as pairs)



Parts



Pairs

Non-Maximum Suppression: Heatmaps represents the probability that a pixel contains a body part but in order to extract exact locations of parts out of a heatmap we need to locate the local maximums. For each pixel of heatmap we consider some neighboring pixels and substitute maximum value among these pixels to the center pixel. Then move pixel by pixel until all the heatmap pixels are covered and compare it with original heatmap matrix. Those pixels with the same values are peaks. Suppress other pixel values to zero. The non- zero pixel denote the body parts.

Bipartite graph: After finding location of each body parts we need to form pairs and for this purpose graph theory is helpful. For example, in a given image after locating a set of neck positions

and a set of left hip positions we need to find the association between them. For each neck in the frame, there is a possible connection with a set left hips as shown

in figure 2. Here we use bipartite graph, where the vertices are the body part candidates, and the edges are the connection these parts. Finding the best matching between vertices of a bipartite graph is a problem in graph theory known as the assignment problem. In order to solve it, each edge should have weights.

Line Integral: In order to assign these weights, we compute line integral along the line segment of the skeleton figure connecting each body parts, over the corresponding PAFs in x and y directions. Line integral measures the effect of PAFs along a given connection between body parts.

The line integral will give each connection a score, that will be saved in a weighted bipartite graph. In reference to the previous example this means that all edge connections between set of necks and set of left hips are scored and further we determine which of these connections is true which basically means we correctly match neck of person A to left hip of person A and so on for other

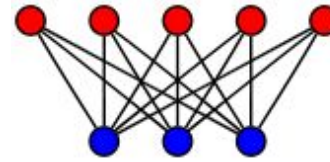


Fig. 2. A set of connections between body part candidates

parts.

Assignment: The weighted bipartite graph represents all possible connections between two body parts (neck and right hip), and holds a weight for every such connection. We find the best connection between two parts by using assignment algorithm. Sort each possible connection by its score. The connection with the highest score is a final connection of that body part.

Merging: Start with an assumption that at first, every connection of body part is different person. Create a set of such persons {P1, P2, …, Pk}. Each one of these sets contain two parts (a pair). And a part consists of a tuple having-body part index (neck, hip, etc), a coordinate in the 'x' and 'y' direction. If persons P1 and P2 share a body part index with both having the same x and y coordinates, then it means they are the same body part of a single person and hence P1 and P2 is a single person. So, we merge both sets into P1 and remove P2. We continue find such shared body parts until no two persons share the same part.

Output of Openpose: Finally, after merging body parts we get distinct set of people in the frame, where each person is a set of body parts and where each of these parts contains- body part index, x and y coordinates and its confidence score.

We reviewed different techniques for recognizing human actions and discussed pose estimation techniques called open pose in brief. The second module is a weapon detector and both these information from a video sequence is combined to predict threat level on a scale of 1 to 5 by another module of neural network.

There are more advancements to be made in human action recognition field to provide a real time detection of videos where the prime focus should be on including more real-life actions, speed and accuracy. Using inputs other than only video sequences and a combination of inputs like speech, gestures, emotions and psychology will improve the accuracy and reliability of such systems. Hence, we conclude that more robust and practical systems for video surveillance can be built using the concepts presented here which has a huge upcoming demand in our modern society.

MAHADEVAN
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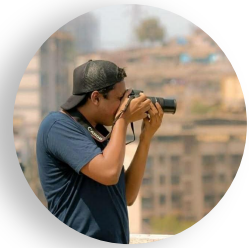

AKASH NAIR
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ANVESHANA 2020

Event Name	Anveshana
Venue	Nehru Science Center
Project Title	Auto Billing Mall Shopping Cart
Team Leader	Vrunda Mange
Partner	Manasi Khamkar
Project Guide	Mrs Swati Rane
School Student 1	Vasim Thakur
School Student 2	Suresh Patone

Anveshana is a Science & Engineering competition which culminates in a Fair where the students exhibit their projects/models. The competition involved undergraduate Engineering students and underprivileged school going students, wherein we mentored school students and helped them in creating models .The event was held on 16/02/2020 and 17/02/2020 at the Nehru Science Center.Our topic was 'Auto billing mall shopping cart' in which we had built a

barcode code scanner app . The basic functioning of app is to scan the barcode available on the item and then generate the bill.The bill included total cost and total weight of the items that customer had bought .In Order to ensure that no theft occurs, at the billing counter the total weight in the cart will be matched with the total weight that is displayed on the app.For our project ,we won a consolation prize of Rs 5000/- and also received a laptop which will be given to the school.

MANASI KHAMKAR
TE

VRUNDA MANGE
TE

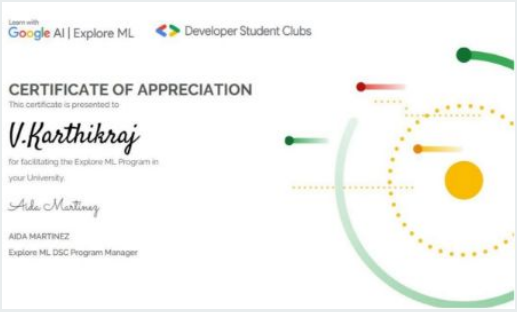
Google AI ExploreML

GoogleAI Explore ML is one of a kind program that focuses on reaching out to those who wish to enter the ML field.

It selects Facilitators that have excelled in the field of machine learning and who have a passion towards spreading knowledge among fellow students and inculcate curiosity towards Deep Learning and Machine learning. As as ML Facilitator for the college Karthikraj had received special training from the experts of GoogleAI on Deep Learning and content to deliver quality sessions Along with the DSC team of SIES GST he had conducted a two days hands on workshop for Students from SIES as well as Other Colleges The following topics were covered in the session :

- Basics of Machine learning and Data Analysis
- Supervised Machine learning
- Deep Learning Techniques

In recognition of his contributions for sharing of experiences and knowledge he received Certificate of Appreciation from Google AI and Developer Student Clubs



STUDENT ARTICLES

I Sayali Patil would like to share my experience at different competitions throughout my engineering in this article.

Myself, Shantanu Ghar and Venkhatesh Arunachalam from the Computer Department came together as a team to participate in hackathons and various competitions. We, 'Team TresComas', participated in countless hackathons and competitions throughout our engineering days, and although initially we failed at many hackathons, we learnt a lot from our mistakes and went forward. We participated in various competitions like DeepBlue Season 4, where we won the Super Team Award, ERROR-404 Hackathon conducted by M.H. Saboo Siddik College of Engineering where we won the 3rd prize, SmartCity Ideathon conducted by AP Shah College where we won the 2nd prize, CSI Innovations conducted by SIES Graduate School of Technology where we won the 1st prize in IOT Category.

I-HACK, IIT BOMBAY

AI HACKATHON, CDAC-NVIDIA-ATOS

Later on, we got an opportunity to represent our college in one of the biggest national hackathons conducted by CDAC in collaboration with NVIDIA and ATOS, where participants included professionals from various startups and students from various colleges from all around the country, including the IITs. We were shortlisted amongst top 12 teams in the finals, out of the 750+ applications that were submitted since the first round. On the 30th of September, 2019 we won the 1st Prize at the AI Hackathon, a cash prize of 1,00,000/- and a limited edition Titan V GPU, the Hackathon was held at CDAC Pune. Later, we also represented our college at I-Hack, conducted by the E-Cell of IIT Bombay were we stood 2nd and won a Cash Prize of 30,000/-

PARENT'S ARTICLE

SAP S4 HANA ERP (Business Suite with In-Memory computing)

K. V. GANESHAN
(FATHER OF AISHWARYA GANESHAN, STUDENT - TE CE)

Conventional relational databases have always relied on storing content row wise which works well when the tables contain limited volume of data. SAP S4 HANA (High performance Analytic Appliance) the next generation business suite is SAP'S ERP for large enterprises which is optimized for SAP's in memory database SAP HANA. This is commercially the most successful product which uses column storage .Storing data by column results in better compression than the conventional row store. It also performs well while query processing since queries read only the columns which are required. The power of in memory computing eliminates latency and accelerates data processing to provide real time analytics and subsequent decision making. This is also the first data management platform to handle both transactions and analytics in memory on a single data set. The application development capabilities of SAP HANA include support for a variety of programming languages, including JavaScript, Java, and Python through native APIs. This can be deployed on-premise or on cloud.

There are three ways to adopt S4 HANA for an enterprise-

a) Greenfield (New implementation)- This starts with a fresh S4 HANA box complete reengineering of process with required process simplification.
b) Brownfield (Re-Use)- This migrates your existing SAP version to S4 HANA with minimal changes and only primarily a technical upgrade leaving the business process AS-IS.

a) Landscape Transformation-This is ideal for large enterprises with many instances of SAP and non-sap ERP systems and customers who want to consolidate into one Global S4 HANA instance or selective data migration(e.g. – remove obsolete company codes).This can harmonize business process and shared master data can be made available through consolidation.

For third party systems and interfaces which need to integrate with this product the SAP integration and Certification Center (SAP ICC) which is part of SAP PLS (Partner and Innovation Lifecycle Services (SAP PLC) supports customers, partners and independent software vendors to get certified for integration with S4 HANA. There is an SAP certified Solutions Directory to search for Add-ons and Integrated Solutions.

There are two hosting options

SAP S/4 HANA On-Premise Edition- With on premise, the customer manages everything, including the HANA database, applications, data centers, OS, middleware, servers, virtualization and networking.

SAP S/4 HANA Cloud Edition- SAP S/4HANA Cloud is the SaaS (Software as a service) version of S/4HANA. SaaS deployment means that users can take advantage of much of on-premise S/4HANA's functionality without needing the hardware, databases or IT staff required for the on-premises version.

In S/4HANA Cloud, SAP provides and manages almost everything for customer.

STUDENT AWARDS

Sr. No	Name of the student	Class	Name of Activity	Place	Level (National/ International/ Zonal/ District)	Date	Awards
1	Sayali Patil Shantanu Ghar Venkatesh A	BE CE	AI Hackathon	CDAC Pune	National	26th Sept 2019 to 30th September 2019	1st position
2	Sayali Patil Shantanu Ghar Venkatesh A	BE CE	I_Hack	E-Cell IIT Bombay	National	03rd Feb 2020	1st Runner up

STUDENT AWARDS

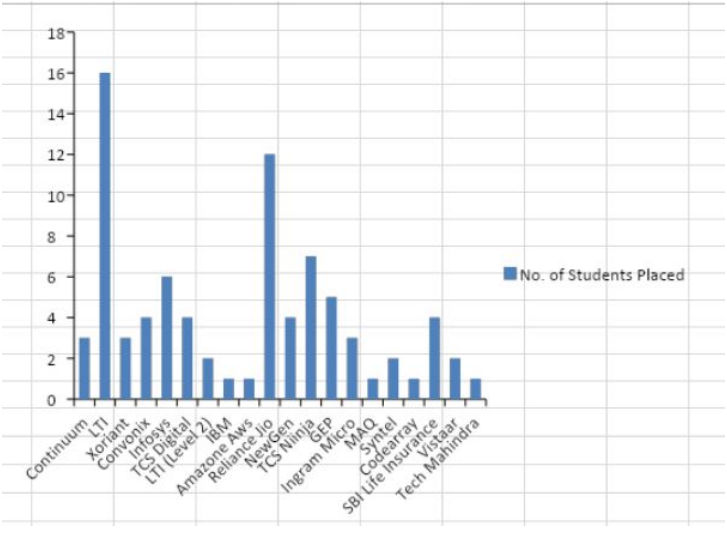
Sr. No	Name of the student	Class	Name of Activity	Place	Level (National/ International/ Zonal/ District)	Date	Awards
3	Karthikraj,Senthil T,Thirumalainambi Y,Shweta S	TE CE	Deep Blue	Mastek Ltd., Mahape	Zonal	16th Feb 2020	Special Mention for outstanding award
4	Mansi Khamkar Vrunda Mange	TECE	Anveshna 2020 Science and Engineering Fair	Mumbai	Zonal	18th Feb 2020	Consolation Prize

PLACEMENT STATISTICS

2016 - 2020

Higher Studies	21

Company Name	No. of Students Placed
Continuum	3
LTI	16
Xoriant	3
Convonix	4
Infosys	6
TCS Digital	4
LTI (Level 2)	2
IBM	1
Amazone Aws	1
Reliance Jio	12
NewGen	4
TCS Niinja	7
GEP	5
Ingram Micro	3
MAQ	1
Syntel	2
Codearray	1
SBI Life Insurance	4
Vistaar	2
Tech Mahindra	1



INNOVATIONS 2020

The CSI Student Chapter of SIES Graduate School of Technology organized a national level project competition, INNOVATIONS, on 28th February, 2020. Innovations served as a platform for young minds to take this window of opportunity and bring forward their innovative ideas in the form of projects.

This time the CSI council of SIES GST, Nerul worked hard and strategically thus creating a mark of receiving 70+ abstracts. The projects were from various fields such as computers, information technology, electronics, Internet of Things, Robotics, Mechanical, etc. Out of the received abstracts, 27 projects were selected for the competition after carefully analyzing each project based on parameters such as novelty, effectiveness, positive impact on society and scalability. “Spending quality time, quality efforts and hard work provides quality results, was proved by the participating teams.”

Competition was held in two venues:
Venue A – presentations related to computer and IT.
Venue B – presentations related to IOT, mechanical and Electronics

We had the privilege of having Mr. Kaustubh Gadgil Scientific Officer (G), BARC as the chief guest for the event.
The I/c principal of SIES GST, Dr. Atul Kemkar, welcomed the chief guest and all the jury panel.
The jury panel for Venue A (Software) included Mr. Nilesh Shinde, Founder CEO at START PRO, Mr. Vivek Yadav, CEO @ StringsWay Tech, Mumbai, Mr. Debashish Chodhury, Founder of All in Cloud and for Venue B (Hardware) Mr. Amit Singh Co-founder of YUPS Tech (India) and Zerek Technologies WLL (Bahrain), Prof.Yogesh Karunakar, 22 years of teaching experience Head EDC: Convenor ECell, KC College of Engineering.

The Valedictory Ceremony was graced by Dr. Atul Kemkar Principal, Dr. Aparna Bannore, HOD CE and Ms. Suvarna Chaure, CSI, SBC. The vibrant and innovative competition was concluded by a vote of thanks given by the Chairperson of CSI Student Council, Mr. Shreemun Pranav.

Inauguration Ceremony

Inauguration Ceremony included launch of CSI's First edition of Magazine named as 'MegaByte'. Dr. Atul Kemkar, Principal welcomed all the Jury panel and Chief guest Mr. Kaustubh Gadgil. Ceremony was followed by the speech of Dr. Atul Kemkar Principal, Mr. Kaustubh Gadgil Chief Guest, Dr. Aparna Bannore HOD CE, Ms. Suvarna Chaure CSI SBI and by Chairperson of CSI council Surya Walujkar.

Valedictory Ceremony

Winners of Innovations 2020:

- Venue A Winners

Prize	Title	Group Members	College
1st	Content Moderation and Censoring System	Vikas Maurya Sheetal Chauhan Purvesh Jain Veerasai	FCRIT, Vashi
2nd	VR measuring Visual Acuity	Rohan Maloor Manthan Gharat Vignesh Srinvas Sharanya Menon	Pillai College of Engineering, Panvel

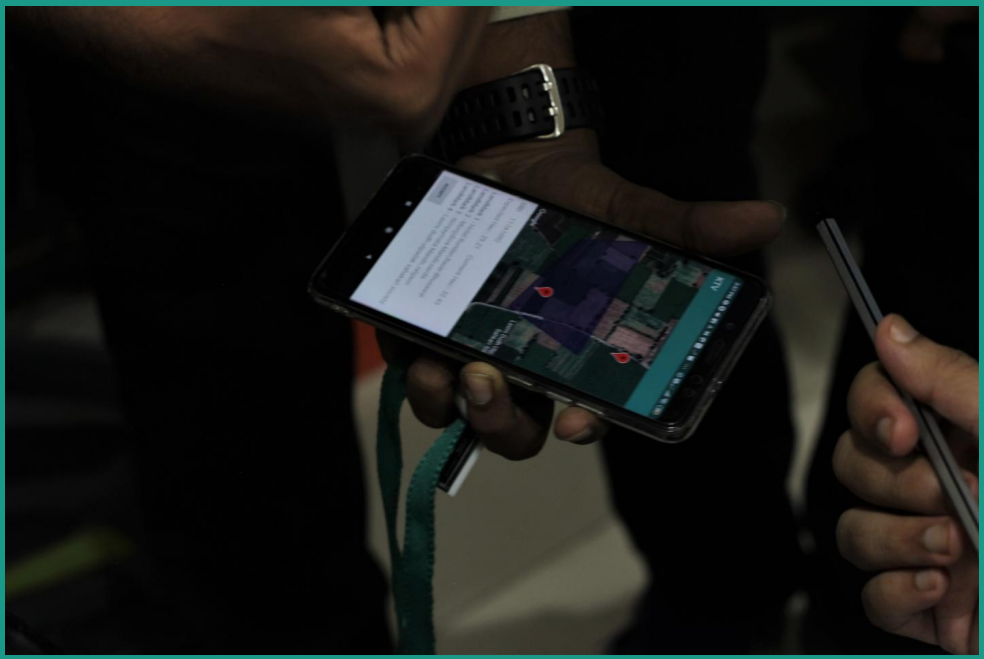
Valedictory Ceremony

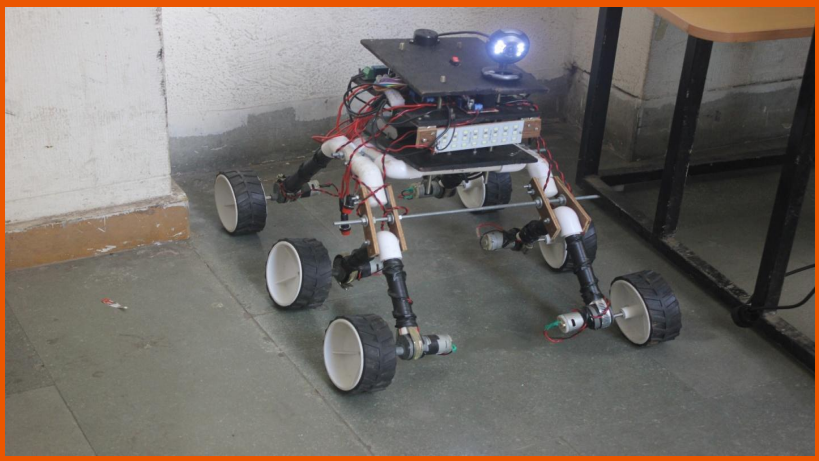
Winners of Innovations 2020:

- Venue B Winners

Prize	Title	Group Members	College
1st	Maternity Sanitary Pad Making System	Somesh Pimpare Sneha Gaikar Suyash Patankar	Pillai College of Engineering
2nd	Redesign and Improvement of Brake caliber System	Jeevan Sunny Mauli Mirajkar Parvati Sundar	SIES Graduate School of Technology

Glimpses of Project Demonstration :





Impact Analysis: Students developed, presented and demonstrated applications using basic engineering knowledge and computational and logical skills for analyzing and designing complex problems useful for society and environment using modern tools so mapped with PO1,PO2, PO3,PO4, PO5, PO6, PO7, PO8,PO9, PO10, PO11, PO12, PSO1 and PSO2 .

INDUSTRIAL VISITS

RELIANCE JIO

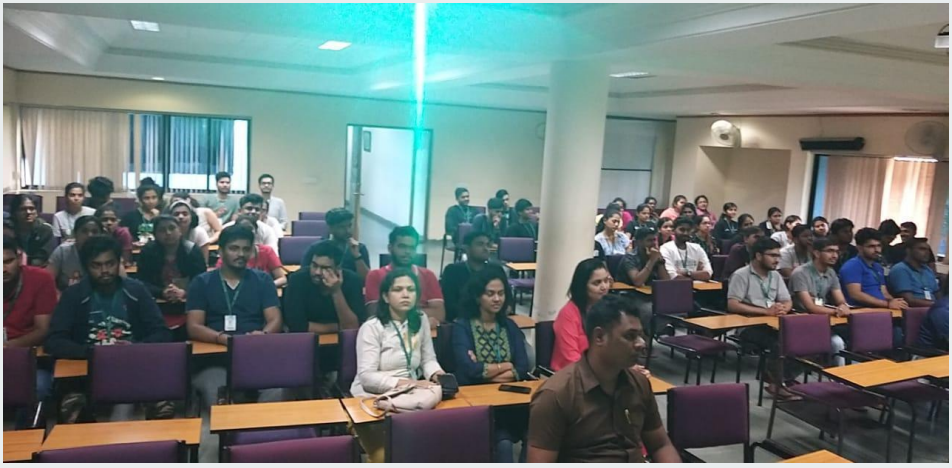
The CE department organized visit of reliance jio for CE students on 1/02/2020. Total 48 students along with 2 faculty members visited Reliance JIO campus, Kopar Khairane, Navi Mumbai. The visit started by registering at the main gate and issuing visiting cards. Later students had been taken across the organization while JIO representative explained about various teams and their roles in industry. Majorly he made student familiar to services and product group. He made students familiar to various concepts in travel industry with real life examples. He told importance of basic concepts and 5G Technology. Finally the visit was concluded with vote of thanks.

INDUSTRIAL VISITS

An industrial visit was organised by SIES GST for the students of Computer Engineering Department to Centre for Development of Advanced Computing(CDAC), Bangalore on 27th December 2019.

51 students, accompanied by the faculies Mrs Pranjali Thakre and Mrs,Suvarna Chaure attended the session conducted by CDAC.

It was a half an hour session where a powerpoint presentation was shown. The speaker talked about Indian Internet Research and Engineering Forum (IIREF). The goal of IIREF - Indian Internet Research and Engineering Forum is to promote and nurture the contributions within India towards the development of Internet Standards through IETF. IIREF aims to foster this by creating a forum for interchange of information among researchers, and contributors to Internet Standards.IIREF is being carried out as a project by C-DAC (Center for Development of Advanced Computing), Bangalore, sponsored by the Internet Governance Division of Department of Electronics & Information Technology (DeitY), Ministry of Communications and IT, Government of India.



She also explained about the Internet Engineering Task Force(IETF). The **IETF** is a large open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet. She gave us an overview on cryptography and network security at the end of the presentation.

At the end she showed the students a 10 minute video which was already sent before the trip as they wanted the students to visit their website and Facebook page.

The next day that is on 28th December, the students were taken to Hindustan Aeronautics Limited,Bangalore. **Hindustan Aeronautics Limited (HAL)** is an Indian state-owned aerospace defence company headquartered in Bangalore, India. It is governed under the management of the Indian Ministry of Defence. Students of all branches attended the industrial visit. We had a campus tour and a video was shown regarding their earlier and upcoming projects.

The Company has a comprehensive Design Organisation. Out of 31 types of aircraft produced so far, 17 have been of indigenous design. The Company has long experience in design and manufacture of a diversified range of aircraft and its systems.

Development Project:

The major on-going indigenous development programs are the Light Combat Aircraft (LCA) MK 1 A, Light Combat Helicopter (LCH), Light Utility Helicopter (LUH), Basic Turboprop Trainer HTT40 & Indian Multi Role Helicopter (IMRH). Design and Development of HTFE-25 and HTSE-1200 engines have also been taken up. HAL has undertaken upgrade of Mirage-2000 & Jaguar DARIN III Aircraft also. Technology development projects have been launched to increase self-reliance in critical areas like the Aircraft Display systems, Mission Computers, Automatic Flight Controls for helicopters and Aircraft Accessories & avionics.

ACKNOWLEDGEMENT

At the end, we would like to extend our sincere gratitude to our management for their constant support. We would like to thank our Hon. Advisor Dr. P V Parameswaran for all his help and guidance in making this magazine a grand success. Also, we would like to thank our Principal, Dr.Atul Kemkar for his constant encouragement. We would also like to thank our HOD Dr.Aparna Bannore for her support and motivations to make this magazine a successful one.Also would like to thank our Faculty Incharge, Prof.Anindita Khade for shaping Techniz. Lastly we would like to thank all the faculty members, students, alumni and all stakeholders for their valuable inputs.

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