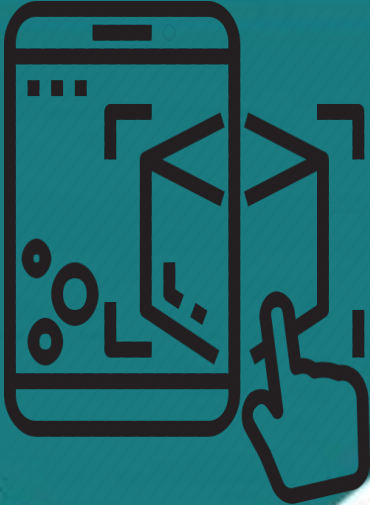


**FACULTY OF COMPUTER APPLICATIONS
& INFORMATION TECHNOLOGY**

November 2019, Issue 16



Augmented Reality

Virtual Reality

Message From Dean, FCAIT

It has been almost eight years since the faculty members started the publication of D-Kosmos in 2012 for the benefit of students where creative write-ups of contemporary and emerging technologies by students can be presented for knowledge enhancement of their colleagues.

So far they have covered variety of subjects such as 4G, IoT, Open Source Technologies, Embedded Systems, Single Board Computers, Artificial Intelligence and Machine Learning, Robotic Process Automation and Quantum Computing besides articles on innovative hardware, software and applications.

The concepts of Virtual Reality and Augmented Reality are not new. However, with advancements in memory capacity, processing power, graphics processing and rendering, superior mobile phone technologies, these concepts have seen real useful applications in business, education, defense, medical science, entertainment, gaming and so on.

In this issue, students have contributed introductory articles on these VR/AR technologies as well as their applications. Hope these will help take you further for deep understanding and rewarding experimentation.

---R. P. Soni



From Editorial Desk

Dear Readers,

Here is an FCAIT's 16th issue of D-Kosmos with new hopes and aspirations!

"Virtual Reality and Augmented Reality was once the dream of science fiction. But the internet was also once a dream, and so were computers and smartphones. The future is coming."

-Mark Zuckerberg

Every year D-Kosmos, with its unique theme, aims to portray the wonderful journey of FCAIT's achievements and success. Likewise, this time D-kosmos provides a peep into the world of Augmented Reality and Virtual Reality and glimpses of various activities and programmes held at FCAIT as well. We know that AR and VR have changed the world, are changing the world and will change the world. Their reach is unbelievable and have marked their presence in the fields like marketing, medical, defence/military, education, and tourism.

FCAIT believes in helping students to build innovative career plans and for that, the institute organizes the various academic tours and industry visits. We believe in the holistic development of our students so we inspire them to take participation in activities carried out under CSI, NSS, CWDC, and ISR. FCAIT provides their students an opportunity to learn, relearn and unlearn great number of things. Students knowingly and unknowingly pick up various life skills by attending workshops, seminars, ice-breaking sessions, student-alumni interaction, and TechTalk organized by FCAIT. FCAIT also organizes Faculty Development Programme for the advancement of their faculties. The present issue gives an account of all these activities in brief.

We welcome your suggestions and remarks via email so please get in touch for reviews at dkosmos@glsica.org.

Wishing you all a happy reading of D-kosmos!

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Augmented Reality

Augmented reality has come a long way from a science-fiction concept to a science-based reality. Until recently the costs of augmented reality were so substantial that designers could only dream of working on design projects that involved it – today things have changed and augmented reality is even available on the mobile handset. That means design for augmented reality is now an option for all shapes and size. The first conception of augmented reality occurred in a novel by Frank L Baum written in 1901 in which a set of electronic glasses mapped data onto people. Today, augmented reality is a real thing and not a science-fiction concept.

There were many other breakthroughs in augmented reality between past and today; the most notable of which includes:

- Bruce Thomas developing an outdoor mobile AR game called ARQuake in 2000
- ARToolkit (a design tool) being made available in Adobe Flash in 2009
- Google announcing its open beta of Google Glass (a project with mixed successes) in 2013
- Microsoft announcing augmented reality support and their augmented reality headset HoloLens in 2015



Characteristics Augmented Reality Systems :

- A combination of real-world and virtual objects in the real environment.
- A synchronization of real and virtual objects with each other.
- It is highly interactive and runs in 3D in real time.
- AR requires more sophisticated technology compared to VR.

How is it developed?

Creation of an AR experience involves a multi-stage process, right from the development of the 3D models to the technology that powers the image tracking and depth sensing. 3D artists use several software programs like Sketch Up, Cinema 4D, Blender and many more to create 3D models. The process starts with a rough sketch after which it goes through various series of approval.

Once the image gets accepted, the modeling begins. The next step is to apply the model's skin, which is called the texture map. The texture map gives realism to the model and can be styled to fit the needs of the project. After the completion of the 3D model, it goes through the rendering process for a complete AR experience.

The Current State of Augmented Reality

Augmented reality is achieved through a variety of technological innovations; these can be implemented on their own or in conjunction with each other to create augmented reality. They include:

General hardware components – the processor, the display, the sensors and input devices. A smartphone contains a processor, a display, accelerometers, GPS, camera, microphone etc. and contains all the hardware required to be an AR device.

Displays – monitor is perfectly capable of displaying AR data there are other systems such as optical projection systems, head-mounted displays, eyeglasses, contact lenses, the HUD (heads up display), virtual retinal displays, EyeTap, Spatial Augmented Reality and handheld displays.

Sensors and input devices – GPS, gyroscopes, accelerometers, compasses, RFID, wireless sensors, touch recognition, speech recognition, eye tracking and peripherals.

Software – the majority of development for AR will be in developing further software to take advantage of the hardware capabilities. There is already an Augmented Reality Markup Language (ARML) which is being used to standardize XML grammar for virtual reality. There are several software development kits (SDK) which also offer simple environments for AR development.

There are apps available for or being researched for AR in nearly every industrial sector including:

- Archaeology, Art, Architecture, Commerce, Office
- Construction, Industrial Design
- Education, Translation
- Emergency Management, Disaster Recovery, Medical and Search and Rescue
- Games, Sports, Entertainment, Tourism
- Military, Navigation

Applications of AR

Marker-based apps:- This is the most popular AR software principle. Markers can be various – from simple geometric figures (enclosed into QR-codes) to complex for digital perception physical objects like human faces.

Gyroscope-based apps:- This AR software simply works with the data accumulated by the user smartphone's gyroscope. With the help of this built-in feature, developers get to enliven virtual 3D objects on top of real objects in the physical environment.

SLAM apps:- Such solutions employ the concept of Simultaneous Localization and Mapping, which is based on collecting data from several sensors at once. They draw up three-dimensional objects against the background of real objects.

Available Tools for AR

Vuforia- recognizes 2D and 3D objects that can turn any surface into a touchscreen, video playback when the target surface or image is detected.

Wikitude- build apps for smart glasses, employ location-based services, employ object, scene, and image recognition features.

ARCore- understands the environment by detecting the surfaces, and their size and location and also works with Java/OpenGL, Unreal and Unity.

MaxST- tracks multiple targets at the same time (up to 3 items), physics engine effect to create more realistic experiences.

EasyAR- perceive environments, recognize clouds, record the screen, export, import, and integrate assets.

ARmedia- an ability to create markers in real-time mode, activation of one of the world's most perfected 3D trackers from Inglobe Technologies, multilevel processing of data received through GPS, gyroscope, accelerometer, and magnetometer.

DeepAR.ai- recognizes faces and particular facial features in real-time mode, tracking of shifting face positions with the consideration of lighting and degree, cross-platform rendering engine, integration with Maya, Blender, and similar solutions.



AR or augmented reality has gone from pipe dream to reality in just over a century. There are many AR applications in use or under development today, however – the concept will only take off universally when UX designers think about how they can integrate AR with daily life to improve productivity, efficiency or quality of experiences. There is an unlimited potential for AR, the big question is - how will it be unlocked?

Niharika Sharma, Jolly Sharma, TYBCA, SEM-V

Virtual Reality

Virtual reality is a digital experience that gives a real which nobody can see because it doesn't exist in the real world. Virtual reality is like closing your eyes and experiencing the sound of music like as if you are in front of a live artist or at that exact place and time when the instrumentals of a song were being composed. It is experiencing things that do not exist.

VR has a very special feature of fooling the senses into believing one is present in a virtual world, by providing interactive 3D surroundings simulated by a computer. These simulations can depict any tourist location or attraction reproduced as 3D imagery, controlled by powerful computers creating a complete Virtual Environment (VE). VE is simply a generated virtual digital environment that makes the user feel as if he/she is present inside it. A complete VR System is regarded as the interface between the real world user and the VE.

With Virtual Reality, you can take a trip to the moon and it would feel and look exactly like you just landed on the moon but in reality, you are just sitting a chair in a room experiencing all this. Unlike movie experience where you are stationed in one position looking at a big screen, Virtual Reality is much more different as you can move around and the computer world would be moving along with you.

Principles for VR Display Technology are:

Stereoscopic imagery: A binocular HMD can display slightly different viewing angles for each eye, creating a binocular overlap.

Interpupillary distance (IPD): The distance between the two eyes, measured at the pupils. HMD Resolution: For an effective visual experience, a resolution of 1920x1080 (960x1080 per eye) is required.

On-Board Processing and Operating System: Wireless HMDs, also known as "smart goggles", have on-board operating systems such as Android.

Types of Virtual Reality

There are different types of virtual reality technology and they include:

1. Non-immersive reality

This type can be seen in the virtual reality flight simulator. It has a widescreen PC with a surround system and comes with other accessories like headphones, joysticks etc. It is non-immersive reality because the viewer does not get fully immersed in the reality this device produces. It won't give a viewer the experience of being back in time or even ignite the person's senses but one would still get a virtual reality experience.

2. Fully immersive reality

One would experience full virtual experience because this type of virtual reality comes with a very powerful computer. This powerful computer must be able to detect sounds, sight, and even the slightest movement. It should be able to adjust the person's experience. The viewer would have a head-mounted display (HMD) and would also put on sensory gloves. To achieve the fully immersed virtual reality, the device will make use of two monitors and a sound system.

3. Collaborative

Collaborative reality is usually in the form of virtual reality games and they are not fully immersive. This virtual reality gives the viewer an interactive experience and so one can even share their experience with other people in the virtual world.

4. Web-based

Some Scientists have discovered ways to use virtual reality over the internet using the Virtual Reality Markup Language (VRML). This gives people an opportunity to discover new and interesting things the internet can offer. Also, people get to interact and have real experiences with their friends on social media.

5. Equipment Used for Virtual reality

When setting up a virtual reality one would need to connect sensors which will be used to monitor the person's movements. The Virtual reality devices always come with two monitors, touch/body perceptions, and a sound system.

Other hardware equipment used in virtual reality are:

1. Immersive rooms
2. Data Gloves
3. Head-mounted displays (HMDs)
4. Immersive rooms
5. Wands
6. Handheld virtual reality controller

How Virtual Reality Can Be Applied

Many people believe that virtual reality can only be useful for games and this is not true because there are other ways it can be used. Virtual reality is not just a fantasy world for entertainment but it has also been used by many professionals for information and research purposes. Engineers, Dentists, Doctors, Archaeologists and even the Military have used virtual reality for over thirty years.

AVAILABLE TOOLS for VR

The four best devices available in the market are Valve Index, HTC Vive, Oculus Quest, PlayStation VR. Using the sensors in combination with VR/AR systems do not only allow the detection of the location of the user but it also helps to detect the user's direction of movement and speed of that movement in any direction.

The entire VR/AR unit is involved in various tasks like generating signals, the transmission and sending of information to the Central Processing Unit (CPU) and the Graphical Processing Unit (GPU). The signals generated from different sensors can take different shapes including Electromagnetic Signals, Optical Signals, Mechanical Signals, and Acoustic Signals. Different tracking systems use these respective types of signals.

APPLICATIONS OF VR/AR

Augmented reality and virtual reality are two newly emerged technologies in the field of computer graphics. Through Augmented Reality system, a user can see the real world with virtual objects superimposed upon it. With the emergence of the Augmented Reality system, a new concept of a virtual world also came into existence. In the early 1990s due to the increasing development in VR, it started becoming very famous. Various applications for AR/VR are :

Effective Planning and Suitable Management: With VR technologies, travelers can experience bird's-eye view of their destination, to have detailed look and feel of the place to be visited.

Education Tools: VR has great potential to entertain and educate people via games, interactive sessions, Artificial Intelligence based Interactive Systems.

Interactive Dining Experience: With the help of augmented reality technology a virtual tour of the restaurant is possible along with that one can even make dining decisions using the virtual menus available.

Real-Time and Reliable Navigation: The technology may help in elevating the navigation maps with the addition of digital elements like arrows as well as other helpful information to the map.

Exploring the property: The visitors can virtually visit the hotels, restaurant spa or fitness center.

Beyond Academics

Workshops & Seminars

To go beyond classroom teachings and curriculum FCAIT organizes workshops and seminars on recent trends and technologies for their students.



| Date | Name of Activity | Name of Expert |
|--|---|----------------------|
| 9 th July, 2019 | Workshop on Android Mobile Application Development using Android Studio | Mr. Prashant Sugandh |
| 13 th & 20 th July, 2019 | Seminar: Creating Diagram via DIA tools | Prof. Rinkal Shah |
| 17 th & 18 th July, 2019 | Workshop on Node.js | Prof. Nirav Suthar |
| 18 th July, 2019 | Workshop: Guidelines for clearing Entrance Exam | Mr. Umang Zaveri |
| 22 nd & 23 rd July, 2019 | Workshop on MongoDB | Prof. Monica Gupta |
| 24 th & 25 th July, 2019 | Workshop on jQuery | Prof. Jainin Vakil |
| 6 th September, 2019 | Seminar on NLP | Dr. Purna Tanna |
| 12 th September, 2019 | Seminar on Machine learning | Mr. Sandip Rathod |

Educational Tours

FCAIT organized an academic visit to Vikram Sarabhai Space Exhibition (VSSE), Ahmedabad on 17th September, 2019. This exhibition made the students familiar with the achievements, future plans and concerns of the Indian Space Research Organisation (ISRO) through the media of working models, static displays, the 3D theatre and the interactive multimedia presentations.

FCAIT had organized an education tour to Dandi Kutir Museum and Adalaj ni Vav on 12th July, 2019. During a visit to Dandi Kutir the students could learn many novel things from the presentations on Gandhiji's private and public life. The museum depicts both Gandhi as a man and Gandhi as a political leader. The museum also highlights the Gandhian principles like truth, non-violence and civil-disobedience. After visit to museum students were served snacks at the canteen. The next destination was the heritage site- Adalaj ni Vav. The students gathered information about the builder of the stepwell from the in-charge of the place. He also explained the cultural value of the place. The vav is an incredible example of Indo-Islamic architecture and design.

Industrial Visits

FCAIT plans for industrial visits to make students familiar with the world of industry and to provide them a platform for observational learning.

| Date | Industrial Visit |
|--|----------------------------|
| 9 th July, 2019 | BISAG |
| 12 th July, 2019 | AMUL |
| 19 th & 20 th July, 2019 | MUNDRA |
| 20 th July, 2019 | ECS Corporation |
| 14 th September, 2019 | Ramdev Foods Products Pvt. |
| 21 st September, 2019 | Parle-G |



Social Activities & Student- Alumni Interaction

NSS and ISR Activities

Having faith in Helen Keller's words "alone we can do so little; together we can do so much".

FCAIT motivates students to participate in several activities aimed at the upliftment of society like Blood Donation Camp, Surakshabandhan Celebration, Tree Plantation Activity, and Clothes Distribution Drive.

| Date | Activity |
|-------------------------------|------------------------------|
| 9 th August, 2019 | Blood Donation |
| 16 th July, 2019 | Tree Plantation |
| 19 th July, 2019 | Cloth Distribution Drive |
| 14 th August, 2019 | Suraksha Bandhan Celebration |



CWDC Activities

FCAIT organized a seminar on "Groom yourself and face the world" on 11th July, 2019. The key speaker Ms. Tirthi Shah shared her views on personality development, importance of eye-contact in communication, non-verbal communication, and on how to present ourselves confidently. Mr. Arhant Shah and Mr. Dhruv Shah from Planet Education made the seminar interactive through question-answer session.

FCAIT organized a seminar on "Self Defence Techniques" on 22nd August, 2019. This seminar was conducted by Shri Jaldeepbhai and Naveetbhai Patel, police personnel from Ahmedabad Police Surakhsha Setu Cell. The aim of this seminar was to build awareness about various laws that protect women and also to execute multiple techniques of self-defense through demonstration. The seminar ended with a question-answer session and students were also made familiar with the availability of emergency helpline numbers for police protection.

Students- Alumni Interaction

As FCAIT is keen on being in touch with its alumni across the world, the institute arranges sessions for Student-Alumni interaction. It provides our students an exposure to alumni's work profile and culture. Moreover, students acquire knowledge about the recent trends and technologies of respective countries where alumni have settled.

This semester we got connected to two of our alumni:

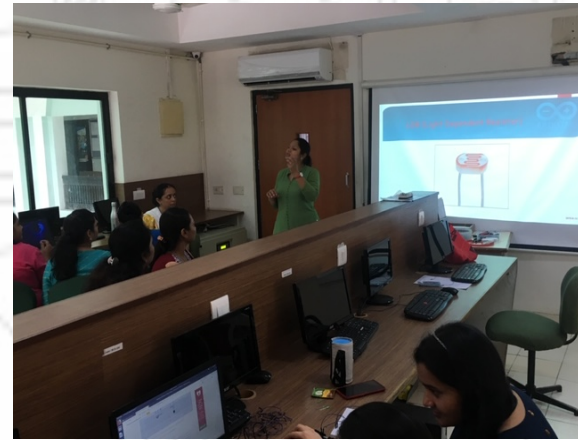
- Ms. Avni Dave, Business Owner, Brick Coffee House & Arktek3d Rendering Service, Florida, USA.
- Mr. Yogesh Gupta, Freelance Developer and Sr. Web Developer, St. Michaels Hospital and Tapcrew, Toronto, Canada.



Faculty and Student Accomplishment

FDP on ARDUINO UNO- Open Source Embedded Platform-

FCAIT organized Faculty Development Programme on “OPEN SOURCE EMBEDDED PLATFORM - ARDUINO UNO” on 13th and 14th August, 2019. The resource persons were Prof. Poonam Dang and Prof. Jyoti Dubey from FCAIT, GLSU. They conducted the hands-on sessions besides delivering the resource lectures. They dealt with the following areas: Introduction to Embedded Platforms, MCU, SBC, Audrino Family and UNO Architecture. They briefed about the various sensors and components like proximity sensor, ultrasonic sensor, potentiometer, light emitting diode, buzzer, seven-segment display, light dependent resistor, Bluetooth module, and GSM module. They also taught the interfacing of various components and sensors with Arduino UNO. FDP helped them to learn the key issues on Embedded Systems and Smart Sensors for ARDUINO applications.



Faculty Achievement

Prof. Bharti Gupta published a research paper titled "Effective Energy Management IoT Framework for Smart Metering System" in International Journal for Research in Applied Science & Engineering Technology (IJRAR) Volume 7, Issue IX, September 2019, ISSN No: 2321-9653.

Prof. Bharti Gupta published a research paper titled "IoT Framework for Smart Metering System- A REVIEW" in International Journal of Research and Analytical Reviews (IJRAR) Journal No: 43602, Volume-2, Issue-2, June 2019, E-ISSN No: 2348-1269, P-ISSN No: 2349-5138.

Prof. Nirav Suthar and Dr. Ankit Bhavsar published a research paper titled “Leaving Habitat of Wild Animals in Gir National Park: A Critical Scenario and A Possible Solution” in International Journal of Innovative Technology and Exploring Engineering Volume-9 Issue-1, November 2019 ISSN No: 2278-3075.

Students Achievement

FCAIT-TYBCA students, Niharika Srivastava, Himanshu Joshi, Isha Mishra, Dhiraj Joshi, Jolly Sharma, created a mobile application SAKSHAM (I am Capable). It is a telephonic service and website for differently abled students through which they can easily book a writer for their examination. Students have presented their idea at Ahmedabad Global Women Startup Weekend (In partnership with Google) and secured 2nd position. They also presented this innovative idea at Shanti Business School Hackathon event and won a special recognition award for the innovative idea.

For registration and to get more information about Saksham you can visit the links given below:

Website- <http://sakshamahmedabad.herokuapp.com/>

Facebook- <https://www.facebook.com/saksham.iamcapable.1>

Instagram- https://instagram.com/saksham_iamcapable?igshid=1kqekgrc8919b

Twitter- https://twitter.com/Saksham_Capable?s=08

Gmail- sakshamiamcapable@gmail.com

