Sixth Sense Enabled Campus -Possibilities and Challenges

Sindhuja Raghupatruni[1]
Department of IT,
CBIT, Hyderabad

Niharika Nasam[1]
Department of IT
CBIT, Hyderabad

Keerthi Lingam[2]
Asst, Prof., Department of IT
CBIT, Hyderabad

ABSTRACT
Whenever we encounter a new object our senses try to sense and analyse that particular object and makes us interact with them. But to know the complete information about a particular object we should go through it in detail by surfing on net or asking the relevant person for information. Instead, sixth sense technology can be used to immediately trace out the whole information about an object as soon as we see it. In this paper, we tried to design an application for sixth sense enabled college. This application cab be used by the administration to know about the academic qualifications of a particular student, student can also know about the upcoming events and other information from noticeboards without actually physically being present near the noticeboard. Anyone can get the review of a book and its availability in the library. Background work for Sixth sense technology, its applications, advantages and its future scope is also presented in this paper.

General Terms: Cloud computing, RFID, Sixth sense, Augmented reality, Computer vision

Keywords: Sixth Sense Technology, Augmented Reality, Evolution, Applications

1. INTRODUCTION
Computers began to rule the mankind from many centuries. People began to use them for many purposes and later they found place in almost every area like offices, hospitals, educational institutions, super markets house hold etc. Many types of software have come up enabling us to do our task in an easier way. For each and every work we do we began depending on computers for example booking an online ticket, paying telephone bills, online shopping etc. People began to work like machines in front of machines. As the time passes may things have changed and many new things have come into limelight and computers are no such exceptions. Many scientists are trying to develop a technology to integrate the physical world with the digital world. Humans have 5 senses namely Eyes, ears, nose, tongue and skin which perform their own function i.e. eyes for seeing, ears for listening, tongue for tasting, skin for touching and nose for smelling. As shown in Fig 1.

There could be another sense which would enable us to sense things that are not basic and biological. In order to get to know about many things we take the help of internet but with the advent of a technology to integrate the physical world with the digital world a technology is proposed which would

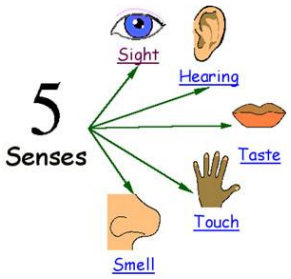

Fig 1: Five senses of humans

enable us to sense things that are not basic and biological can be assumed as sixth sense technology. Sixth sense technology can make the entire world as a computer via hand gestures. It can be used in colleges, supermarkets, schools, map navigator, jewellery shops etc. Using hand gestures we can zoom in, zoom out or pan like any other multi touch system does. Sixth sense technology can be used to check the quality of a particular object, directions to particular destination, etc.
Augmented reality [4] is the concept which bridges between physical world and digital world. Augmented reality combines virtual world with the real world, even the fictitious world can be experienced. The concept of augmented reality can be combined with sixth sense in order to have better gadgets that make us machine free. With the advent of sixth sense technology, if it can have its roots into all the fields we can expect things to happen in a much better way.

2. SIXTH SENSE TECHNOLOGY
Previously many technologies evolved such as augmented reality where the superimposition of graphics, audio, and other enhancements were used. Unlike virtual reality, augmented reality does not create a simulation of reality instead it blurs the line to show the difference between what's real and what's computer generated by enhancing five senses. In simple words, augmented reality [4] is changing the way our world is viewed and sixth sense technology is making it appear in real.

Initially Steve Mann developed a neck worn projector with a camera for implementing sixth sense technology. Later, Pattie Maes and Pranav Mistry carried his work and developed a augmented-system which they call Sixth Sense, presented in TED conference [4]. The Sixth Sense device makes any plane surface as an interface with which we can interact physically. The Sixth Sense prototype is a wearable gestural interface that

augments the physical world around us with the digital information.

The sixth sense prototype is made using very common and easily available equipments like pocket projector, a mirror, mobile components, coloured caps and a camera as shown in Fig 2. The projector and camera are connected to a smart phone via blue tooth. Natural hand gestures are used to interact with the digital information.

2.1 Sixth Sense Prototype

The uses of various equipments mentioned above are Camera to capture the image of the object which is found in its view and it can be considered as digital eye.

Fig 2: Motion Capture [4]

Projector is to project the visual information on to the surfaces and objects making them as physical interfaces. Mirror is used to adjust the angle between the projector and the screen. It reflects the rays coming from the projector on to the screen. A smart phone which is enabled with access to Internet is used in order to process the video data. Colored Caps are placed at the tip of users fingers. They are marked with red, yellow, green and blue tapes. These help the camera to recognize the gestures. All these hardware components are coupled in a pendent. [3] [6] [2]

Gesture recognition [1] is a term used to interpret the gestures through mathematical algorithms and mathematical gestures. Gesture recognition can be seen as a way for computers to understand human body language, thus building a bridge between machines and humans than primitive text user interfaces. Gesture recognition can be conducted with techniques from computer vision and image processing. Computer vision is the science and technology of machines that is concerned with the theory behind artificial systems that extract information from images. In Sixth Sense technology, gesture recognition was considered inorder to understand the motion of fingers.

2.2 Advantages of Sixth Sense approach

Sixth sense technology features a user guide that makes it simple to use. There are important gestures using which people can easily learn without going through tutorials. There are various advantages of Sixth Sense Technology.

2.2.1 Capture Photos with Fingers

In order to snap a picture, the user has to make a rectangle in air as shown in Fig 3. The picture will be taken and it will be placed in memory card. A person can resize and edit it whenever needed by projecting it on any hard surface like wall. [4]

Fig 3: Capturing images [6]

2.2.2 Phone Dialler

Sixth sense can be added to our cell phones. Instead of carrying a cell phone in hand, a person can project the keypad on his palms and make calls just by touching the digital keys and press the keys as done in mobile phone. There will not be any limitation for screen and any medium can become an output medium [3]. Sixth sense in other words will bring the digital and real world together.

2.2.3 Read Books

In library, a person can easily check whether a particular book is interesting or not based on the rating and reviews of the book which is viewed as soon as the book is opened.[4] This makes things easier and time efficient. People can easily decide whether to go for that book or look for another book.

2.2.4 Video Newspaper

Instead of reading a newspaper [4] which has static images a person can view a video regarding particular news as shown in Fig 4. In this case, Sixth Sense pulled up a video online about the same news that is published in the newspaper. This device can be used easily by all the people because it uses hand gestures which everyone uses in daily life.

Fig 4: Video Newspaper [2]

2.2.5 Quality Check

In shopping malls, one can easily check the quality of food they are about to buy, quality and reviews of other products they wish to buy. This process reduces the customer-complaints list in the malls hence increasing the profits.

3. PROPOSED SYSTEM

Before proposing a new system it is good practice to see the way it can change the real world. Now, let us compare the present system which is being followed with sixth sense scenario which may be implemented in future.

3.1 Comparison of present scenario with Sixth Sense

Here we are presenting an idea on how efficiently several tasks can be done using the sixth sense technology. Table 1 reflects this comparison. Here each factor is taken and the comparison

is made between present scenario and how the performance can be improved using sixth sense technology

Table1: Comparing present scenario with sixth sense

S.NO	FACTOR	PRESENT SCENARIO	WITH SIXTH SENSE
1	Updates	Takes time to reflect in data	Immediately reflected in data
2	Library	Less effective	More effective
3	Notice Board	Time consuming	Faster access
4	Exam Branch	Slow process	Quicker process

3.2 Practical Approaches

Sixth sense finds its applications in many places. Many experiments are going on in order to extend its applicability into many other fields. Physical Education (PE)[14] is completely involved with sixth sense technology and the first curriculum of PE's is to be implemented by 2020. The teaching staff can easily understand the strengths and student preferences that are present in their digital files. Here we are proposing an idea to develop an application for sixth sense enabled campus that can be extended to all the educational institutions and can be customized based on their needs. The graph gives an idea on how sixth sense is advantageous over present scenario.

In a typical college environment, Teachers have to look at the performance report of the students to decide whether he needs extra classes to improve his grade in academic. Whereas in a sixth sense enabled college, the application can envisage the need of tutorials for a particular student just by focusing the device at him. In a typical University environment, students or faculty should go to the library to get the book and depend on internet to find the best book for the course. Students normally submit their assignments in paper in typical colleges, check their grades on notice boards, check for the upcoming events in noticeboards. All this can be made much more easier by making the campus sixth sense enabled. This application can be used across the college in different places like, library, exam branch, classrooms, cafeterias, playground, transport office, etc. Here in this paper we presented an overview of few areas like library, exam branch and notice boards.

3.2.1 Checking the notice boards

Whenever the user makes the symbol of "N" through their hands the camera will recognise it and understands that the details of notice board are to be mentioned. It passes the data to the processor in the form of signals and the processor checks the related database and collects the information. Finally the information can be projected with the help of the projector onto the screen to which it is focussed. The whole process takes place as shown in Fig 5.

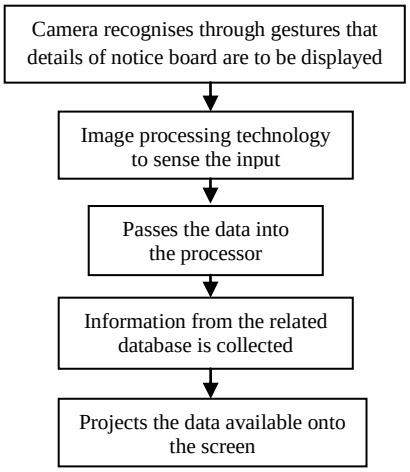

Fig 5: Block diagram to implement notice board

3.2.2 Library

The camera captures the image of the book and sends it as input to the processor. Based on the input the processor performs the function of checking the related database and then the corresponding data is projected on to the book with the help of the projector. Students or Faculty can write a review for the book they referred to. So when another student checks for that book, he can also read the reviews of others who have already referred it.

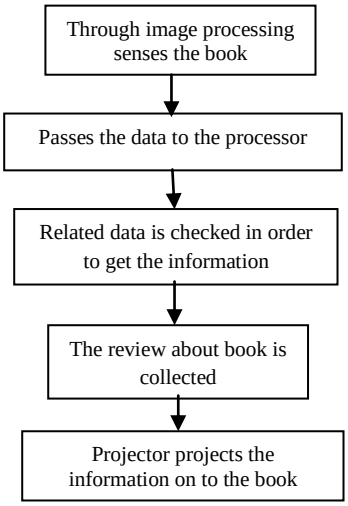

Fig 6: Block Diagram For Library

The device can also give suggestions of other available books, journals or papers relevant to the area in which the user is looking for. The whole process takes place as shown in Fig 6.

3.2.3 Exam branch

Whenever a person draws the symbol of "e" in the air the camera will recognise it with the help of gesture recognition technology and senses the purpose. It sends this data as input to the processor where it checks for the authentication. In this process a user id and password scheme is used for authentication because students have access to different elements of data and administration has access to different data. Once it is decided whether the person is a student or

administrator the data is collected from the database and only that data to which they are accessible is displayed on the screen through the help of the projector. The whole process takes place as shown in Fig 7.

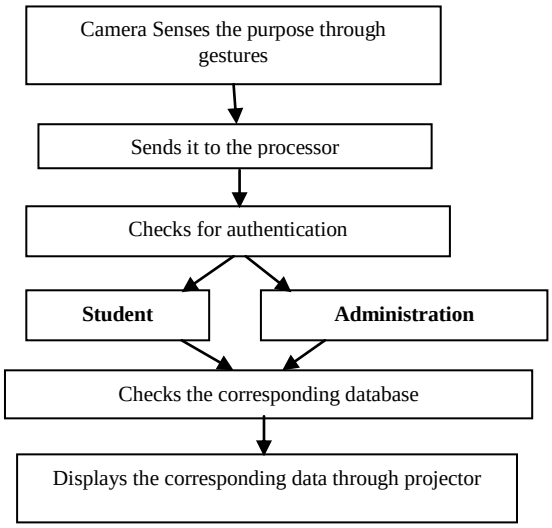

Fig 7: Block diagram for Academic related information

Fig 8 shows the overview of the system and how different units are connected in the three applications mentioned above. [note: complete access ,limited access]

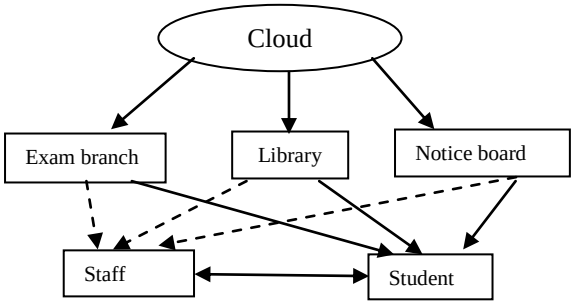

Fig 8: An overview of sixth sense enabled college system.

As smart phone is being used in implementations of these ideas, a virtual cloud is created from where the data can be obtained in the campus. This cloud helps the data to be distributed round the campus and it can be re-allocated as per demand.

4. EXPERIMENTAL ISSUES

Before going into the experimental details, let us see the implementation of how it can be done. The technologies involved in making a sixth sense device include gesture recognition, augmented reality, radio frequency identification and computer vision. Gesture is defined as the feeling or expression through which particular information can be conveyed. It is a natural, spontaneous act and is unpredictable. For example, we can judge a person's mood on particular day by simply examining their facial expression [10]. Gesture recognition is recent trend in computer science field which is done through image processing and computer vision. . The task of gesture recognition is highly challenging due to complex background, presence of non gesture hand motions, and different illumination environments [15] This technology makes a person move the cursor on the computer by just pointing his finger towards the monitor screen. The fig 9 shows an image where the child is being sensed with the help of hand gestures [8].

Fig 9: Child is being sensed with the help of hand gestures[8].

Augmented reality [4] plays a major role in sixth sense technology. It is the device which makes the digital world connected to real world. It is changing the way we view the world and adds smell, sounds and feedback to the real world as it exists. The fig 10 shows an image where the mobile phone is operated with the help of augmented technology on the palm of the user instead.

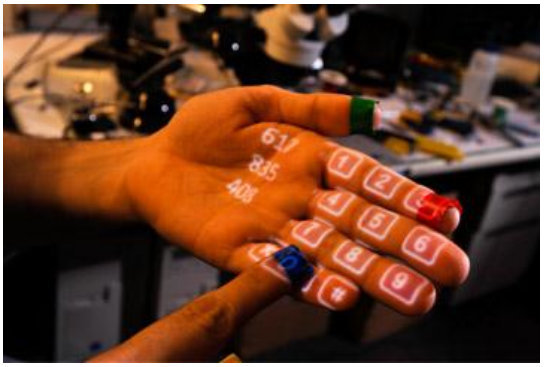

Fig 10: Operation of mobile phone with the help of augmented technology [9]

Radio Frequency identification (RFID)[7] is electronic tagging technology which makes use of radio magnetic waves to identify a moving or stable object by partitioning it into tags. Whenever a RFID device is energised it identifies the information through passive transponder. This device is used to transfer data via portable device which plays a significant role in sixth sense technology. Fig 11 shows the implementation of RFID technology in library.

Fig 11: Library management system using RFID technology [12]

Computer vision is used to provide the high dimensional data from real world to produce information digitally. It is the technology which makes the useful information to be extracted from the available information.

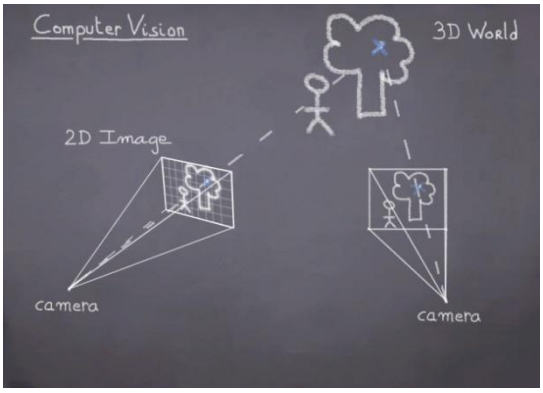

Fig 12: Image being extracted using computer vision [11]

Fig 12 gives a clear idea on how the computer vision works. Providing a sixth sense enabled campus is quite a challenge. First challenge is the cost. This device can be cost effective only if the students and the faculty can make best use of it in the campus. Cell phones and PDAs have become so common these days that it is hard to find a student who doesn't possess at least one of these devices. So if the campus is made sixth sense enabled, student as well as faculty can use their devices not only for their personal use but also for academic purposes. Another idea is, instead of making every student have his own sixth sense devise, our idea is to arrange few devices near every facility in the campus. Providing proper privileges to data is another challenge. Confidential data should not be given access to everyone. Appropriate authentication is required to access any kind of data.

This device need not search the web to get the necessary information but to make it more efficient we designed to make all the data available in the college cloud. Main challenge here is to secure the data and also to give right privileges to access data to relevant people. Securing the cloud is a vital challenge. Students can put in their assignments, class materials and other data in cloud and this makes the campus paper free. Students need not actually carry their laptops or other machines to show their work. This is an additional task that can be done by this device. Students can use the projector on the device and project their assignment on a surface.

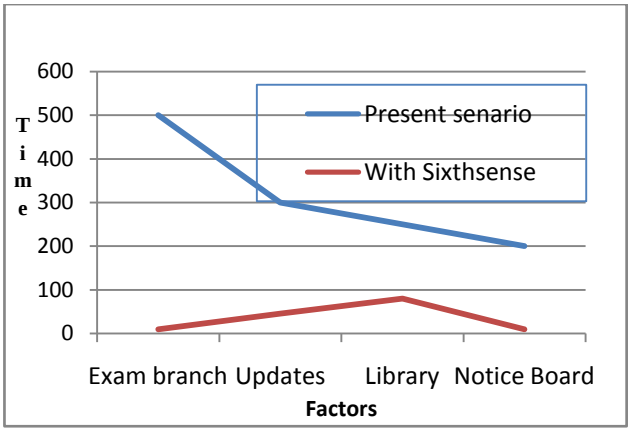

Fig 13: Present scenario versus Sixth Sense

As shown in fig 13 there will be a lot of change in the efficiency of the task performed when Sixth Sense technolog is incorporated. In the above graph time is considered as y coordinate and different factors are considered as x coordinate. It efficiently shows the variations between these two coordinates.

5. CONCLUSION AND FUTURE SCOPE

Sixth Sense Technology recognizes the objects around us and makes us interact with the information in any way we need without the use of microelectronic gadgets using simple hand gestures. It can be used as 5th sense for handicapped people. Individuals can make their own applications according to their need. Sixth sense technology clearly became a transparent user interface thus making life easier.

As technology changes, many devices hit the market and leave soon if they are not efficient. The security reasons are to be considered while using sixth sense technology. Authorised access to an application plays a major role. For instance, while using this sixth sense technology in libraries, there should be a separate method for faculty and students to access them as it may lead to hoax. Sixth sense technology is very different from other devices and is a new topic for hackers and other people. We got rid of coloured markers in recent years. However, we should try to make it more secure and avoid radio waves which are harmful and could cause brain cancer to children. Camera and projector can be incorporated into a mobile device than using them separately.

However, once the sixth sense technology comes into existence we can see a new world around us where laptops, cell phones, cameras and other electronic gadgets have less priority.

6. REFERENCES

[1] S. Sadhana Rao, Sixth Sense Technology, Proceedings of the International Conference on Communication and Computational Intelligence, India.27 – 29 December,2010

[2] Bathani Raksha K, Sixth Sense Technology OR WUW (Wear Ur World), Research Expo International Multidisciplinary Research Journal Volume - II , Issue - II June – 2012

[3] Meenakshi Gupta, Shruti Sharma, Virtual Class room using six sense Technology, IOSR Journal of Computer Engineering (IOSRJCE) Volume 6, Issue 4 (Sep. -Oct. 2012)

[4] Monika Arora, Basic Principles of Sixth Sense Technology, VSRD-IJCSIT, Vol. 2 (8), 2012

[5] Sneha Allu, Advantages and Disadvantages about the technology, blog

[6] Pallavi Sonone, Sixth sense technology, Presentation2012.

[7] Lenin Ravindranath, Venkata N. Padmanabhan ,Piyush Agrawal, Sixth Sense : RFID-based Enterprise Intelligence, Research paper.

[8] Content about Gesture recognition in wikipedia: http://en.wikipedia.org/wiki/Gesture_recognition

[9] Working of augmented technology and its working: http://www.howstuffworks.com/augmented-reality.htm

[10] Information about Gesture recognition given in an article-http://www.engineersgarage.com/articles/gesture-recognition-technology

[11] Image-http://vision.mas.ecp.fr/Personnel/teboul/vision.php

[12] Library management using RFID technology-http://www.libbest.com/rfid.html

[13] Video-http://www.ted.com/talks/pranav_mistry_the_thrilling_potential_of_sixthsense_technology.html

[14] Article on physical education in future-http://www.pelinks4u.org/articles/pasco4_11.htm

[15] Mohamed Alsheakhali, Ahmed Skaik, Mohammed Aldahdouh, Mahmoud Alhelou, International Conference on Information , Communication and Signal processing(ICICS), 2011