Application of Sixth Sense Technology in Lecture Theatre for Engineering Students

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ABSTRACT

Sixth Sense Technology has emerged as a field of study that makes an effective interaction between digital world and human (techno savvy) without any physical interface. The information around us of different formats is digitalized and processed by human by gestures and some kinds of expressions. This paper introduce how to use this virtual technology in a lecture room as teaching aids to make lecture more effective. A lecturer needs different kinds of teaching aids like writing board, writing Marker, Ink remover, Notes, power point slides and more during teaching but using sixth sense technology all these aids can be used by our gestures and expression only. The information what we want to deliver through the lectures can be digitalized, projected and expressed by gestures that can be handled by our finger caps or by other movement of our hands. The lectures are delivered more effectively using images, videos, real life examples, query session .Besides those things the attendance list, library status of each student can be easily updated in the data base. Even a student can fetch lecturer's delivered lecture of a particular date from his hostels with some restrictions. This paper applies the methodology of sixth sense technology and its application in lecture Room to help teachers and students during

Keywords

Voice Recognition System, Gesture based System Motion detection, Colour Recognition, Image Processing, Sixth Sense Technology.

1. INTRODUCTION

The world is running with the speed of technology. Most of The people are growing to be as a technocrat and techno savvy. Almost Every day a new technology is emerging and the next day a number of techno savvy are ready to follow the approach. Sixth sense technology emerged in the same pattern that changes the form of interaction between the digital devices and human. The interaction works on the basis of human behavior where the computer system recognized the gestures and expression as commands and responds it. The paper is following the approach of sixth sense technology and applying it in a class room to make teaching more interesting and effective. As Different kinds of teaching components like images, videos, programming codes, and real life examples are shown during teaching. We also use some kind of writing board and marker to solve our problems and after that we erase that portion. Our aim is to digitalize all these components and access those using finger, voice or hand gestures. Whatever operations are performed during teaching is virtually digitalized like through this system our voice will be recorded and interpreted in to text by voice recognition system. An image or video can be shown in to screen in to a

live mode can be zoomed, minimized can be feel. To apply the technology inside a class room some hardware components like pocket based projector, a camera and a mobile device, screen and sensing finger caps of different colors are used. The different color cap on finger tips reflects the different pixel teaching and learning process. Actually this is a new Way of working in a class Room, Though a bit expensive but more efficient and effective way in teaching methodology or frame movement of images or videos. Here in this paper we are demonstrating how the different kinds of teaching objects or aids can be used by a human without touching using a bunch of different technology.

2. TECHNOLOGY RELATED APPLICATION IN LECTURE THEATRE

Usually some kind of teaching aids are used in a class room such as markers of different colours, sometimes coloured chalk as a writing material, duster to erase them. But we want to eliminate these things and it is possible by vision based interaction through hand .To make a lecture technology enabled we use an integrated set of technology to perform different applications.

2.1. Voice Recognition System

This system is used to recognize our voice in the lecture theatre. To write anything on the screen we use voice recognition system called as a "Speech recognition engine". As we input our voice on the screen the engine translate it into text which the application understands and the delivered lecture is displayed in the screen. Actually what we utter that is a sequence or streams of words between two pauses. The engine contains speech IC that can be used for all sorts of data and a particular language (we are assuming "English") and algorithms to convert spoken input into text.

2.2. Tracking and Gesture based Recognition

To apply these mechanisms Sixth Sense Technology works. The Sixth Sense technology contains a portable pocket projector, a mirror and a camera contained in a head-mounted or handheld, wearable device. Both the projector and the camera are connected to a mobile computing device in the user's pocket. The projector projects visual information into screen board. A webcam recognizes and tracks users' hand gestures, physical movement and expressions using computer-vision based techniques. The software program processes the video stream data captured by the camera and tracks the locations of the coloured markers at the tips of the user's fingers. The movements and arrangements of these finger caps are interpreted into gestures that act as interaction instructions for the projected application interfaces.

We use a screen like a white board or any wall mounted screen that senses our gestures that are captured by a webcam. The screen is partitioned in to many sub screens for different purposes. Like a part of it is used for writing, another part is used for Video; a part is used as an interface for programming implementation further on.

We use some colored caps on finger tips. Different colored caps are used to interpret hands gestures.

As the hand moves in a particular region called as Region of interest (ROI), the webcam capture this On the basis of coordinate (angle of movement) and projected on sensing surface. The captured image frames are converted into gray scale from RGB format and interpreted by vision based algorithms. This system could project multiple photos on the, and the user could sort, re-size and organize them with gestures. The image can be captured by hand gestures to form a rectangular or other shape in which image is required. When we want to demonstrate a real life video of examples a Web-enabled smart phone in the user's pocket processes the video data, using vision algorithms to identify the object. Firstly, camera captures a real time video of moving hand in front of camera on a screen. Then three different phases are performed on the captured frame. In the first phase different models such as implementation of color space model to extract the skin pixels and motion detection to extract the identified object is performed.InThe second phase the probability of the hand movement is identified by image recognition technology and calculating the outputs of different models in phase I to obtain the finger tip. In the third phase, the finger coordinates detected were transferred on the server containing database for gestures with the help of networking or sockets. Some other kinds of software components attached with this system searches the Web and interprets the hand gestures.
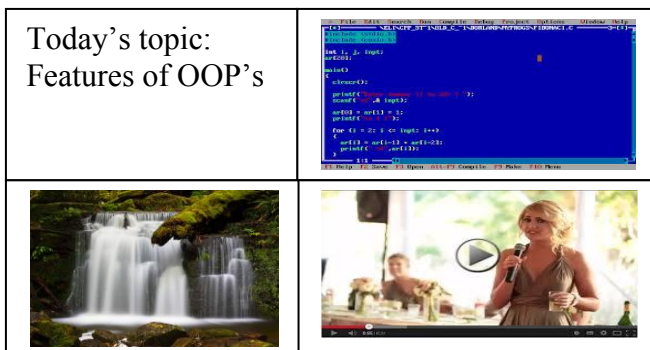

Fig 1: Screen Layout

Through the use of this system a user can access stored e -books or research paper of related subjects from data base and project them onto screen board in a partition. With the help of a Sixth Sense device the user can easily access data from machine at real time speed.

There are different characters stored on the basis of finger moving coordinate. The programming codes for these characters and their functionality are written in a high level language such as C#. C Sharp is a simple, modern, general-purpose, object-oriented programming language wherein an algorithm is developed for colour recognition and motion detection. It is full of features that make development faster and easier,

2.3. Accessing Data base and Visual Representation of Data

During teaching we required different kinds of books, papers, well prepared notes and other study material. Through this technology we can access data base and the written material can be converted in to a real video. A video implementation of text that is available can also be accessed using online system. The system can be extended further to access the library and other academic information. The user doesn't require any machine human interface to access the data. The data is accessed through recognition of hand gestures .This functionality is much easy and user friendly in comparison to other command based process.

2.4. Updating Database

The attendance of students is also a part of teaching curriculum. The technology is much effective for attendance of the student using voice recognition or gestured base mechanism where daily attendance can be stored in the database.

3. SYSTEM RESOURCES

Camera: A webcam captures an object in view and tracks the user's hand gestures. It sends the data to the smart phone.

Colored Markers: Marking the user's fingers with red, yellow, green, and blue tape helps the webcam recognize gestures. In future these colored caps could be eliminated. The work is in process.
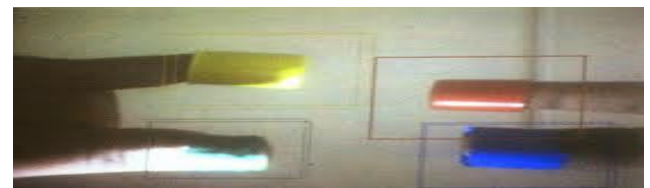

Fig 2: Coloured markers

Projector: A tiny LED projector displays data sent from the smart phone on any surface in view--object, wall, or person. A laser projector can be used to increase brightness.

Fig 3: Head Mounted Projector

Coloured Finger caps:
To control gestures pattern four fingers wearing different colored markers or caps are used in real time. The projector displays video feedback to the user on a vertical surface.

Smart Phone: A smart phone with good functionality of sound, image and video capturing sore data require by projector to project data on projector.

4. PROPOSED METHODOLOGY

Our aim is to enable voice, image and interaction with graphical user interface by detecting the position of user's hand fingers. Since a different activity takes place during the mechanism, the algorithm can be shown by fig 4.1:
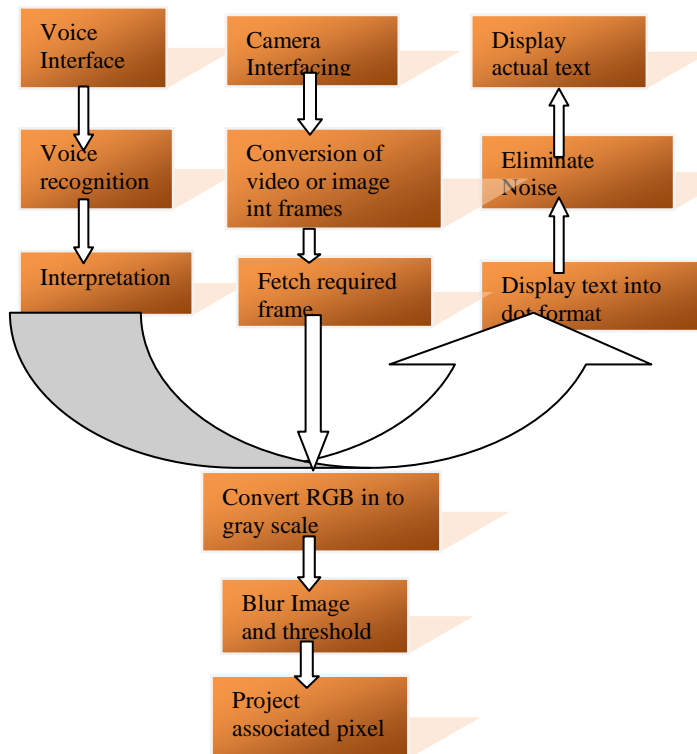

Fig 4: Methodology

A Webcam captures the real time video or images and sends the captured information for further processing. The mechanism works in a continuous manner in which the captured real time information (Video) is converted into frames of images. The frames of images are obtained continuously one after the other and the latest frame is considered further for processing i.e. for the color recognition purpose. The camera captures the object in a polar fashion i.e. the right side of the real time image appears as left in the captured image and vice-versa. Therefore the captured image is first and foremost resized and flipped so that the captured image is found to be the same as the real time image.

Fig 5: Image Rotation

Actually a real time video exists in RGB format. It is converted in to gray scale by defining some value for its brightness and saturation. Generally the ranges of values are between (50 to 255). The obtained colour could be well familiar with human perception. The color which is detected in gray format appears as white color whereas the other colors appear as black color. Now mathematical morphology is used to remove noise by using operation of erosion and dilation. Using finger gestures the coordinate of frames pixels is changed and size changes. The edge of image is blurred using Wiener deconvolution technique. Now the threshold process is applied to separate that pixel of image which we want to analyze. As the pixel of higher intensity is selected a value is set for it to identify it.

We want that whatever is speaking by a teacher it should be recognized by the screen using voice recognition system. The delivered voice is converted into text. The noise is removed from text. Now the students can look at the screen like any program, examples and other onto screen board.
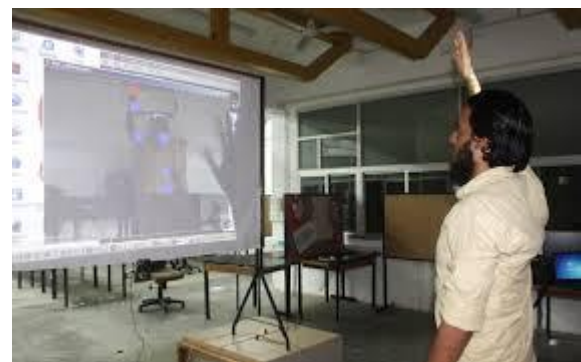

Fig 6: Hand Gestures Recognition

The data base stores the different books and papers, and other video lectures can also be accessed and updated using this technology. Students can send their query and assignment also through this system.
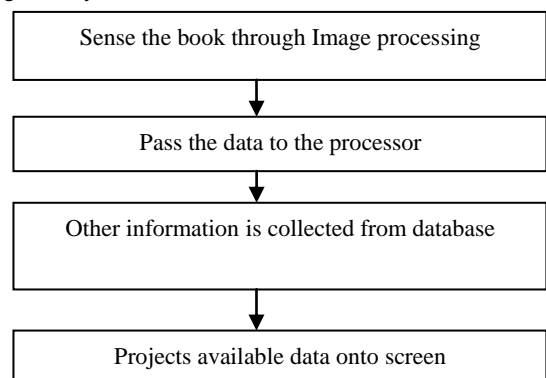

Fig 7: Image processing Method

5. PRACTICAL APPROACH

The system is an integrated system that requires an integration of different technologies and resources. It forms a cloud structure in which different applications are connected. Different applications works parallel but independently. The below diagram explains how all components are connected in the system.
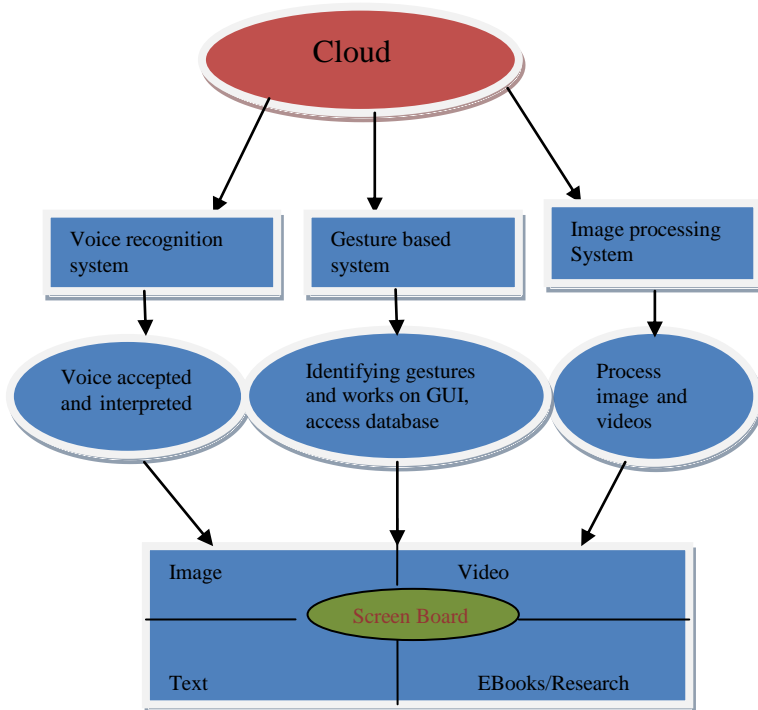
Fig 8: Complete System

6. SYSTEM GOALS AND FUTURE SCOPE

Sixth sense technology is developed to digitalized human behavior. In this system we have applied the technology to form a technology enabled Lecture Theatre. The system is developed to present a lecture in a different approach where everything is visible to students. It saves much time. Examples can be shown to students using images or video that is more approachable. Students can ask query from the system, and get replied instantly. The main goal of the system is to make the lecture delivery more efficient and smart, where the students can know what the future scope of concern subjects is and how it is related to their career. The visual implementation of programmatic solution for a project would be very helpful to them to understand the theoretical and practical concerns.

In future the system could be extended by adding more new components in it. We can add the library with the system where the user can get knowledge about the available different books of different subjects, journals or research paper of relevant area. The administration notices can be accessed and visualized on the screen also by only hand gestures using appropriate kind of authentication scheme to make the system secure. As a cloud the whole college can be enabled with technology. A main challenge with this system could be its cost otherwise it provides a reliable and a user friendly system. The resources like mobile, projectors and camera could be made portable and integrated in a single device.

7. CONCLUSION

Sixth sense technology emerges as the sixth sense of a person by which he is recognizing the physical objects around us and interacts with the information by only hand gestures. The system is making the class more interactive and interesting .it makes our life as a faculty and students very easy. The developer will have to focus on securities issue to make it robust. For a hacker it will be a new kind of system to hack.

Problems could be occurring due to electromagnetic rays that could have deadly effect on brain. So the developer should be more aware about it to make it more secure. Thus if the system is used in an educational institute or any other organization with full-fledged security and functionality could be like a blaster in tech world.

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