

# Sixth Sense Automation Using Touch Screen Wall

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**Abstract**— Sixth sense technology is widely used as HCI interface for domestic, military and hospital applications. In this paper, an effective human computer interface (HCI) based on sixth sense technology is presented. The presented technique overcomes the gap between computer and human using touch sensing mechanism. The proposed technique is implementing by interfacing MATLAB with Embedded System through communication device X-Bee. In MATLAB, Image Processing Toolbox is used for generating a virtual screen for controlling the devices and the rest section comes under microcontroller board in embedded system section. To estimate the virtual touch screen as virtual switch, we have enlarged RGB, Gray and BW techniques with Image Processing Toolbox in MATLAB. The experimental test and setup is designed in such a manner that the maximum accuracy can be obtained. Smooth and white background is used to acquire the image with better quality. The experimental result demonstrate the validity of the proposed technique for wide range of images and found to be an effective solution for image processing using virtual switch.

**Index Terms**—Automation, Sixth Sense Technology, Image Processing, Gesture Recognition

## I. INTRODUCTION

Most the parameters in the world are physical and the technology is growing fast toward digital word. Modern technology provides revolutionary ways to interface the physical word with digital information. Touch screen technology is one of the most widely accepted modern technology to sense the physical quantity which make it easy to access the information in less time and efficient ways. The advancement of capacitive touch screen made it possible to access the physical information with high sensitivity and greater accuracy.

Sixth sense is one of the efficient and modern interface technique used to interface the physical world around us with digital information with the help of natural hand gesture to interact with that information. By combining the gesture recognition technology with sixth sense it is possible to acquiring and controlling the physical data through distance. There are various factors needs to be incorporate while using six sense technology such as position of the camera to capture the image, the communication protocol to transmit the information to target user interface, and the embedded electronic system to continuously transmit and receive the data. The major factor in all these constraint is the position of the camera which leads to the accuracy and efficiency of the target object.

In this paper, a sixth sense technology based automation system using touch screen wall is presented. Various aspect of the presented technology is discussed in detail. The physical object is first captured by using camera and then the obtained

image is processed in MATLAB using man to machine interface. The object is then transmitted using both wired and wireless channel to the embedded electronic system. The system is found to be working excellent and provide efficient conversion of physical object into digital information.

The rest of the paper is organized in different sections start with the description of the system architecture, components and main aspects explained in section 2. The section 3 deals with the implementation of the proposed scheme. The results and achievements are explained in the following section. Finally the conclusion is drawn in last section.

## II. SYSTEM ARCHITECTURE, COMPONENTS AND MAIN ASPECTS

The architecture of the proposed sixth sense technology based automation system is shown in fig. 1. In this Section, we shall briefly illustrate the main aspects, with special regard to the image processing and gesture reorganization for emerging applications.

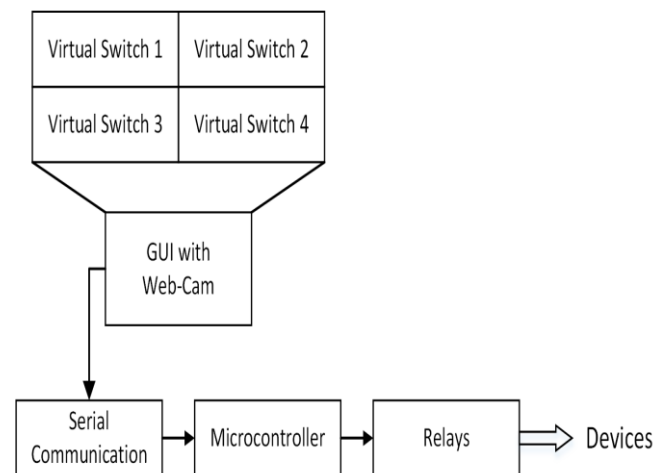


Fig. 1. System Architecture

The main aspect of the proposed system is based on gesture recognition. Gesture Recognition is the basic technique to perform man-machine interface. It is a study based on Compute Science and technology for interpreting man gestures with the help of mathematics algorithm. Gesture technique is a simple technique that recognizes gestures in the form of input commands and allows system to work with these commands for controlling and performing the desirable task. Gestures must be intuitive, simple and universally acceptable. They can emerge from anatomy motion but commonly from face and hand. The precious advantage of the technique is that human can interact with machine from a distance, no need to have a physical contact with system. Rather than speech recognition, it is more efficient for conveying information

from man to machine and vice-versa. It is possible to move a mouse cursor according to movement of our finger by gesture recognition. A controller can magnify body and hand gestures, it contains gyroscopes and accelerometers to detect rotation, tilting and acceleration of movement -- or a camera can be equipped with computing device so that the software can identify and interpret specific gestures.

The system has four major parts: Object, Camera, Communication protocol and embedded system for interfacing with MATLAB environment.

A. *Object*: An A<sub>2</sub> size section of wall is selected for object. To remove irregularity and for smooth surface, we can affix a white chart on the wall and get a snapshot of this section. One of the object images are shown in fig. 2.

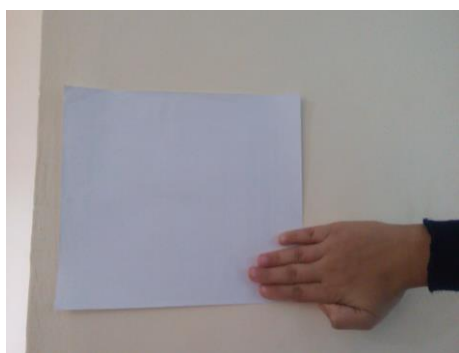


Fig. 2. Obtained Images of the object

B. *Camera*: Camera is a reliable and primary source of obtaining the information and capturing the movement of the desired object. The object is captured by Camera and sends the image as an input to MATLAB for further processing. Camera recognizes the hand movements and sends commands to MATLAB for performing tasks using computer-vision based techniques

C. *Wireless Communication protocol*: After capturing and preprocessing of the captured object using camera, the desired object needs to be transmitted through suitable communication mode. The communication mode can be select as wired or wireless depending upon the requirement and application of the desired system with respect to the tradeoff of cost and power effectiveness. The system is tested with Universal Synchronous-Asynchronous Receiver Transmitter (USART) and with Bluetooth (wireless mode). Bluetooth module (HC05) works as wireless communication protocol. This module is used for interfacing MATLAB and Embedded circuit. It receives commands from MATLAB code and transmits a signal to microcontroller for further process. It works in the range of 30m approximately. The advancement in this work is that we can broaden our transmitting range by using Xbee module for Wireless transmission.

D. *Embedded Circuit for man-machine interfacing*: In order to provide the communication interface with real object a microcontroller based circuit is used for controlling home automation as Virtual switch. The complete implementation of the embedded portion is shown in fig. 3

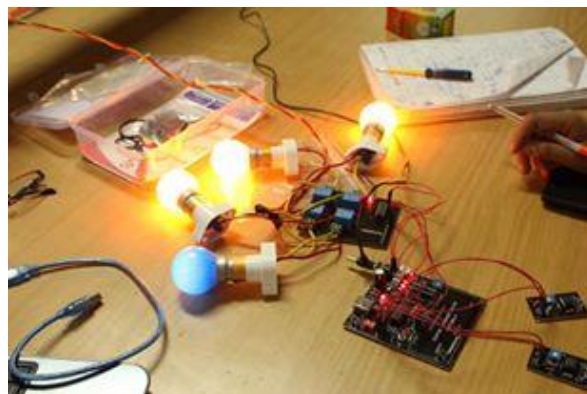


Fig.3 Embedded Electronic Part of the System

A simple 8-bit microcontroller having serial communication port can be used for implementation. The microcontroller receives commands as an input from HC05 module and transmits an output to the relay based switching board. The controlling of home's apparatus is done by command received by board. Then, the section which is captured by camera works as a virtual switch.

### III. SYSTEM IMPLEMENTATION AND INTEGRATION

The implementation of the purposed technique is divided into various parts as explained in above section. After deciding the object, first step is to capture the object in image form by Integrated Web-Cam of the system. Camera is accessed in MATLAB using Image Acquisition Toolbox by specific commands. The specification and resolution of camera are in default setting that is integrated Web-Cam 'WinVideo-1', Resolution 'YUV 640X480', Returned-Color-Space 'RGB'. The camera is captured image of wall of white color. The captured image is in the RGB ('color name') format. To achieve a clear and digital image, we have to convert RGB into GREY and GREY into BW format. It is not possible to convert directly RGB into BW format. By using morphology commands, we remove the noise from the image for getting a good intensity and noiseless image and then split the image section into four parts. Splitting image is another property in Image Processing Toolbox. It divides image in even parts. We need to specify in commands that how many rows and columns we want to have in image. We are using this small section of image for further processing.

After capturing the image, the wired or wireless communication starts between MATLAB and Embedded Circuit. The communication mode depends on selected module either USART or HC05. The coding part for both the module remains same as declaration of object using a variable, COM Port assign. On execution of code, when object satisfy constraints applied on the code the interfacing between MATLAB and Embedded starts. The module sends commands to microcontroller of embedded circuit to controlling the automation part.

After receiving the commands from module, the microcontroller sends commands to relay based embedded circuit. Thus, the home apparatus is controlled by commands directly. It is clearly seen that the home appliances is controlling by touching the image section of wall or we can

say that our wall is working as a switch termed virtual switch. Using the concept of gesture recognition, it is possible to perform industrial automation along with home automation.

#### IV. RESULTS AND ACHIEVEMENTS

By implementing above techniques, the home appliances can be controlled by wall as virtual switch. This application is widely used for security purpose in army and automation field. For handicapped people, it is very useful for performing various actions as controlling home appliances. Nowadays, Sixth Sense Technology is presented everywhere. The advancements in educational field is that we can remove number of hardware components. We could use any surface or wall wherever we are to carry out activities are done in a PC. To monitor the agricultural lands, it is very beneficial. In short, Sixth sense technology could make the era magical.

#### V. CONCLUSION

The Virtual switch reduces the human efforts and makes very secure network for day to day life. It can implement on several applications that demonstrates the viability, usefulness and flexibility of the system. It could change the method of interaction with real world and truly provide complete awareness of the technology around us. It will surely revolutionize the era.

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