This paper presents a better and accurate way to human computer interaction methods. A real time system is proposed and developed which needs no glove of sensors for the hand, still we can directly interact with system. The implemented system is tested by demonstrating how we can control device using the hand signs. Gesture recognition interfaces can be used as a natural communication channel between humans and machines and give rise to a plethora of applications such as hardware-free remote controls, sign language interpretation and other human welfare applications.

**Keywords:** Hand Gesture, SVM, Erosion, Dilution, Morphological operations, Absolute Difference, Contour, Binary Thresholding

**INTRODUCTION**

Evolution of technology and the development of digital signal processing in combine providing a way to interact with the computers virtually. We can personalize this development so that is useful to simplify the human effort in real time. In present scenario gesture recognition systems are widely occupying most of the daily routine works, as we can make use of the device on the go. These systems are like ALERT and FORGOT. We can use this hand sighs in controlling mouse, keyboard functions. Rapid and simple conversion of hand movements into 3D computer space for the purposes of computer animation is another area of interest.

The hardware used for computer games of present generation slowly replacing with the sign language. Control of mechanical systems such as robotics. Using the hand to remotely control a manipulator. The extensive experiments demonstrate that our hand gesture recognition system is accurate efficient robust to hand articulations, distortions and orientation or scale changes, and can work in uncontrolled environments with cluttered backgrounds (Malassiotis and Strintzis, 2008) and lighting conditions. The superiority of our system is further demonstrated in two real-life HCI applications (El-Sawal et al., 2008).

There are many pattern recognition
techniques. However, the problem with gesture recognition (Nasser et al., 2011) is that the inputs usually consist of multi-dimensional and time-varying Data. If the input data were either multi-dimensional or time varying, existing pattern recognition techniques could easily be applied. A common approach to handling such data is to divide each gesture into short phases, and then to recognize each phase using a pattern recognition technique for multi-dimensional data. In order to be applicable to current PCs and mobile devices, a gesture recognition system should be based on existing and common hardware such as low-resolution web cams or mobile-integrated cameras. It is also desired that the System will be able to operate under non-uniform background, lighting and noise conditions. Another requirement for the gesture recognition system is to be computationally non-intensive in order to be suitable for real-time classification.

We use an SVM to learn the transition conditions for each state. The SVM is a popular pattern recognition technique with supervised learning. Since it divides the feature space for each class, the SVM can handle unknown data well, although it is not suited to grouping sample data. In order to classify the dynamic hand gestures under noisy background, motion history image and different groups of novel Haar-like features (Kolsch and Turk, 2004) are investigated to classify the dynamic up, down, left, and right hand gestures. A simple efficient algorithm using Support Vector Machine is developed. These defined hand gestures are intuitive and easy for user to control most home appliances. The primary idea of the SVMs is to implement a hyperplane (Hirotaka et al., 2001) as the decision plane, which separates the positive and negative binary classes with the largest margin, which is related to minimizing the VC dimension of SVM. In a binary classification problem where feature extraction is initially performed.

**BLOCK DIAGRAM AND EXPLANATION**

**Components Description**

**Transmitter Section**

A Camera is used to capture the frames from real time. Most of the technological device comes with integrated cameras however we can add the externally to make it more flexible.

PC is the module where all the processing like storing temporary frames, developing pattern recognition algorithm takes place. It has to be with good processing speed and also has to support the required development environment.

UART provides the physical communication link between the PC and the hardware we are developing. The MCU is the processing unit for the hardware.

Encoder module improves error less transmission over a noisy channel. We can use NXM class devices based on our requirements.

RF transmitter suitable for short distance communication. Speed and Accurate. The rate
of oscillation in the range of around 3 kHz to 300 GHz and 3 m to 30 m distance can be covered.

**Receiver Section**

RF receiver receives the signal sent by the transmitter and decodes it.

Decoder helps to find the errors occurred in the transmission.

Voice board is nothing but a sounding device. It’s like an announcer of the recognized sign. Let’s say when system identifies a sign as ONE it speaks as ONE.

Most of the high end industrial application devices have relays for their effective working. Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their applications. We use Single Pole Single Throw (SPST) type here for implementation. However we can choose our desired type based on the requirement.

**SOFTWARE ENVIRONMENT**

The required software environment is provided by the Programs named OpenCV and Microsoft Visual Studio.

OpenCV is an open source C++ library for image processing and computer vision, originally developed by Intel and now supported by Willow Garage. It is free for both commercial and non-commercial use. Therefore it is not mandatory for your OpenCV applications to be open or free. It is a library of many inbuilt functions mainly aimed at real time image processing. Now it has several hundreds of image processing and computer vision algorithms which make developing advanced computer vision applications easy and efficient.

**Key Features:** Optimized for real time image processing and computer vision applications. Primary interface of OpenCV is in C++. There are also C, Python and JAVA full interfaces. OpenCV applications run on Windows, Android, Linux, Mac and Ios. Optimized for Intel processors.

OpenCV(http://docs.opencv.org/master/doc/user_guide/user_guide.html) has a modular structure. The main modules of OpenCV are listed below

**CORE:** This is the basic module of OpenCV. It includes basic data structures (e.g. - Mat data structure) and basic image processing functions. This module is also extensively used by other modules like highgui, etc.

**Highgui:** This module provides simple user interface capabilities, several image and video codecs, image and video capturing capabilities, manipulating image windows, handling track bars and mouse events and etc.

**Imgproc:** This module includes basic image processing algorithms including image filtering, image transformations, color space conversions...
and etc.

**Video:** This is a video analysis module which includes object tracking algorithms, background subtraction algorithms and etc. Objdetect: This includes object detection and recognition algorithms for standard objects. OpenCV is now extensively used for developing advanced image processing and computer vision applications. It has been a tool for students, engineers and researchers in every nook and corner of the world.

The library is very much rich for processing real time images some of those important functions and syntax are given below. However you can find these functions in the official page of the OpenCV as its free of licence.

```c
typedef struct CvCapture;

CvNamedWindow ();
Creates window with given name.

Syntax: Int cvNamedWindow (const char* name, int flags=CV_WINDOW_AUTOSIZE);

CvGrabFrame();
Grabs frame from camera or file.

Syntax: int cvGrabFrame( CvCapture* capture)

cvReleaseCapture();
Releases the CvCapture structure

Syntax: void cvReleaseCapture( CvCapture** capture);
```

**WORKING**

A camera is used to acquire the image in real time and then sends to PC. It may be a integrated to the system or we can add externally. We cannot process images as soon as we got them from camera in real time The image is stored temporarily and processing section will the recognize the hand gesture. First the trained xml file must be lined in the program so that the system first identifies the hand. Then we focus on the hand part. We convert the hand image into a fully binary image which is a black and white version of the image. This also known as histogram of the image in which all pixels must either white or black. Then the system able to recognize the gesture of the hand and the corresponding signal is sent to the transmitter section which is connected to PC. The transmitter transmits with RF frequency. The receiver receives the signals and control the device with relay as per the hand gesture. The voice board tells the identified gesture.

However real time noise is unpredictable so we can implement some additional add-ons. First we make sure that the object (Viola, 2001) present in the frame is human for this we can look for face. As the sensors are abundantly available in the market we can go for a temperature sensor to verify the human with body temperature or we can go for a heartbeat sensor. The noise can be minimized with image processing techniques, Absolute Difference, Contour, and Binary Thresholding.

**OBSERVED RESULTS**

The number fingers in the frame can be identified from camera in real time. The image is stored temporarily and processing section will the recognize the hand gesture. First the trained xml file must be lined in the program so that the system first identifies the hand. Then we focus on the hand part. We convert the hand image into a fully binary image which is a black and white version of the image. This also known as histogram of the image in which all pixels must either white or black. Then the system able to recognize the gesture of the hand and the corresponding signal is sent to the transmitter section which is connected to PC. The transmitter transmits with RF frequency. The receiver receives the signals and control the device with relay as per the hand gesture. The voice board tells the identified gesture.

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show that the system can achieve satisfactory real-time performance regardless of the frame resolution size as well as high classification accuracy under variable scale, orientation and illumination conditions, and cluttered background. Three important factors affect the accuracy of the system, which are the quality of the webcam in the training and testing stages, the number of the training images. However, if detection of hand gestures for computer animation (Du W and Li H, 2000) is required then we must train the system with thousands of gestures which is complex but yields high accuracy. A system which relies on both training and comparison of all gestures used would not be sufficient for this task.

**REFERENCES**


