

# Real Time Hand Gesture Recognition System Using Webcam for Convenient HCI

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## ABSTRACT

With the large use of computers, Human computer Interaction has become an important part of our daily life. Gesture recognition enables humans to communicate with the machine and interact without any peripheral device like mouse, keyboard etc. Compared to many existing interfaces, hand gestures have the advantages of being easy to use and intuitive. Gestures are used widely for different applications on different domains. This includes human-robot interaction, sign language recognition, interactive games etc. The essential aim of building hand gesture recognition system is to create an interaction between human and computer where the recognized gestures can be used for controlling a computer. With the help of this technique one can pose a hand gesture in the vision range Of a computer and desired action is performed by the system. Simple web camera is used for computer vision, which helps in monitoring gesture presentation.

**Index Terms:** Human Computer Interaction (HCI)

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## I. INTRODUCTION

In HCI there is communication between humans and machine without need of any physical contact with the device and this can be achieved by eliminating peripheral devices like mouse, keyboard. In this project there is interaction between humans and computer as we are giving input to computer through gestures. Much system uses sensors for recognition of gestures. But there is limit on distance and also they are costly. MPU 6050 sensor is used in mobile. But its range is only up to 0.2 m to 0.5 m, so there is limit on distance in sensors. But we can increase distance using webcam. It is easily available and price is also low as compared to sensors. So we decided to use webcam instead of sensors.

## II. MOTIVATION

Sensors cover limited distance and also they are costly. So here we decided to use webcam instead OS sensors so that it will overcome disadvantages of sensors.

Design a real time hand gesture recognition system using webcam instead of sensors increasing efficiency between human and computer interaction over a long distance. The essential aim of building hand gesture recognition system is to create effective and Convent an interaction between human and computer where the recognized gestures can be used for controlling a computer.

## III. LITERATURE SURVEY

In paper [1] presents the design and implementation of a system of accelerometer-based hand gesture recognition. This system will be embedded within a modern remote control to improve human-machine interaction in the context of digital TV of Argentina. Models such as the multilayer perceptron (MLP) and the support vector machine (SVM) are types of artificial neural networks (ANNs) that attempt to reproduce the problem-solving process of the brain. The drawback of

this paper is the gesture should be performed in slow motion also all the gestures should be gone under proper training and validation process. (Artificial neural networks (ANNs) that attempt to reproduce the problem-solving process of the brain.)

In paper [2] presents a technique for real time human hand gesture recognition system for automatic tap operation. In this work there are two major steps for achieving this goal: firstly, the detection of skin colour and secondly, the classification of a gesture into valid and invalid hand gesture for the operation of the water tap. The proposed system uses Support Vector Machine and neural network for classification of the hand gesture which in turn operates the tap. The Drawback of this paper is the recognition of skin color and the to be validated in proper manner i.e. all the five fingers of the hand has to be opened and waved.

In paper [3] a real-time Kinect-based dynamic hand gesture recognition (HGR) system which contains hand tracking, data processing, model training and gesture classification is proposed. In the first stage, two states of the performed hand including open and closed are utilized to achieve gesture spotting and 3D motion trajectories of gestures are captured by Kinect sensor. Further, motion orientation is extracted as the unique feature and Support Vector Machine (SVM) is used as the recognition algorithm in the proposed system.

The drawback of this paper is it uses 3D motion trajectories of gestures using kinetic sensor. Also this sensor is of high cost.

In paper [4] they have proposed a hand gesture recognition system for American Sign Language recognition using important features of hand such as fingertips, palm center etc. The system is capable of recognizing hand gestures even when the fore-arm is involved and it can tolerate a certain rotation of palm and fore-arm. We have implemented principal component analysis to remove ambiguity between two similar types of gestures and given emphasis to detect movement epenthesis by means optical flow technique.

In paper [5] a vision-based hand gesture recognition system is considered in this paper. Unlike other hand gesture recognition studies, our study considers a complicated background and possible dynamic motion of hands. Thus, instead of using simple background subtraction, in this study, many problems are considered, such as detection of skin color image, detection of when a hand reaches in the field of the camera view and detection of a full palm. The proposed system consists of four stages, detection of the appearance of hands, segmentation of hand regions, detection of full palm, and hand gesture recognition. Detection of the appearance of hands is to find out when a hand appears in the front of the camera. Moreover, some morphological techniques, along with two stage skin color detection, are employed to alleviate the effect of noise. The proposed two-stage skin

color detection approach is adopted from the idea of handling outliers to extract the palm from a Complicated background.

#### IV. EXISTING SYSYEM

This architecture presents the design and implementation of a system of accelerometer-based hand gesture recognition. This system will be embedded within a modern remote control to improve human-machine interaction in the context of digital TV [1].

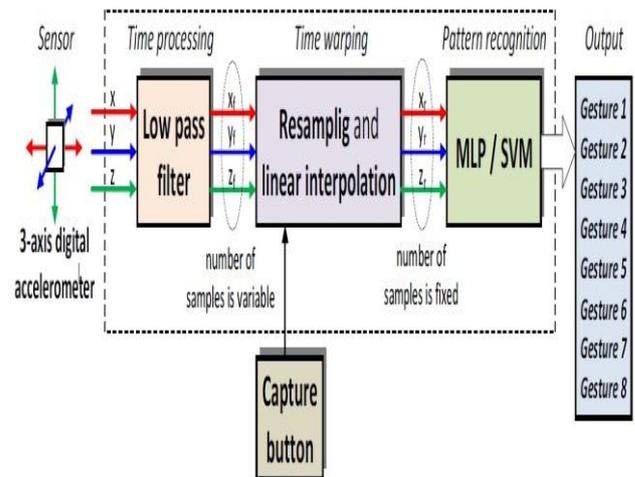


Fig.1. blocks diagram of accelometer based hand gesture recognition system.

The system [1] accelometer based hand gesture recognition has as inputs the acceleration signals and the capture button. The acquisition of the acceleration vectors for a given gesture starts when the capture button on the remote control is pressed and ends when the button is released. In this way, the samples of the 3 axes that make a gesture are obtained. The system has a single output corresponding to the recognized gesture from the captured samples, which will be converted into a control command for digital TV systems.

In our system we are going to cover some of the disadvantages of accelometer based hand gesture reorganization system. Firstly in proposed system they were using a sensors to capture the hand gestures performed by remote control in front of TV so in our system we are using a Standard Web Camera to capture the hand gestures so automatically the cost will be reduce due to Standard Web Camera because its cost very less as compare to sensors in all gesture reorganization systems. Another factor is distance, so we increase the distance of capturing a hand gestures. And in Accelometer based hand gesture reorganization system they are training the database with the help of different techniques but in our system database training is not required because we are going to store all the patterns in system to match the activities which are going to perform.

**V. PROPOSED SYSTEM**

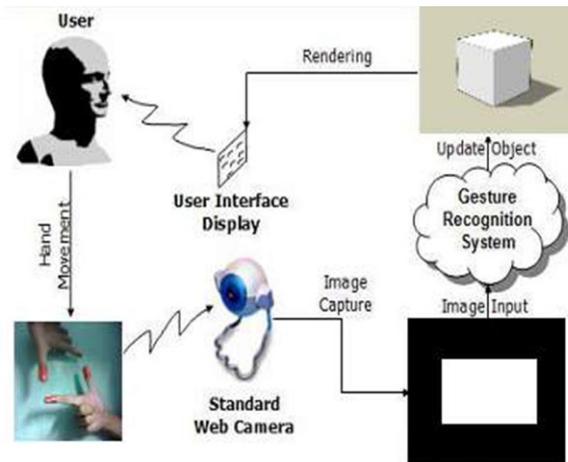


Fig.2. blocks diagram of real time hand gesture reorganization system using web camera.

**VI. WORKING PRINCIPLE**

The goal of gesture recognition in HCI context is for a computer to interpret or recognize gestures made by the user. Vision-based gesture recognition aims to use cameras and computer vision techniques to detect, track and recognize gestures. In the system architecture user interacts with two devices first one is use interface (Monitor) and second one is web camera. When user interact with system By hand gesture that time camera record the video and recognize the gesture. The main steps typically involved in vision-based gesture recognition include these stages.

1. Image pre-processing: to perform color interpolation and improve signal-to-noise ratio.
2. Object segmentation: to localize and segment objects of interests, such as head, face and hands.
3. Feature extraction: to extract a small set of salient parameters to represent each gesture and provide good distinguish ability between gestures.
4. Gesture classification: a pattern recognition task which compares incoming feature vectors against those from a database of predefined gesture representations. The gesture database is built through training and modeling. HMM (Hidden Markov Models) is a widely used technique for classification.

When all the above steps perform it perform action related to that gesture on screen, to provide proof-of-concept for the Gesture Cam idea, we used a Logitech Quick Cam Pro 4000 and a PC to implement a smart camera that can perform head and hand gesture recognition in a desktop environment

$$IZ(W, D) = \sum_{i=0}^1 \sum_{j=0}^1 (W + i, D + j, W, D)$$

**VII. ALGORITHM**

- Step 1. Start Webcam.
- Step 2. Perform Hand Gesture in front of webcam.
- Step 3. Webcam Capture user gesture in image format.
- Step 4. User gesture image is given as input to Gesture recognition system.
- Step 5. Gesture recognition system matches user gesture image with predefined gesture image.
- Step 6. If user gesture image is matched with predefined image then the operation is performed.
- Step 7. Output will get display on screen as per gesture.

**VIII. FUTURE ASPECTS**

The proposed system has a wide variety of applications and can be modified or extended for the future use. This proposed technology can be implemented in security systems to provide the authentication.

A particular set of hand gestures can be used to open or close the locker and system. This technology can be easily implemented on modern smart phones with front facing camera. The application for the system can be developed on both android platforms as soon as android packages are available. The system works very well in real time as tested.

TABLE 1. ESTIMATED RESULTS

	Paper Name	speed	distance	cost
1	Accelerometer-Based Hand Gesture Recognition System for Interaction in Digital TV	Low	0.2 -0.5	High
2	Hand Gesture Recognition for Automatic Tap System	Good	0.2 -0.5	High
3	A Real-time Dynamic Hand Gesture Recognition System Using Kinect Sensor	Low	0.2 -0.5	High
4	Hand Gesture Recognition System with Real-Time Palm Tracking	Low	0.2 -0.5	High
5	Vision-based Hand Gesture Recognition System for a Dynamic and Complicated Environment	Low	0.2 -0.5	High

## IX. CONCLUSION

Our desired system will use web camera instead of sensors which will increase the distance significantly between user and machine detecting hand gestures from User and will perform operations significantly according to it. And reduces project cost also.

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