



APPLICATION INVOCATION BASED ON HAND GESTURE RECOGNITION USING DEEP LEARNING TECHNIQUES

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ABSTRACT

Hand gesture recognition provides an intelligence and natural way of interaction between human and computer i.e., HCI. The main goal of hand gesture recognition is to create a system which can identify the specific gestures of human and make use of them to convey information for control the device. Vision-based hand gesture recognition is considered to be more feasible for HCI in the field of computer vision and pattern recognition with the help of latest advances. The project deals with various techniques, methods and algorithms related to the gesture recognition. Hand gesture recognition has the advantage to communicate with the system through basic gesture language. Edge detection is the most commonly used technique in image analysis, and there are more algorithms to enhance and detect the edges. An edge is defined as the boundary between an object and the background, and it also indicates the boundary between overlapped objects. The threshold boundary is used for detecting hand and gestures of user very faster. Based on gestures the specific applications can be opened.

Keywords—*edge detection; segmentation; classification; threshold boundary, sign language;*

A. INTRODUCTION

Touch and Gesture are the two natural ways for a user to interact in the environment. Gestures are involved in remote interaction with smart screen or virtual reality. Gesture recognition is an important one in the interaction of human and robot. Few years back, Hand gesture recognition (HGR) has been employed in various application areas such as virtual reality, gaming and vehicle automation. HGR is performed through two methods.

- Vision Based Recognition (VBR)
- Sensor Based Recognition

VBR utilize camera to capture hand image and analyze image feature extraction. In sensor based approach, digital based gloves and sensory devices are used which collects the gesture data of user. Some algorithms are followed in HGR are Neural Network Algorithm, ROI (Region of Interest) Algorithm[1], Binarization Algorithm, Skin Detection Algorithm.

Neural Network Algorithm is used for identifying fingers. ROI Algorithm is used to count the fingers [1]. Binarization Algorithm is used to assign the value 0 for background image and value 1 for foreground image. Skin Detection Algorithm detects the skin region from input image [2].

B. EXISTING SYSTEM

Gesture Recognition consists of two approaches a) Vision based b) Digital Glove based. Gloves are made of chips. The system displays chip as red pixels. In glove based approach, some type of flex sensors, accelerometers are used. Flex sensor calculates the amount of deflection whereas Accelerometer measures changes in gravitational acceleration [3]. Image processing is used to convert an image into digital format and perform functions on it in which image like photo as input. The flex sensor and Accelerometer are used which provides analog signals regarding the orientation and position of the Robot to the microcontroller [3]. The signals are processed by microcontroller and transmit the processed data to the computer. Gestures can be either static or dynamic. In static gesture, image is captured using camera. The captured image is given for analysis by using segmentation. The image captured is in RGB color model. RGB image is then converted into HSI color model because the skin regions are easily detected in HSI color space. After that the recognized hand is converted into binary image. Binarization Algorithm is used to assign the value 0 for background image and value 1 for foreground image. The major disadvantages are hand segmentation become complex of various backgrounds, Glove cost is very expensive.

C. PROPOSED SYSTEM

In this system, the web camera is used to capture the video stream of hand gestures provided by user in real time. The Captured image frame is taken as input and processed using Image processing method. The input image is taken from web camera. While capturing image, red line represents convex hull, green line represents contour that is hand [7]. The given RGB image is converted by eliminating hue and saturation into gray scale image [4]. The obtained image is then

adjusted by illumination control. In gray scale image, background estimation is done by using ROI (Region of Interest) Algorithm [1]. It creates the structural element using disk shape known as Frame Separation method. The background is eliminated from gray scale image [5]. It identifies the hand from background separated image by converting into binary image. The identified hand gesture is processed to open the particular application and voice output is obtained through the speaker. The major advantages of handling this device are segmentation accuracy is high, easy to detect the finger counts, open application with less computational steps.

D. LITERATURE SURVEY

A Title “Hand Gesture Recognition using DWT and F-Ratio based feature descriptor” was authorized by **Jaya prakash, Sahoo** [9]. In this paper, the Static Vision based hand gesture recognition is developed under the following steps: preprocessing, feature extraction and classification. A discrete wavelet transform (DWT) and Fisher ratio (F-ratio) based feature extraction technique are used, which are used to classify the hand gestures in an uncontrolled environment. A linear support vector machine (SVM) is used to recognize hand gesture and it is handled as a classifier.

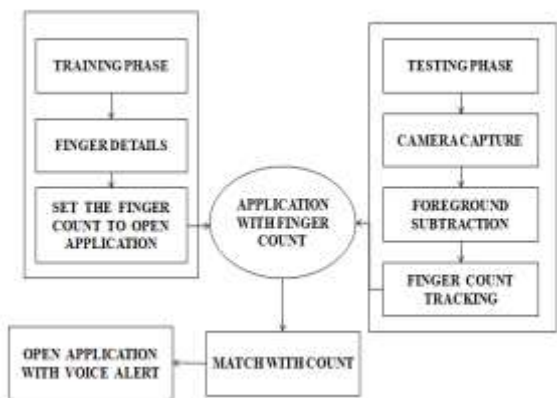
A Title “Finger Detection for Hand Gesture Recognition using Circular Hough Transform” was authorized by **Amrita, Biswas** [8]. In this paper, Captured image is taken as input. A technique used is Circular Hough Transform which detects the circles in imperfect image and calculate radius value. Gesture could be difficult in understanding variations and flexibility nature of the hand shape. Some tracking information like skin color or shape is used.

A Title “Deep Learning for Hand Gesture Recognition on Skeletal Data” was authorized by **Guillaume, Devineau** [10]. In this paper, Convolutional Neural Network (CNN) is introduced to processes the hand skeletal data and no depth image is calculated. Some commonly performed features are the orientation of the joints, the position of skeletal joints, the angle between joints, the distance between joints, are calculated from the

skeletal data. The drawback is it only works on complete sequence.

A Title “Hand Gesture Recognition using Input-Output Hidden Markov Models” was authorized by **Sebastien, Marcel**. In this paper, HGR is based on Input Output Hidden Markov Model (IOHMM) [11]. The IOHMM uses the current observation of gestures. When the trained gestures are encountered, the classification is more powerful than the neural network used.

E. SYSTEM DESIGN



In training phase, train the user about the finger count details. Set the finger count to open the particular application. In testing phase, capture the hand image using web camera. By Background subtraction method, background details are eliminated, only foreground image is considered [5]. Then track the finger count using algorithms. Neural Network Algorithm is used for identifying fingers. ROI Algorithm is used to count the fingers [1]. Binarization Algorithm is used to assign the value 0 for background image and value 1 for foreground image. Skin Detection Algorithm detects the skin region from input image [2]. Finger counts are set to open the application in coding phase. The tracked finger count is matched with the count in coding phase. Finally the application will be opened with voice alert message through the speaker.

F. METHODOLOGY

There are several methods that are used in HGR. They are Skin detection, Edge detection method, Neural network. In Skin detection method, image is captured and converted into frames. The image in RGB is converted into HSI color space. Finger tip is detected using this method [2]. In Edge detection method, Canny edge detector is used. Vectorization is performed on each of the pixels which are located at the boundary [6]. In neural network, neurons are organized into input, hidden and output layers. It is a set of input values and associated weights.

G. MODULES

- a. Hand image acquisition
- b. Background subtraction
- c. Region of Interest
- d. Finger count detection
- e. Application process

HAND IMAGE ACQUISITION

Hand image is captured using web camera. The purpose of web camera is to capture the hand gesture generated by user and stored it in memory. The .NET framework package is used to store the image in memory.

BACKGROUND SUBTRACTION

Defining the background can be hard when it contains overlapping objects such as shadows, shapes and moving objects. The system must need to adapt these changes. The technique is used to extract the foreground from background image [5]. Using binarization approach to assign the values to background and foreground image. Foreground pixels are identified in real time environments.

REGION OF INTEREST

A Region of Interest (ROI) is a subset of a dataset or an image which is identified for a particular need. Hand image are extracted and provide segmented results. ROI Algorithm is used to count the fingers. The concept of ROI is commonly used in many application areas [1].

FINGER COUNT DETECTION

The centroid of the binary image is determined [7]. This will be the center of the hand which will be used to remove the wrist of the hand and palm [6]. The largest distance between one pixel to another on the contour of the object is determined using ROI formula. This method is very much useful when the background intensity should be similar every time the system is used. The system might fail when depending on the user's hand skin color.

APPLICATION PROCESS

The gestures are classified using the maximum distance between the centroid of the two fingers determined in the finger detection process [7]. The finger count can be classified to open applications for blind user. If finger count is 1 means, open video clip, 2 means open news link.

H. PERFORMANCE EVALUATION

EFFICIENCY:

It is defined as the total number of accuracy based on the segmentation, features and image recognition and some other properties.

Efficiency=

$$\frac{\sum \text{Total number of favourable conditions on the basic feature} * 100}{\text{Total number of conditions}}$$

Total number of conditions

I. RESULTS

STEP 1: Click "START" button



STEP 2: HGR Application will be opened



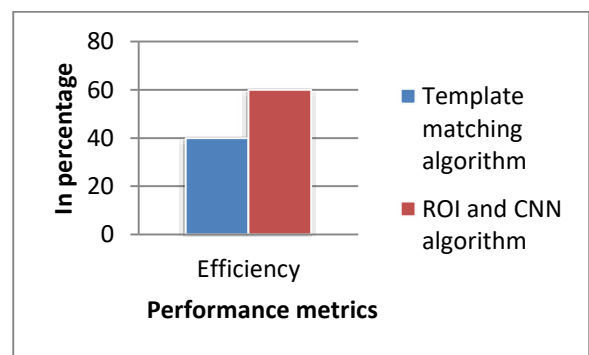
STEP 3: Front camera analyze the gestures



STEP 4: Video clip is opened with voice alert



J. PERFORMANCE CHART



K. CONCLUSION

One of the most requiring abilities to the human being is an ability to listen, speak, see and respond according to the situation. But there are some unfortunate ones who are disadvantaged of this and not aware of using computer. The project aims in bridging the gap by introducing the inexpensive computer so that the gesture language is captured, recognized and translated into speech for the benefit of blind people. This makes the user feel like a normal person with the help of finger classification.

L. FUTURE WORK

In future, the approach can be extended to implement the framework with deep learning algorithm and

embed the system with real time embedded systems. Framework would have the capacity to convey by precisely knowing the yield from specific part. It will have the ability to make an explanation of different pronunciation to hand signals effectively. It will also have the ability to close the application by hand gesture when user wants to switch over to another application.

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