A Review Of Various Hand Posture/Gesture Recognition Classification Approaches

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Abstract:-Hand gesture recognition has been increased with the time because of its applications and has capability to interface machine efficiently through system interaction.The different applications of hand gesture recognition are robot control, medical, gaming,sign language smart home system.The limitations are hardware, cost,and difficulty in target detection. The main goal of hand gesture recognition is to recognise human gesture to convey the information for controlling device. HGR system has a good care nowadays because of simple interaction among human and machine. In this paper a critical review on the hand gesture recognition is presented.The fundamental issues of the hand gesture recognition system is presented with the challenges of the hand gesture system.The methods are involved with different approaches which are sensor based, vision based, motion based and color based recognition. The classification techniques which are based on machine learning used to detect the patterns in the data and recognition of the new hand gesture data sets.

Keywords:- *Sign Language, Hand Gesture Recognition, Robot Control and postures.*

I. INTRODUCTION

Gesture Recognition refers as perceptual user interface (PUI) along with face recognition, tracking of eyes and voice recognition. Gesture Recognition is basically mathematical interpretation of human movement through computing system. PUI enhance the efficiency of the logical design of the program stored inthe system device. In gesture recognition, movement of the body is recognised by camera or the system. Gesture originates from the movement of the body and hands which can originate as hand gesture recognition or face motion recognition[3]. The system may able to solve complex structure and conditions. The overview of gesture recognition is given in figure below:

Hand Gesture
Hand Gestures represents different hands and shapes by gesture recognition system to generate the results through computer vision. The detection of hand gestures extracts the necessary features of the hand image.

Hand Gesture Recognition
Hand Gesture recognition is the recognition of the movement of hands in space trajectory and perform operation based on parameters. Hand Gesture divided into

different types namely dynamic gesture recognition, static gesture recognition. HGR captures the image through the camera to get the hand image which is pointed to the system. Then image pre-processing is done and after that the image segmentation and extraction of the feature image sequence to understand the behaviour is done. The system monitors the data in form of data streams and that are separated. The classifier method used to extract &detect the feature to recognize the gesture in the given image.
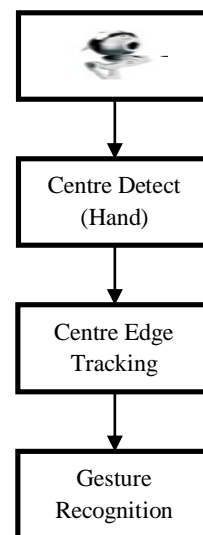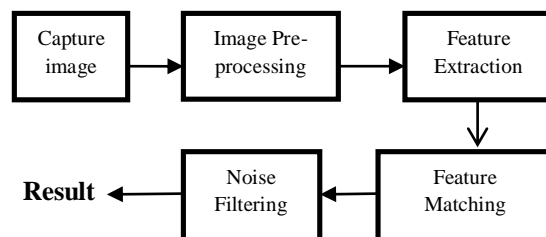

Figure 1 Gesture Recognition

Figure 2 Hand Gesture Recognition

The Hand gesture recognition based on different approaches:-

1. Segmentation: - The image segmented and manipulated simultaneously before analysing the patterns and pixels. New images are created after the segmentation.

2. Tracking: - The consecutive frames are tracked with each frame.

3. Pattern recognition:- The features of the data stored in database correspond to motion of the hands.

Applications Prospects of Gesture Recognition are:

1. Education.
2. Control Virtual reality environment.
3. Home appliances and control field.
4. Improves human language understanding.
5. Gaming Zone, medicine, business, computer and many other fields.
6. In the techniques of Sign languages.
Challenges of Gesture Recognition are:-

1. Difficult to detect target.
2.Hand gesture has lot of redundant information.
3. Difficulty in target recognition.

II. RELATED WORK

*Xu, Y. and Dai, Y et al., 2017[2]*reviewed a research on the appearance model and use of gesture recognition planning to outline the ordinarily utilized hand gesture recognition strategies, investigation their quality and frail focuses, and rundown the testing issues in ebb and flow research of handgesture recognition[1]. Hand is a flexible item, there may huge contrasts exist between same signals and high closeness between various motions. Along these lines, same signals made by various individuals may fluctuate, and motions made by a similar individual at various time or spot may likewise extraordinary.*Fang, Y and Wang, K et al., 2007[3]*focused on appearance display based technique. There have been various research endeavors on appearance based technique as of late. Freeman and Weissman perceived motions for TV control utilizing standardized connection [3]. This strategy is productive however might be delicate to various clients, misshapenings of the posture and changes in scale, and background. It is a testing undertaking to follow the enunciated articles. Despite the fact that shape based strategies accomplish better outcomes for unbending articles, it isn't appropriate for the verbalized items, for example, hand. Surface or appearance based strategies have been improved to be progressively vigorous for the non-inflexible articles. A few methodologies resort to background modelling with confinement of stationery camera.*MeenakshiPanwar et al., 2012[4]* proposed a research on real time system by detecting features fingerprints , thumbs, orientation for hand gesture recognition. In this research, shape parameters of hand gestures. The gesture recognition mainly done on the basis skin, color and texture based on the features of the extracted image. The simple web cam works on the basis of intensity of the pixels by removal of the background noise through k

mean clustering for segmentation of the image. In this research, several steps of the thumb and finger detection for hand gesture recognition approach. Normally the individuals use the writing texts of hand gestures on electronic document like MS Office, notepad. The power of the method is that it is very simple, dynamic approach and high recognition at minimum computation.*RafiqulZaman Khan et al., 2017[5]* proposed a research ondifferent methods of hand gesture recognition system through neural network, fuzzy mean clustering. Several methods and algorithms based on feature extraction to capture the shape of the hands. In this research, the methods of the different postures and gesture system are presented in this research. The hand gesture recognition system has natural interaction between the system and the hardware system. The gesture system has the ability to interact with the efficient machine through interaction with system interaction and hardware.*SonalGarg etal., 2015[6]*proposed a research on the history of the communication technologies which have great access to sensor disabilities. In this research, there is need of the electronic devices to translate sign language into motion of speech which takes place in the mute communities. Wireless data gloves are used through the sensor for the data communication. The deaf people use the gesture methods to express the emotions and views so that opposite persons can understand their view of speech. The detection of the gesture process is employed for the sanctioning of the communication between the individuals.

III. DIFFERENT METHODS OF HAND GESTURE RECOGNITION

1. Sensor Based Recognition: -Sensor Based Recognition use electronic sensors for capturing the movement and location of hand gesture. Sensors may be of different types, vision based, mount based,and multi touch screen sensors.The palm and finger locationcan be sensed using sensor of gloves.Itis difficult system because uses the electric connection.The example of sensor based approach is data glove. The advantage of this approach is high speed and accuracy.Sensor based approach is expensive so to overcome this, visual based is established[8]

Figure 3 Data Glove

2. Vision Based Recognition: -This approach is very simple, natural and convenient to users because human can communicate with the system.The alphabets and numbers can be recognised by using vision based approach. The

images of the hands are captured by cameras and various types of cameras are used for this approach.

3. Motion Based Recognition: -This technique is based on recognition of movement of object. This approach is very complexfor object detection, object description, motion modelling, and pattern recognition and for gesture recognition[10].

4. Color Based Recognition: -This approach is used to track the body movement based on markers of different colors. The markers used to interact with visual models and accessibility of zoom, draws, and writes on virtual keywords. This model is flexible and users mount different coloured markers i.e red, greenand yellow.

Figure 4 Color based recognition

4. Depth Based Recognition: -The Gesture recognition is one of the important component in depth based approach. This model based on 3-D geometric information of the depth camera. The principle of this approach relates to 3D feature and depth of the image.The depth of the image compared with color image

IV. SEVERAL CLASSIFICATION METHODS
Machine learning has an ability to solve pattern matching problem and algorithm of system trained by data sets.This method able detects the pattern in data and the pattern used in problems for recognition of new data sets. The classification methods based on machine learning in hand gesture recognition are:-

1. Pre-processing:- In this process the curved outline of the vertices of image are coloured red.The vertices joined by blue lines forms a polygon.

Figure 5 Pre processing

2. Polygon Approximation: - In this process the approximation of the two dimensional curves shown as polynomial figure. Theunnecessary curves are removed and bended and the resultant image is simple polygonal image formed by closed polygonal path.
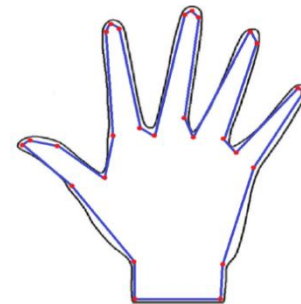

Figure 6 Polynomial approximation

3. Convex Differentiation: - In this model the complex figure are portioned into parts .The process divided in two categories:-exact and approximate. In exact decomposition the number of clusters are minimised and ensure each cluster have low threshold.
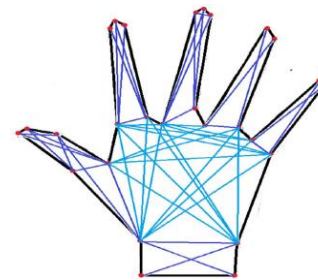

Figure 7 Convex Differentiation

4. Feature Vector:-In this process each gesture has 36 dimensions and the equivalent division of 5 degrees makes 36 partitions from 0 to 180 degree. In this method the mid points of wrist points are joined.One extra line is added to generated line to form feature vector.

V. CONCLUSION AND FUTURE SCOPE
It is concluded that the hand gesture recognition is used in the wide variety of the applications which are human computer interactions, robotics, and sign language recognition. Many researchers has done a lot of work in the hand gesture recognition. In this paper, various techniques of the hand gesture recognition has been summarised.The depth sensor is normally preferred using vision based and the glove based approach provides the color and as well as the depth data that are not affected by illumination background. In this paper the various challenges are

covered that are gesture, classification of the gesture and implementation of the gesture recognition system.The classification methods that includes Pre-processing, Polygon Approximation, Convex Differentiation, Feature Vector has been summarised.

The future scope is based on the combination of the hand gestures with the other gestures such as face recognition, body posture.The hand gesture recognition can be enhanced by comparing the sample dynamic images and static images in sign language.

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