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CURSOR CONTROL SYSTEM USING HAND GESTURES

[1]Mrs K. PRATHYUSHA, [2]T. ISHWARYA, [3]N. PRAVALIKA, [4]V. SOWMYA

[1]Assistant Professor, Dept.of CSE, Teegala Krishna Reddy Engineering College, Meerpet, Hyderabad,

[2,3,4]BTech Student, Dept.of CSE, Teegala Krishna Reddy Engineering College, Meerpet, Hyderabad

thikariishwarya@gmail.com, pravalika.nasu@gmail.com, Sowmyavanga44@gmail.com

Abstract: *In a world of technological advancements, almost 300 million are deaf and 1 million are dumb people. For conversations to be possible, knowledge on ways of expression and insights of their standard versions in practice are to be studied and as a concern towards making their lives better, many research works have been under progress. The following proposed project helps to develop an integrated system which can be useful for deaf/dumb people to easily communicate with normal people. This can be further developed into an innovative communication system which can support mobile or wireless communication for deaf and dumb in a compact device. The basic approach of the idea involves conversion of one mode of communication to the other which is Sign language to text/speech and control mouse using hand gestures. Sign language is a well-structured non-verbal communication skill through which a speaker's thoughts can be meaningfully conveyed where in, each gesture, including movement of head and other body parts, has a meaning assigned to it. In the proposed system a gesture or sign image is sent to the system which is then evaluated using neural network models like (CNN)convolution neural networks. It involves different layers where feature extraction and classification steps are performed to enhance the features extracted from the image. When the input image matches with the given datasets the output gesture is recognized and based on that mouse functions are performance.*

Keywords: *Cursor Control System, Hand gesture, convolutional neural network,*

I. INTRODUCITON

The main objective of this project is recognition of a gesture by appropriate training of the neural network and controlling mouse with gesture. We aim to achieve accuracy in identifying correct gesture during run time. This recognition system is beneficial for

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people who cannot communicate with normal people

In a world of technological advancements, human race have been experiencing the comforts. But a considerable part of our companions are deprived of these privileges because of being differently abled. According to the World Health Organization, about 285 million people in the world are blind,300 million are deaf and 1 million are dumb. As a concern towards making their lives better, many research works have been under progress. One such attempt is our effort in this project to develop an integrated system which can be useful for any of blind, deaf or dumb person to easily communicate with both normal and differently abled person of any disability. This can be further developed into an innovative communication system which can support mobile or wireless communication for deaf, dumb and blind people in a single compact device.

The basic approach of the idea involves conversion of one mode of communication to the other which is Sign language to text/speech. Sign language is a well-structured non-verbal communication skill. Speaker's thoughts can be meaningfully conveyed through sign language wherein, each gesture, including movement of hand, head and other body parts, has a meaning assigned to it. In the proposed system a gesture or sign image is sent to the system which is then evaluated using neural network model-(CNN)convolution neural network. It involves hidden layers where feature extraction and classification steps are performed to enhance the features extracted from the image. When the input image matches with the given dataset present in the neural network's memory, the gesture is recognized and corresponding output is produced

As the computer technology continuously grows to develop, people are now interested in smaller and smaller electronic devices. Increasingly

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we are recognizing the importance of human computing interaction (HCI), and in particular visionbased gesture and object recognition. In our paper, we propose a novel approach that uses a video device to control the mouse system (Mouse functions). Gesture recognition enables humans to be able to communicate with the machine (HMI) directly and interact naturally without any mechanical devices. Using the concept of gesture recognition, it is possible to point a finger bearing color caps at the computer screen so that the cursor will move accordingly to the movement of the color caps. This paper proposes a novel vision based cursor control system, using hand gestures bearing color caps on the fingertip captured from a webcam[10]. Today we are using mouse or a touchpad to control the computer mouse which required physical contact with the devices. In this paper, we are using hand gestures which are required no physical contact other than color caps with any device and we can operate it from a large distance. This can be very comfortable method to control mouse. So mouse control using hand gesture is a unique and new concept to control the computer mouse. The cursor control using hand gesture system can be implemented in MATLAB. The system was able to control the movement of a cursor by tracking the user's hand bearing color caps. Cursor functions were performed by using different hand gestures. This system has the potential of being a viable replacement for the computer mouse, however due to the constraints encountered- it cannot be completely replace the computer mouse. The major constraint of the system is that it must be operated in a well lit room. This is the main reason why the system cannot completely replace the computer mouse, since it is very common for computers to be used in outdoor environments with poor lighting condition.

II. LITERATURE SURVEY

- Bhumika Gupta, Pushkar Shukla,and Ankush Mittal have used HOG and SIFT to extract feature for

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image.These features are then combined into a single matrix.Correlation is computed for these matrices and is fed to a K-Nearest Neighbour Classifier.Out of 200 gestures 179 were identified correctly.

- Sanil Jain and KV Sameer Raja worked on Indian Sign Language Recognition,using coloured images.They used feature extraction methods like bag of visual words,Gaussian random and the Histogram of Gradients (HoG).Three subjects were used totrain SVM,and they achieved an accuracy of 54.63%when tested on a totally different user.

- Lionel Pigou,Sander Dieleman,PieterJan Kindermans,and Benjamin Schrauwen their contribution considers a recognition system using the Microsoft Kinect,constitutional neural networks(CNN's)and GPU acceleration.Instead of constructingcomplex handcrafted features,CNNs are able to automate the process of feature construction.They were able to recognize 20 Italian gestures with high accuracy. Their predictive model was able to generalize training with a cross-validation accuracy of 91.7%.

- Haitham Hasan and S.Abdul-Kareem have proposed a technique for hand gesture recognition based on shape analysis.They used neural network based approach to classify among six static hand gestures namely open,close cut,paste,maximize andminimize.They have used a unique multi-layer perception of neural network for classification using back-propagation learning algorithm.They were able to achievean accuracy of 86.38%.

III. PROPOSED SYSTEM

In the proposed method we are acquiring the important time images and videos from web camera through which it is able to convert the videos into images and can be process them.

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Our purposed Virtual Mouse can be used to overcome problems in the real world such as situations where there is no space to use a physical mouse and also for persons who have problems with their hands and are not able to control a physical mouse.current world scenario the COVID- 19 situation,it is not safe to use the device by touching them because it may result in a possible situation of the spread of the fungus or viruses by touching the devices.

The system can be grouped into four main components. Therefore, in the Methodology, the method used in each component of the system will be explained separately. There are following subsections:

1. Color Detection

2. Hand Contour Extraction

3. Hand Tracking

4. Gesture Recognition

5. Cursor Control

1. COLOR DETECTION

Color detection involves detecting the color pixels of the tapes bearing on the fingertip in an image. It is a fundamental step. A wide range of image processing applications such as face detection, hand tracking and hand gesture recognition. The result would be a grayscale image (back projected image), where the intensity indicates the likelihood that the pixel is a color tape pixel. This method is adaptive since the histogram model is obtained from the users color caps, under the preset lighting condition.

2. HAND CONTOUR EXTRACTION

The OpenCV [1] function cvFindContours() uses an order finding edge detection method to find the contours in the image. In the contour extraction process, we are interested in extracting the hand contour so that shape analysis can be done on it to determine the hand gesture

The assumption was made that the hand contour is the largest contour therefore ignoring all the noise contours in the image. This

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assumption can be void, if the face contour is larger than the hand contour. To solve this problem, the face region must be eliminated from the frame. The assumption was made that the hand is the only moving object in the image and the face remains relatively stationary compared to the hand. This means that background subtraction can be applied to remove the stationary pixels in the image, including the face region. This is implemented in the OpenCV[1] function named "BackgroundSubtractorMOG2".

3. HAND TRACKING

The movement of the cursor was controlled by the tip of the index finger. In order to identify the tip of the index finger, the centre of the palm must first be found. 4. GESTURE RECOGNITION The gesture recognition method used in the proposed design is a combination of two methods, the method proposed by Yeo and method proposed by Balazs. The algorithm for the proposed gesture recognition method is described in the flow chart that cab be shown below. It can be seen that the convexity defects for the hand contour must firstly be calculated. The convexity defects for the hand contour was calculated using the OpenCV inbuilt function "cv Convexity Defects". The parameters of the convexity defects (start point, end point and depth point) are stored in a sequence of arrays. After the convexity defects are obtained, there are two main steps for gesture recognition:

SYSTEM ARCHITECTURE

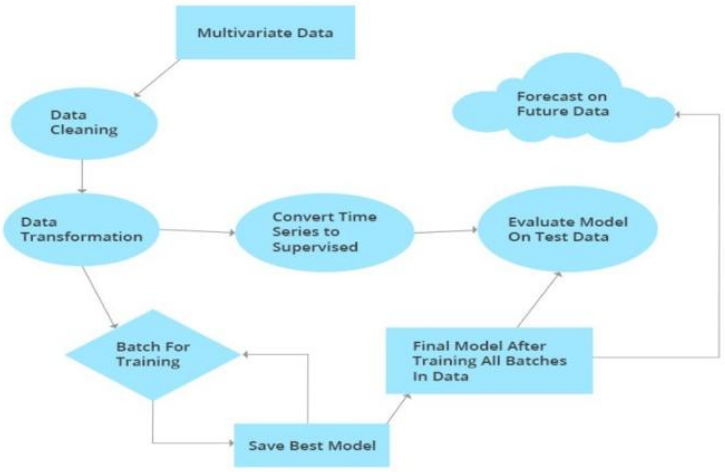

Fig.1 system architecture

A system architecture or systems architecture is the conceptual model that defines the structure, behavior, and more views of a system. An

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architecture description is a formal description and representation of a system. Organized in a way that supports reasoning about the structures and behaviours of the system.

IV. RESULTS

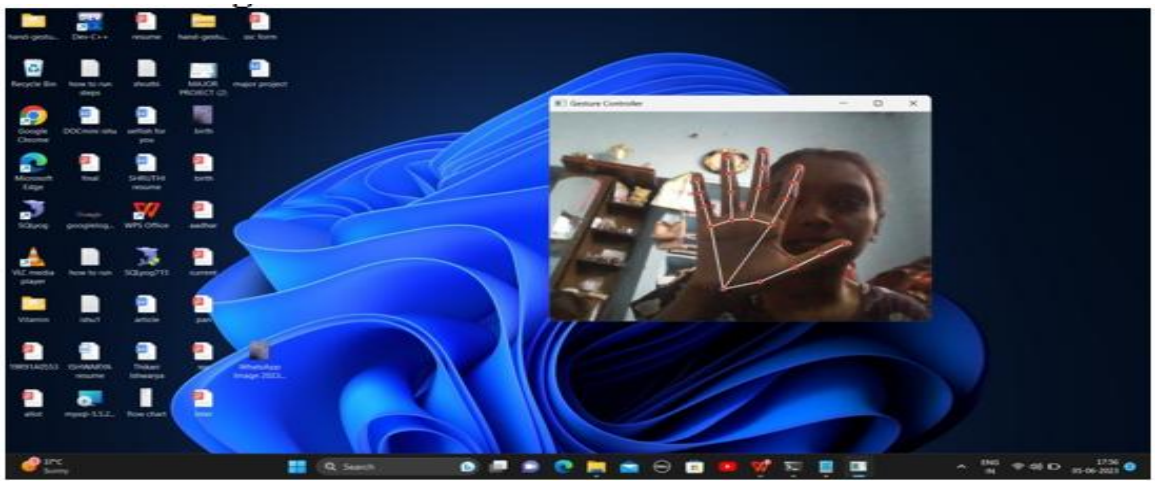

Fig.2 Hand Recognition

Fig.3 Right click:

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Fig.4 Curser movment

Fig.5 Drag

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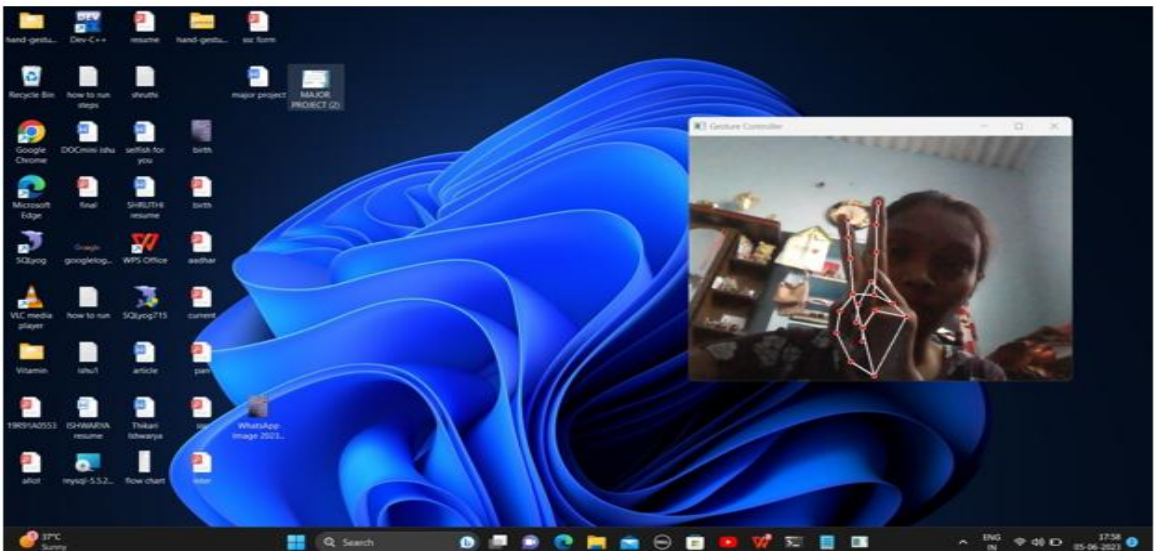

Fig.6 Paste

Fig.7 Volume control Gesture

V. CONCLUSION

Communication is an important part of our lives. Deaf and dumb people being unable to speak and listen, experience a lot of problems while communicating with normal people. There are many ways by which people with these disabilities try to communicate .One of the most prominent ways is the use of sign language ,i.e. hand gestures. It is necessary to develop an application for

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recognizing gestures and actions of sign language so that deaf and dumb people can communicate easily with even those who don't understand sign language. The objective of this work is to take an elementary step in breaking the barrier in communication between the normal people and deaf and dumb people with the help of sign language. The accuracy of the model obtained was appreciable when Convolution Neural Network was used.

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