Gesture Recognition by Using Neural Networks

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Abstract- *Disabilities in people like Paraplegia, Parkinson's disease can greatly affect their living . More than 270,000 patients suffer from various types of motor impairments in the United States alone . In the past few years Computational gesture recognition has made significant improvements. Our work presents a design on how gesture recognition helps in solving various problems faced by disabled persons in communicating things. An interface design is proposed based on research and Accessible interfaces state of art. The proposed system has the ability to recognize gestures shown to it. All it needs is a webcam. The gesture shown to the camera is processed by the computer after applying the neural networks.*

Keywords- Hand Gestures, Neural Networks

I. INTRODUCTION

Humans have used language as a communication medium throughout the history. Sign language is a way of conveying information using body language. This includes hand gestures, facial movements, movements of hands and legs etc. to communicate information. This way of communication is very useful for persons with impairments .

The proposed model uses computer vision, image processing, neural networks to recognize various gestures shown to it. It keeps track of the various gestures shown to it. When a particular gesture is shown to the camera,it captures that gesture and sends it to the neural network for processing. The neural network compares the gesture with its existing database and tells what kind of gesture it is.

The system rejects any type of errors which does not exist in its database. An error message is displayed when the patient's gesture is out of bounds.

II. RELATED WORK

The first gestures that were used for computer interactions date back to the work of Ivan Sutherland who demonstrated an early form of stroke based gestures to manipulate graphical objects on a tablet display using a light pen, this was known as Sketch Pad. This form of gesturing has received wide range of acceptance in the human and computer interaction community.

C.W .Ng et al proposed a vision based gesture detection system which was able to recognize 14 different types of gestures in real time to manipulate windows and objects within a graphical interface. It detects hand gestures through bending of fingers based on image property analysis.

As computer fields have merged along with computational ability to solve problems. Many researchers and computer engineers have worked on hand gestures and machine learning to achieve a good end. G.Qian and Peng.B developed Online gesture spotting from visual hull data, IEEE Trans. on Pattern Analysis and Machine Intelligence which was received very well. Later S. Mitra and T.Acharya has made a paper on Gesture Recognition which is a survey, IEEE transactions on systems, man, and cybernetics-part 2007.

Further M.Shah and J.Davis Recognizing Hand Gestures, in Proceedings of European Conference on Computer Vision along with K. T. Tseng and Y. T. Chen developed a multiple-angle hand gesture recognition system for human machine interactions, in Proceedings of 33rd Annual Conference of the IEEE industrial Electronics Society, Taipei, Taiwan.

III. PROPOSED SYSTEM

A gesture recognition system for disabled people is built using MATLAB. The proposed system depends on Vision Interface or GUI. The Vision interfaces are based on popularity and feasibility because the computer machine is able to communicate with user using webcam or camera. Using this , the user can be able to give commands (hands commands or gestures) to the computer by just showing some actions (hand movements) in front of the webcam without clicking mouse or typing on keyboard. Hand movements are the essential and vital points in hand gesture recognition model in the human hand model. This approach is based on detection and recognition on applying a learning model to reconstruct the hand mode.

1. Dataset :

There are fifty different gestures which are taken with the help of webcam and they are stored in database for

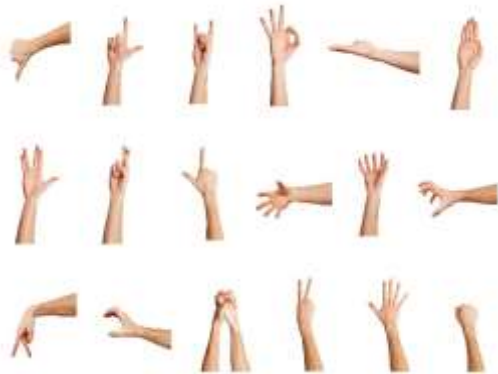training purposes. The data for testing will be taken at runtime.

Fig 1 : Hand Gestures

2. Image Acquisition:

The Image acquisition is the first step in image processing because without getting the images we cannot perform any kind of operation. The tools make it easy to acquire images and video from frame grabbers and cameras directly into MATLAB. In this work, the webcam is used to capture a video which is taken as input.

3. Feature extraction:

It is the method by which input data is changed into the set of features. It extracts necessary information from the input data. To perform the required task, it reduces the size of image input representation and simplifies the amount of resources required to describe a large set. In this work, feature extraction consists of two major steps. The first one is image segmentation and second one is edge detection. Image Segmentation is the method by which a digital image is separated into segments(small parts). Image segmentation is generally used to locate boundaries (lines, curves, etc.) and objects in images. In order to get those important parts, background subtraction has to be done. We have to detect the objects. Edge Detection is used to identify the points in a gesture image. The points can be easily detected by the sharp changes in the image. And these points are called as edge. Next the edge pixels are highlighted. For that we use a technique called the sobel edge detection technique. Later we have to convert an image to a binary image, based on threshold. This removes pixel value below the standard value. Finally to equalize the entire extracted pixel and to improve the local contrast of an image and bringing out more detail we perform adaptive histogram equalization.

4. Gesture Classification:

After completion of previous step, the application will convert the gesture into its recognized character which might be helpful in understanding sign language. In gesture recognition, take the image during runtime and perform feature extraction and maintain a trained data sets.The trained data sets contains output of feature extraction and also real hand gestures of the person. In this module, compare run time feature extracted images with trained feature extracted images.

5. Translation:

Either the text-to-voice system or display of message on screen interface will help normal people to communicate more effectively with mute or hearing impaired people. Using required functions, we convert the word into speech. First, it converts raw text which contains symbols like numbers and abbreviations into equivalent of written-out words. Then it converts the symbolic linguistic representation into sound and gives a message on screen.
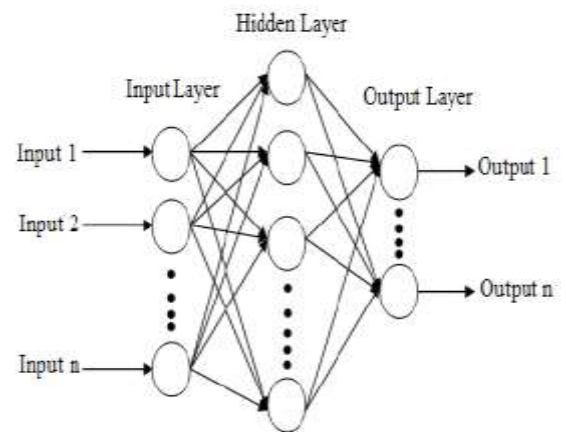

Fig 2: Translation

IV. OBJECTIVE

In this system, the interface developed will provide basic information like: Date, Time, Weather, etc. It will be performing actions according to the commands given using the hand gestures by the patients. This will enable them to make request for any kind for help from nearby helper without any issues. This also helps the workers to do their respective task without watching the patient at all times. The system uses a basic camera, a computer interface, a hand-gesture dataset and neural network.

V. REQUIREMENT ANALYSIS

1) Hardware Requirements

OS-Windows 7 and above . Processor- Intel Pentium and above . Hard disk- 160GB RAM - Minimum 512MB.

2) User Requirement :

High resolution camera or Webcam,Speaker   and a Display.

3)Software Requirement :
 a)MATLAB
 b) Data Set Storage

VI. PROCEDURE OF WORK

The main objective of this system is the ability to use hand gestures for the general applications, aiming for the natural interaction between the human and computer. The steps of procedure have been discussed below:

 1) Image capture from high resolution camera or webcam.
2) Images resizing 150 140 pixels fit (the desired size). Edges detection which detect boundaries of hand gesture.In this step we are using 2- filters.
3) Divide two image matrices resulting dm and dn element by element and then taking the a tan (tan1) to get gradient orientation.
4) Re-arrange the blocks of inputting image into columns by calling MATLAB function im2 col. This is optional step.
5) Converting column matrix with the values to degrees. By using this way we can scan the vector for values ranging from 0 to 90. It can also be seen from the orientation histograms where values come up only on the first and last quarter.

VII. BENEFITS OF PROPOSED SYSTEM

1)The system if developed will greatly helpful by overcoming the problem of communication for disabled people
2)It can also speed up the automation of applications in certain place of work.
3)It will act as automation tool
4)It overcomes the labour of nurses and caretakers of disabled people.
5)As the current system is manual it does not need any sophisticated training for the users of the system.

VIII. SYSTEM EVALUATION

1) Advantages: The system can be further customized to greater extent to cater the needs of automation. The applications will greatly improve the automation process. Multiple algorithms working together to produce best results.

The system is very easy to deploy, safe with convenient operations. Access to authorized personnel only.
2) Disadvantages: Designing the framework architecture for the system can be challenging part to make framework dynamic. Cannot help people with hand impairment. The void sin education system can be found.

IX. CONCLUSION

In this paper, we are introducing a new proposed system for Signal processing, where these patients cannot move their bodies except hands. We build this system to real movements and translate those movements to requests carried out by doctors. The future GRNN is very bright especially for signal processing and disabled patients .This technique is natural and easy way to make contact with a machine (simulation) , where the user not needing the training phase. This technique can be made as wireless technique which will be used for faraway patients . At this time, the proposed technique can be controlled remotely. So in any case of disaster like earthquake or fire, if the person is in danger and can't get any help, he can show hand gesture syntax to the system which then interprets it and will send it as a signal to transceiver nearby and it will forward the signal further to the rescue team in the control room. This system can be developed by adding Global Positioning System. By using this method the person will be easily identified by the rescue team.

REFERENCES

[1] G.Qian and B. Peng, Online gesture spotting from visual hull data, IEEE Trans. on Pattern Analysis and Machine Intelligence, vol. 33, no. 6, pp. 11751188, 2011.

[2] T. Acharya and S.Mitra, Gesture Recognition: a survey, IEEE transactions on systems, man, and cybernetics-part C: applications and review, vol. 37, no. 3, pp. 2127-2130, May 2007.

[3] M. Shah and J.Davis , Recognizing Hand Gestures, in Proceedings of European Conference on Computer Vision, Stockholm, Sweden, 2-6 May 1994, pp. 331-340.

[4] Y. T. Chen and K. T. Tseng, Developing a multiple-angle hand gesture recognition system for human machine interactions, in Proceedings of 33rd Annual Conference of the IEEE industrial Electronics Society, Taipei, Taiwan, 5-8 Nov. 2007, pp. 489-492.

[5] N.Papamarkos ,E.Stergiopoulos and N.Papamarkos, A New Technique on Hand Gestures Recognition, Proc of the IEEE International Conference on Image Processing, 2657-2660, 2006

[6] Y. Kuno, M. Sakamoto, Y. Shirai and K.Sakata, Vision Based Human Computer Interface With User Centered

Frame, in Proceedings of Intelligent Robots and Systems (IROS)94, 12-16 Sep. 1994, pp. 2023-2029.

[7] T.S. Huang and Y.Wu, View-Independent Recognition of Hand Postures, in Proceedings of IEEE Conferences on Computer Vision and Pattern Recognition , SC, USA, vol. 2, 13-15 June 2000, pp.88-94.

[8] V. Vezhnevets, V. Sazonov, A Survey on pixel based skin color detection techniques, in Proceedings of 13th International Conference of Computer Graphics and Visualization Graphicon, Moscow, Russia, 27-29 May 2003, pp. 85-92.

[9] H.M. ,Md. Sham and Md.Sahil., BPN Learning Algorithm for Error Tolerance ET A Proposed Algorithms for Multilayer Neural networks, ICCIT-2005.

[10] T.Kono and A. Torige Human-Interface by Recognition of Human Gestures with Image Processing, Recognition of Gesture to Specify Moving Directions, IEEE international Workshop on Robot and Human Communication, Tokyo, Japan, 1-3 Sep. 1992, pp. 105-110..