ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of DEVELOPMENT RESEARCH

International Journal of Development Research
Vol. 4, Issue, 3, pp. 749-752, March, 2014

Full Length Research Article

GESTURE DETECTION FOR DEAF AND DUMB PEOPLE

***Sangeetha, K. and Barathi Krishna, L.**

Computer Science and Engineering, Apollo Engineering College, Chennai, India

ARTICLE INFO

Article History:
Received 13th December, 2013
Received in revised form
19th January, 2014
Accepted 27th February, 2014
Published online 25th March, 2014

Key words:
Image processing,
Gesture detection,
Sign language

ABSTRACT

Gesture detection using video and image processing is used for enabling the communication between the deaf, dumb & normal people. All the available systems are not portable and not affordable to poor people. This paper introduces new android application which will detect the Indian sign language via mobile camera and converts into corresponding text or voice output. This application reduces the major communication gap between the impaired and normal people. This application uses certain image processing techniques to compare the input with the already stored signs. This application requires only android phone and does not require any special markers or magic gloves on the hand of the user.

INTRODUCTION

Sign Language is a well-structured code gesture, every gesture has meaning assigned to it. Sign Language is the only means of communication for deaf people. With the advancement of science and technology many techniques have been developed not only to minimize the problem of deaf people but also to implement it in different fields. Many research works related to Sign languages have been done as for example the American Sign Language, the British Sign Language, the Japanese Sign Language, and so on. But very few works has been done in Indian Sign Language recognition till date. Finding an experienced and qualified interpreters every time is a very difficult task and also unaffordable. Moreover, people who are not deaf, never try to learn the sign language for interacting with the deaf people. This becomes a cause of isolation of the deaf people. But if the computer can be programmed in such a way that it can translate sign language to text format, the difference between the normal people and the deaf community can be minimized. We have proposed a system which is able to recognize the various alphabets of Indian Sign Language for Human-Computer interaction giving more accurate results at least possible time. It will not only benefit the deaf and dumb people of India but also could be used in various applications in the technology field. This research helps to enable communication between speech impaired people (deaf & dumb) and people (without disabilities).

***Corresponding author: Sangeetha, K.,** Computer Science and Engineering, Apollo Engineering College, Chennai, India*

This application can also help the visually impaired people to communicate with speech impaired people, since the former cannot see the latter using the sign language, there is currently no means of easy and affordable way of communication between such people who are unfortunately in significantly large numbers in a country such as India. This project aims to bridge the gap between this gap by introducing an inexpensive android mobile in the communication path so that the sign language can be automatically captured, detected and translated to text or voice for the benefit of the blind people and people who cannot understand the sign language.

Gesture Detection

Gesture recognition is a topic in computer science and language technology with the goal of interpreting human gestures via mathematical algorithms. Gestures can originate from any bodily motion or state but commonly originate from the face or hand. Many approaches have been made using cameras and computer vision algorithms to interpret sign language.

Image Processing

Digital image processing is the use of computer algorithms to perform image processing on digital images. As a subcategory or field of digital signal processing, digital image processing has many advantages over analog image processing. It allows a much wider range of algorithms to be applied to the input

data and can avoid problems such as the build-up of noise and signal distortion during processing. Since images are defined over two dimensions (perhaps more) digital image processing may be modeled in the form of multidimensional systems.

Review of Literature

Different approaches have been used by different researchers for recognition of various hand gestures which were implemented in different fields. Some of the approaches were vision based approaches, data glove based approaches, soft computing approaches like Artificial Neural Network, Fuzzy logic, Genetic Algorithm and others like PCA, Canonical Analysis, etc. The whole approaches could be divided into three broad categories- Hand segmentation approaches, Feature extraction approaches and Gesture recognition approaches. Few of the works have been discussed in this paper. In (Niennattrakul and Ratanamahatana, 2012; Joyeeta Singha and Karen Das, 2013; Gopalan and Dariush, 2009; Kapuscinski and Wysocki, 2001; Huang et al., 2009; Yu et al., 2010). Many researchers used skin filtering technique for segmentation of hand. In (Niennattrakul and Ratanamahatana, 2012) the technique separated the skin colored pixels from the non-skin colored pixels, thus extracting the hand from the background. Fang used Adaptive Boost algorithm which could not only detect single hand but also the overlapped hands. In external aid like data gloves, color gloves were used by the researchers for segmentation purpose. In this paper Indian Sign Language Recognition used '5DT Data Glove 14 Ultra' data glove which was attached with 14 sensors- 10 sensors on fingers. But accuracy rate was 94%. In [2] Weissmann used Cyberglove which measured features like thumb rotation, angle made between the neighboring fingers and wrist pitch. Limitations were that the system could recognize only single hand gestures

SYSTEM MODEL

Classification of Sign Languages

Sign languages may be classified by how they arise. Home sign is not a full language, but closer to a pidgin. Home sign is amorphous and generally idiosyncratic to a particular family, where a deaf child does not have contact with other deaf children and is not educated in sign. Such systems are not generally passed on from one generation to the next. Where they are passed on, creolization would be expected to occur, resulting in a full language. A village sign language is a local indigenous language that typically arises over several generations in a relatively insular community with a high incidence of deafness, and is used both by the deaf and by a significant portion of the hearing community, who have deaf family and friends. The most famous of these is probably Martha's Vineyard Sign Language of the US, but there are also numerous village languages scattered throughout Africa, Asia, and America. Deaf-community sign languages, on the other hand, arise where deaf people come together to form their own communities. These include school sign, such as Nicaraguan Sign Language, which develop in the student bodies of deaf schools which do not use sign as a language of instruction, as well as community languages such as Bamako Sign Language, which arise where generally uneducated deaf people congregate in urban centers for employment. At first, Deaf-community sign languages are not generally known by the hearing population, in many cases not even by close family members. However, they may grow, in some cases becoming a language of instruction and receiving official recognition, as in the case of ASL. Indian Sign Language, this was a contact signing system or pidgin that was evidently not used by deaf people in the Plains nations, who used home sign.

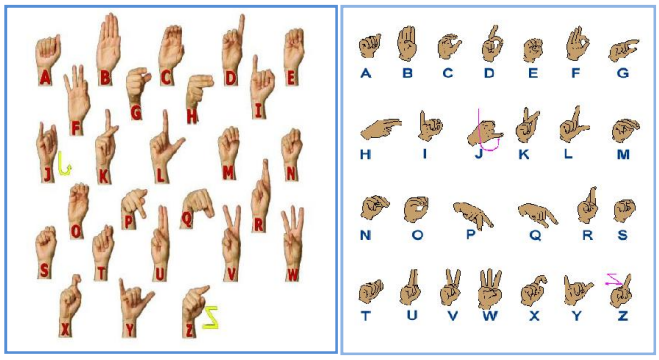


Fig.1. Classification of Sign Languages

Problem Statement

There are many systems available to recognize sign language, but all of them requires the users to wear a glove which is incorporated with accelerometer and gyroscopes. These accelerometer and gyroscopes are used to detect the movement of the hand in the 3D plane. In our project we excluded these gloves and devices, and coded the program in a way that it recognizes the hand of the user without any gloves and devices.

Problem Description

To better understand the problem, the proposed system starts by defining the signs in the context of gesture communications and sign language. This paper used skin detection algorithm in order to detect the skin color of the users and this resulted in exclusion of the gloves and other devices.

Problem Solution

The proposed system uses Gesture detection using Video and image processing. To develop an application which detects the gestures and processes it, produces the equivalent text or voice output. This application captures the image using the camera and it compares it with the image already stored in the packages and uses the image processors to produce equivalent text or voice output. So the advantages are,

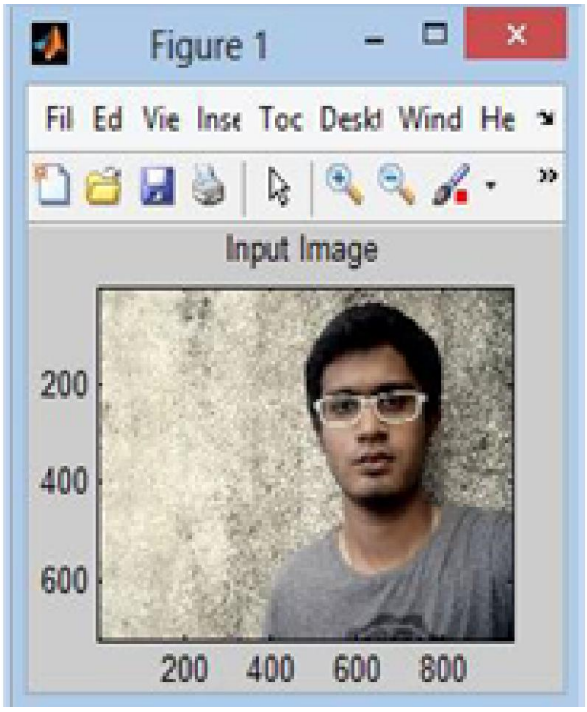
- This application only webcams to find and detect the sign shown by the user.
- It doesn't require any accelerometer or gyroscope for detection. Our system is first in it kinds and cost of our system is also low.

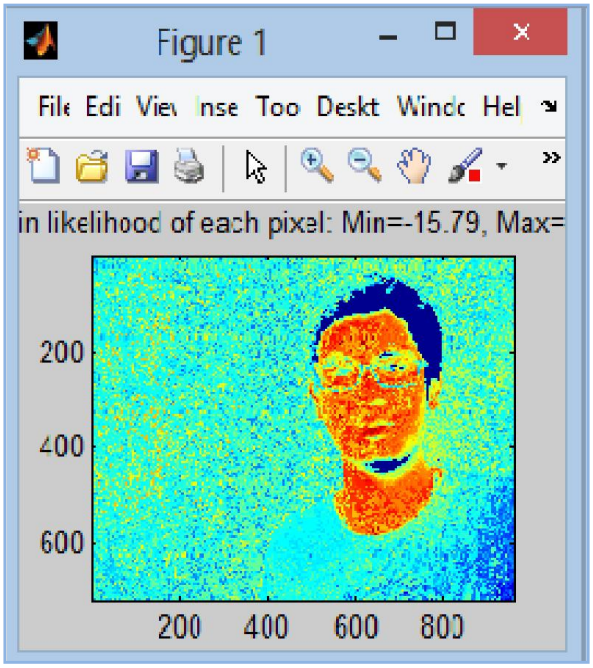
WORK AND ANALYSIS

Skin Detection

Skin detection is an important problem in image analysis. By detecting regions of skin, one can isolate the presence of faces, arms, hands, and gestures. A well-written skin detector used with other image analysis techniques such as Hough

transforms or eigen value-based approaches for pattern recognition could have powerful applications in security, human-computer interaction, or gaming. Imagine drawing a picture on your computer simply by moving your finger over a particular color on an easel, then pressing down on a white surface. The computer would need to know where your finger is to begin with, and this is facilitated by a special case of color segmentation. There are several ways that one can make a skin detector. A basic method is to construct a histogram of properties, used to keep track of how many pixels have particular attributes (e.g. particular values for Hue and Saturation) another method is to train neural networks. Perception can be combined to form a classifier that can learn a non-linear region, and such a tool is perfect for classifying skin. Both of these methods were used to classify pixels for skin, and trained on pairs of attributes of a pixel, either among RGB (red/green/blue) or HSV (hue/saturation/value).





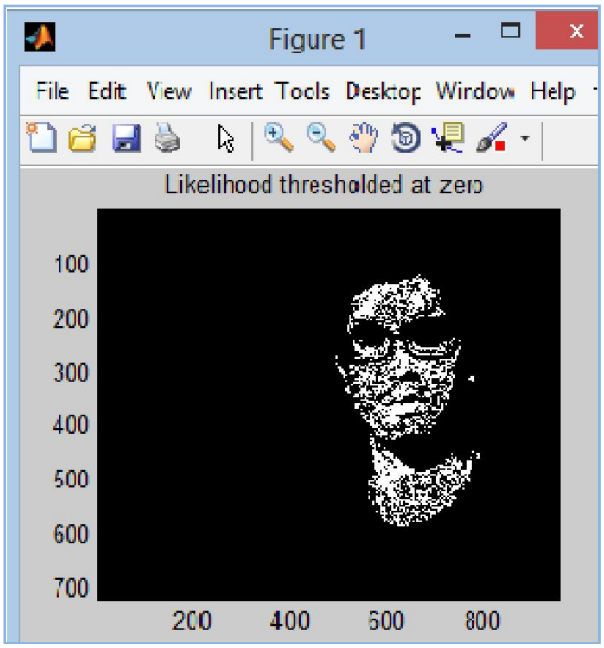


Fig. 2. (A) Input Image (B) Skin Likely Hood (C) Detected Skin

Training took place on over 200,000 pixels, all classified as skin colors. The histograms would simply store how many of what properties were found among these pixels, but the neural networks also had to be trained on what was not a skin tone. Four different classifiers were tested on each color space attribute pair, and scored based on their precision and recall. Ability to recall what is actually skin without classifying non-skin tones is very important, and relative success was measured by sorting the sum of precision and recall. Some of the resulting solutions perform quite well in detecting skin, granted that the camera used to take the picture is of relatively good quality and no one is overexposed in the picture. Several neural network methods outperformed the baseline methods. The choice of color space is actually much more relevant to the performance of the skin detector than is the number of perceptions in the hidden layer. Most skin does get recognized, but the system is also prone to picking up objects similar in color, and perhaps hair. Morphological operations can be used to help get rid of the extra noise in these images.

Conclusions

This paper proposes a simple and efficient sign language recognition system to eradicate the communication gaps between the deaf and dumb people with normal people. Our method doesn't require any gloves and devices for detecting the hand movements, owing to this the cost of the system is reduced by great margin. This system can be used by people by spending less cost when compared to the existing system, since the latter requires additional devices to detect hand gestures. There are three reasons for poor performance of testing data. Firstly, we had skin detection problems. Because there is no strict threshold set for skin probabilities, we set our threshold empirically. However, some background is also skin-like in color, so it may be detected as skin. The huge variation in images also played a part in the low accuracy rates. This includes different sizes of gestures in the images, different background of images, different orientations and angle of gestures, etc. The different illumination for different images too posed a problem. Now our system provides 65% of

correct predicting and we are working on improving its efficiency.

Future work

We have planned to bring our project to the smart phones running on Android and iOS platforms, since many people around the world use their smart phones to communicate with other people. So majority of people can afford the smart phone since its cost it goes on decreasing due to availability of many brands with less cost. Our application may use the camera of the phone to detect the sign shown by the deaf or dumb people and process it to either text or voice output. Which will help other people to understand the deaf and dumb people with ease. Our aim is to bridge the communication gap between the deaf and dumb people with the world (other people).

REFERENCES

Niennattrakul, V. ; Ratanamahatana, C.A., TFRS: Thai finger-spelling sign language recognition system Saengsri, S., Page(s): 457 – 462, 2012

Joyeeta Singha, Karen Das, Indian Sign Language Recognition Using Eigen Value Weighted Euclidean Distance Based Classification Technique, (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 4, No. 2, pp: 188 to 195, 2013.

Gopalan, R. and B. Dariush, "Towards a Vision Based Hand Gesture Interface for Robotic Grasping", The IEEE/RSJ International Conference on Intelligent Robots and Systems, October 11-15, 2009, St. Louis, USA, pp. 1452-1459.

Kapuscinski, T. and M. Wysocki, "Hand Gesture Recognition for Man-Machine interaction", Second Workshop on Robot Motion and Control, October 18-20, 2001, pp. 91-96.

Huang, Y., W. C. Hu, and S. H. Chang, "Vision-based Hand Gesture Recognition Using PCA+Gabor Filters and SVM", IEEE Fifth International Conference on Intelligent Information Hiding and Multimedia Signal Processing, 2009, pp. 1-4.

Yu, C., X. Wang, H. Huang, J. Shen, and K. Wu, "Vision-Based Hand Gesture Recognition Using Combinational Features", IEEE Sixth International Conference on Intelligent Information Hiding and Multimedia Signal Processing, 2010, pp. 543-546.

****