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Design and Simulation of Communication Aid for Disabled Using Threshold Based Segmentation

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ABSTRACT

Man is a societal animal, so it is natural for him to interact and communicate. Communication is a process of exchange of information, thinking, feeling, and thoughts with others in form of verbal or non-verbal message. The people with dual sensory impaired causes difficulties with communication, access to information and mobility. Dual sensory impairment refers to the people who are deaf, dumb and blind. The communication for the disabled people lack the amenities which a normal person would possess. The reason behind this lack of communication is that dumb people cannot talk, deaf people cannot hear and the blind cannot see. Millions of the people suffer from dual sensory impairment and they face a challenging task to communicate with other people. Sign language seems to be a strange new world for the impaired people to communicate and it is the only way of communication to be held between the impaired people. But coming to the blind people they are still facing a problem to communicate. Here encounters a problem for the people with individually hearing loss and vision is much greater than just the sum of the two losses. The problem is not stabilizer, but multiplicative (-hearing) × (-vision) = (challenge)^2 in many ways, deaf-blindness is a disability of access to information and communication. Now a day's communication with people has become easy by social networks, mobile communication etc., but for the challenged people it is not an easy task to communicate with others as they find it difficult to communicate. *"Even they are challenged people – they are not disqualified"*. If the Dumb person is willing to give a lecture or seminar in the presence of both disabled and normal peoples, he faces a problem because he knows only the sign language to communicate with other disabled or normal peoples, coming to blind peoples they are not able to receive his communication and to make a communication between disabled people here develop a communication aid for the disabled and it will help the disabled peoples to communicate easily with both disabled and normal people in same time.

Keywords: Indian Sign language gestures, Threshold segmentation, MATLAB.

1. INTRODUCTION

Communication is the way of exchanging thoughts, idea, opinions, information, or message among the people by written, speech, or signs. Communication Bridge the gap between the people. There are different ways of communication to communicate. Normally the people will communicate oral way of communication i.e., talking to each other whereas the people with dumb they cannot communicate with other as the normal people communicate because they are unable to talk, where as the people with deaf are able to talk and they are unable to hear and the people with blind are unable to vision and are able to talk and hear.

The most common way of communication to communicate between the impaired or disabled people (Dumb-Deaf-Blind) is *sign language* only. Sign language bears the disabled people together. It is mostly used language of disabled people helps communicate with one who has communication disability. Sign language indicates the representation of signs with the help of hands or facial expressions which defines

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some meaning of information to communicate with other. Sign language is the key type of communication of disabled people. It's the fastest and expressive way of communication.

A sign language which talks about non-verbal way of communication with the assist of hands movements, facial and body expressions to convey the meaning of the sign and results in the similarities with the verbal form like spoken lingos, but there are also some major differences between signed and spoken languages. For the disabled people exist, sign languages have been developed. Signing is not only the technique used by the deaf, it is also used by people who can hear, but they cannot actually speak. While they follow syntax in a way that spoken languages do not, sign languages show the same expressive things. As spoken language is not the natural language of the deaf. They naturally default to their native language (sign language).

The language is not created by anybody it can be adopted by themselves by means of their native language. For a local signer, sign observation influences how the brain makes intellect of their vivid occurrence.

For example, a hand shape might vary based on the other signs completed before or else after it, but these variations are arranged in perceptual categories during its development. The brain detects hand shape contrasts but group similar hand shapes self-possessed in one kind. Different hand shapes are stored in other categories. The brain flouts some of the similarities between different perceptual categories, at the same time save the visual information surrounded by each perceptual category for different hand shape. In any place Sign language is easily developed where the hearing impaired people are present in the surrounding society.

Challenge of deafness:

- Communication between the dumb and deaf people.
- Communication between the deaf/dumb and blind.
- ***Communication between the dumb and deaf people*:** Dumb and Deaf people are faces a difficulty to communicate with each other. As the dumb people are unable to speak where as the deaf people are able to speak. To bridge the gap between these two people sign language will helps them utmost to communicate among them.

  For example two people from different places can represent letter "C" as shown in the below, it will differs due to their usage of signs in native language where as signs are to be different it defines same meaning in representation of sign or gesture.
- ***Communication between the deaf/dumb and blind***: One way is possible between the deaf and blind people i.e., the blind people can hear what deaf people says, where as the deaf people can't hear the voice of the blind people due to impaired of hearing and he can receive the information from blind by means of a gestures represented by the blind people or by touching the hands of the deaf people as the blind people know the finger spell and vice-versa or else with the help of interpreter like voice is converted into text for deaf and for blind text to voice interpreter is needed.

Figure 1: Representation of letter C in differeent signs

Figure 2: Communication between the deaf/dumb and blind

The dumb people and blind people will communicate similar i.e., by using the text to voice and voice to text interpreter between these disabled people respectively.

2. DESIGN OF COMMUNICATION AID FOR DISABLED

In the conventional model for disabled is carried out by sign language of signs are converted in to text. In the present days most of the captured signs are segmented under ANN based segmentation because in this technique, it functions like a human brain.

An artificial neural network (ANN) is a similar to the neural function it is of type of network. ANN is adopted for training of gesture images. Artificial neural network (ANN) is a mechanism learning method that represents human brain and be made up of a number of artificial neurons. Neurons in ANNs have a tendency to consume less networks than genetic neurons. Each neuron in ANN receives a number of inputs. Firstly task is applied to these inputs which results in triggering side by side of neuron i.e., output value of the neuron. In this the gestures are captured continuously and the captured gestures are segmented by means of skin color based segmentation. The Gesture is recognized by pattern classification of neural network and the corresponding text output is displayed. Communication aid between the deaf and mute is carried out by the sign language gesture without handheld gloves and sensors. Capturing the sign language continuously and converting them to voice. Thus the implementation of the text output is ready under MATLAB environment [1].

The communication is held by means of a glove based deaf-mute communication interpreter method. The glove is inside fitted out with flex sensors, tactile sensors and accelerometer. The gestures are converted into text display [2].

The design of communication aid for disabled, sample and testing of a convenient keyboard and speaker device with a braille refreshable display for communication between two people [3].

The communication between the deaf and dumb people is carried out by using gesture based device for deaf and dumb person which changes sign language to text display for voice to voiceless people with the help of smart gloves [4].

The communication between a dumb and earshot person shams to be an important disadvantage compared to communication between blind and ancient visual people. It makes an extremely tiny line for them with communication being associate degree elementary aspect of human life [5].

Gesture is an expression of any portion of the body to express idea or implication. One of the major bid areas of gesture communication is Sign Language. Here varied approaches to handle gesture recognition [6], going from scientific models based on hidden Markov chains [7] to tools based on soft computing [8]. In addition to the theoretical characteristics, any practical implementation of gesture recognition typically requires the use of dissimilar imaging and trailing devices or tools. These include instrumented gloves, body suits, and marker built optical tracking. Outmoded 2-D keyboard, enclosure and mouse-oriented graphical user interfaces are often not suitable on behalf of working in virtual environments. Fairly, devices that sense body (e.g., hand) position and orientation, track of observation, speech and sound, facial communication, galvanic skin response, and other aspects of human actions can be used to model communication between a human and the environment.

3. METHODOLOGY OF THE WORK

Communications between disabled and a normal person have all the time be there a challenging task. This paper refer to a way to moderate barrier of communication by developing an assistive method for disabled persons.

The design flow is classifies into three different blocks.

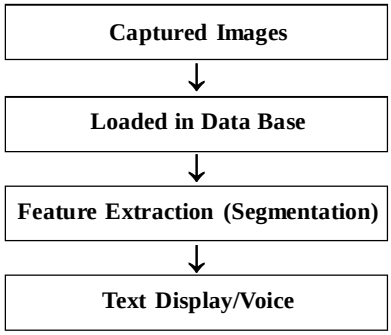

Figure 3: Communication Aid for Disabled

1. Captured images (Gestures)
2. Data base
3. Feature extraction
4. Text display and voice

Firstly the images (sign gestures) are captured by a suitable vision camera with finite focus of gesture appear to be a good clarity. The captured images are stored in a particular data base to retrieve it back when we need. In the data base section different representation of a gesture are make it in a single file and it is continued for different gestures.

The furthermost step is done by implementing a methodology called by threshold based segmentation (i.e., feature extraction). The threshold based segmentation, threshold is one of the simplest methods for image segmentation based on intensity levels.

Threshold based technique works on the postulation of pixels dropping in certain range of intensity values signifies one class and left over pixels in the image represents the other class. Thresholding can be implemented either locally or globally.

For global thresholding intensity threshold value is to be selected to segment the image into object and background. It creates binary image from given input image. The pixels satisfying threshold test are considered as object pixels with binary value “1” and other pixels are treated as background pixels with binary value “0”.

Thresholding methods are the simplest methods for image segmentation, divide the image pixels with respect to their intensity level, use over images having lighter objects than background. The selection of these methods can be manual or automatic i.e. can be based on prior knowledge or information of image features. There are basically three types of thresholding.

Global Thresholding: Global thresholding is done by using any appropriate threshold value (T). This value of T will be constant for whole image.

Variable Thresholding: Variable thresholding, the value of T can differ over the image.

Multiple Thresholding: In this multiple thresholding, there are multiple threshold values like T0 and T1. The output image can be computed as values of thresholds can be computed with the help of the peaks of the image histograms.

After completion of segmentation the text display displays the segmented output along with the voice.

4. SIMULATION RESULTS

The captured image is transformed into binary image. The binary image is then transform into a gray scale image and later transformed by threshold based segmentation. As shown in fig 4 and fig 5.

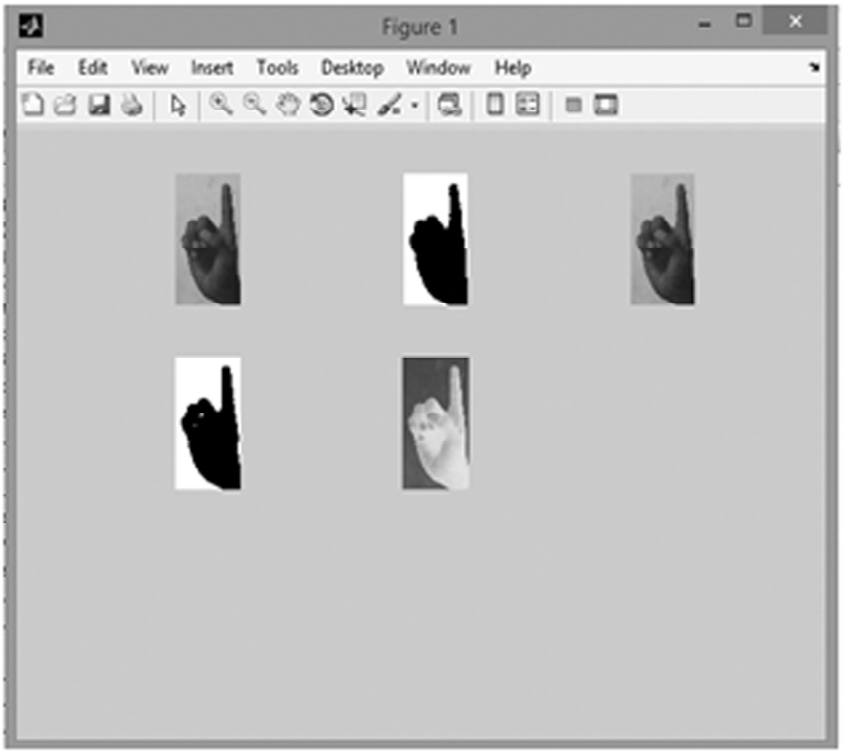

Figure 4: Segmented output

a	b	c
d	e	

In the above fig 4, the images represents

(a) Original image, (b) Binary image,

(c) Gray scale image, (d) & (e) Threshold image.

Figure 5: Segmented output

a	b	c
d	e	f

In the above fig 5, the images represents

(a) Original image, (b) Binary image,

(c) Gray scale image, (d),(e) & (f) Threshold image.

The above fig 4 and fig 5 represent the image segmentation i.e., the fig 4 is the captured image of ISL gesture “1” is converted into binary image. The binary image is then transform into a gray scale image and later transformed by threshold based segmentation. Here the images c and d are the threshold images i.e., the image d is obtained by converting the black regions to white and vice-versa and the fig 5 is the captured image of ISL gesture in “L” is converted into binary image. The binary image is then transform into a gray scale image and later transformed by threshold based segmentation. Here the images c, d and e are the feature extract images i.e., the image d and e is obtained by converting the black regions to white and vice-versa.

The above fig 6 indicates the feature extraction of ISL gesture “L” along with the text display, after the segmentation further move to display the text output of the segmentation image is done. Here the text output is “L” shown in GUI “OK”.

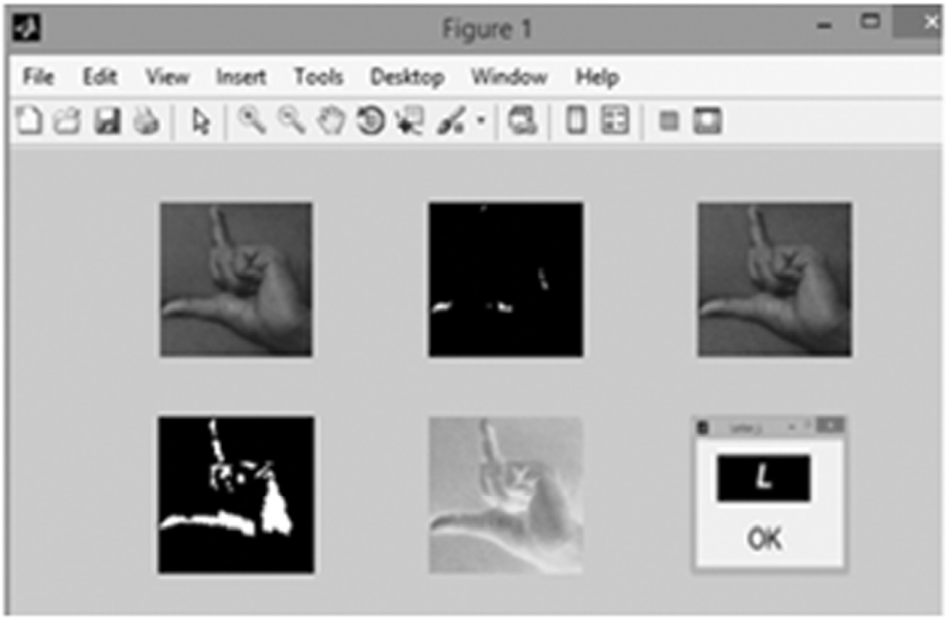

Figure 6: Segmented output along with text display

The fig 7 repressents the voice out of the feature extract (segmentation) image i.e., the text display is convert into voice which will help the blind o recognise the text output.

Figure 7:Text to voice output

5. CONCLUSION AND FUTURE WORK

The line of work was firstly start with MATLAB by perusal the apprehend images (the hand gestures), formerly the apprehend image is segmented by the methodology of Threshold based Segmentation, from the apprehend image is recognise for segmentation technique and the consistent text output is displayed. This will really aid in bridging the communication gap among disabled and normal person and vice versa. This design is proposed based on portable devices that takes user apprehend from the camera, carry out image processing and sign recognition centred on that image to recognise the gesture of the opposed individual and then give a text representation of that sign and lastly the future work is to produce a keen voice to text output. Thus the implementation of the text and voice output is done under MATLAB environment and further process of voice to text output will be done with a committed hardware setup.

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