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Implementation of Bidirectional Voice Communication between Normal and Deaf & Dumb Person

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Abstract: In the existing system there is no hand recognition system to indicate the actions. In the proposed system, Android Application is deployed to capture Images through Camera. Main Idea of the Paper is to understand the communication of the Deaf & Dumb People. Deaf & Dumb people will show their Hand Gesture in front of Camera and it sends to the Server. Server processes the Hand Gesture and corresponding Voice alert is played in the Normal Person side (Android). In the modification, Normal Person will speak through the Android Application, which recognizes the Voice input and it converts into Hand Gesture image to the Deaf & Dumb Person. We can also transfer the Hand Gesture input by deaf & dumb person to multiple Android normal People. We can Establish Two way Communication between Deaf & Dumb child with normal Child.

I. INTRODUCTION

Hearing is one of our five senses and is essential for the development of speech and language in children. For adults, the ability to hear is essential to function in our `hearing world'. Whilst deaf and hearing impaired individuals can communicate with sign language, they continue to be sidelined in many of life's opportunities, from education and employment through to social opportunities, including relationship options. It is important to understand how hearing, as an impairment can lead to disability (limitation of function on an individual level) and handicap (limitation of function within society), if left untreated. For ex-ample, hearing impairment will lead to difficulties in communication (disability) and this can subsequently lead to one being unemployed or underemployment (handicap) in a younger adult. Similarly an elderly grandmother may have difficulty hearing her grandchildren (disability) and hence may not be al-lowed to babysit them (handicap). It is also unfortunate that whilst the technology now exists to treat all types and all levels of hearing loss, many hearing impaired individuals refuse to accept them, to over-come their impairment. With Singapore's modern socio-economic environment and a quality healthcare system, many senior citizens remain physically healthy and are able to continue to work beyond their retirement age. Effective verbal communication is essential in their working environment and in the community. Hearing impairment is associated with significant adverse effects on a person's psychosocial and physical well-being. Telephone and face-to-face conversations become difficult, and affected individuals may start to withdraw socially. These affected elderly may experience depression, altered self-esteem, and diminished functional status. Hearing problems can make it hard to understand and follow a doctor's advice, to respond to warnings, and to hear doorbells and alarms. They can also make it hard to enjoy talking with friends and family. All of this can be frustrating, embarrassing, and even dangerous.

In Singapore, an estimated 33% of those above 60 years and 50% of those above 80 years of age have hearing loss. This number is significant given our rapidly aging population. Although hearing loss from ageing can often be helped with hearing devices, acceptance of hearing aids and hearing rehabilitation by the elderly is generally poor. In Singapore, almost 70% of the elderly who need hearing aids are not keen on having them, although 40% experience negative psychosocial effects as a result of the handicap.

Some reasons for not using hearing aids include: social stigma, cost outweighs benefits, physical discomfort, noise amplification, device performance issues, difficulty in adjusting instrument settings and instrument maintenance. In a local study, some said they were too old, others said they could cope with the disability. It is well recognized that hearing impairment is usually initially realized family members of the hearing impaired individuals whilst the hearing loss is still mild or moderate. Frequently, at this point, there is a strong degree of denial from the hearing impaired individuals.

In the existing work there is no hand recognition system to indicate the actions and there was no application developed for easy communication between normal and deaf & dumb people.

Problems of existing works

- No hand recognization
- Less Effective

II.LITERATURE REVIEW

Zhu Dan has proposed the framework [6] of Offline handwriting recognition has become one of the hottest directions in the field of image processing and hand recognition. It can transform any handwriting to any plain text file. In this paper we attempt to recognize handwritten digits with feature extraction by Back Propagation (BP) Neural network. In addition we introduce the Principle Component Analysis (PCA) for feature extraction which can improve the performance of neural network. On the other hand we make comparison of the recognition rate among three methods: Neural network method, Thirteen features method, Fisher discriminant analysis method.

B.Raghavendhar Reddy have research based on the speech [7]. For the past several decades, designers have processed speech for a wide variety of applications ranging from mobile communications to automatic reading machines. Speech recognition reduces the overhead caused by alternate communication methods. The system acquires speech at run time through a microphone and processes the sampled speech to recognize the uttered text. Our speech-to-text system directly acquires and converts speech to text. It can supplement other larger systems, giving users a different choice for data entry. Voice SMS is an application developed in this work that allows a user to record and convert spoken messages into SMS text message. Speech recognition is done via the Internet, connecting to Google's server. The application is adapted to input messages in English.

Mark S Hawley, Stuart have proposed [8] a new form of augmentative and alternative communication (AAC) device for people with severe speech impairment—the voice-input voice-output communication aid (VIVOCA)—is described. The VIVOCA recognizes the disordered speech of the user and builds messages, which are converted into synthetic speech. The selected message-building technique traded off various factors including speed of message construction and range of available message outputs. The VIVOCA was evaluated in a field trial by individuals with moderate to severe dysarthria and confirmed that they can make use of the device to produce intelligible speech output from disordered speech input.

Peter MATETELKI have proposed a method of using [9]An assistive tool (Interpreter Glove) for hearing- and speech impaired people is created, enabling them to easily communicate with the non-disabled using hand gestures and sign language. An integrated hardware and software solution is built to improve their standard of living, consisting of sensor network based motion-capture gloves. This paper introduces the overall system architecture and describes our automatic sign language interpreter software solution that processes the gesture descriptor stream of the motion-capture gloves, produces understandable text and reads it out as audible speech.

Sharon L. Christ have proposed a model[10] based on Structural equation modelling is a general modelling frame work that incorporates many common statistical methods, including regression, analysis of variance,

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confirmatory factor analysis, and simultaneous equations. First, as demonstrated in the present analysis, it allows for the estimation of multiple equations simultaneously. So that associations between multiple predictor and outcome variables can be assessed in the same model even when the distribution of outcome measures varies from dichotomous to ordinal.

III. PROPOSED SOLUTION

A. Overview

In this paper Android Application is deployed to capture Images through Camera. Main Idea of the Paper is to understand the communication of the Deaf & Dumb People. Deaf & Dumb people will show their Hand Gesture in front of Camera and it sends to the Server. Server processes the Hand Gesture and corresponding Voice alert is played in the Normal Person side (Android). In the modification, Normal Person will speak through the Android Application, which recognizes the Voice input and it converts into Hand Gesture image to the Deaf & Dumb Person. We can also transfer the Hand Gesture input by deaf & dumb person to multiple Android normal People. We can Establish Two way Communication between Deaf & Dumb child with normal Child.

Merits of proposed work:

- Hand Recognization
- More Effective

B. Mobile Application

Android based mobile application is deployed in the deaf & dumb person for communication purpose. This is the main model to obtain their gesture inputs and to be processed. In this application camera is automatically initiated and captures the gesture input image provided by the deaf & dumb person. We also stored pre-recorded voices. Normal Person will speak through the Android Application, which recognizes the Voice input and it converts into Hand Gesture image to the Deaf & Dumb Person.

C. Server

The Server Application which is used to communicate with the Mobile Clients. The Server can communicate with their Mobile Client by GPRS and GPS. The Server will monitor the Mobile Client's accessing information and Respond to Client's Requested Information. The Server will not allow the Unauthorized User from entering into the mobile phone**.**

D. Image Acquisition

A image acquisition android camera is used, after that frames are send to the server and edge detection of the video is done which is followed by thinning that reduce the noise, tokens are being created from thinning image after tokens are fetched. The paper briefly describes the schemes of capturing the image from android device, image detection, processing the image to recognize the gestures as well as voice result.

E. Image Pre-processing

In the field of image processing it is very interesting to recognize the human gesture for general life applications. Gesture recognition is a growing field of research among various human computer interactions; hand gesture recognition is very popular for interacting between human and machines. It is nonverbal way of communication and this research area is full of innovative approaches. That is in this module every image as meaning and it will be stored in the server and it create the communication between the disable and human.

F. Recognition

This paper aims at recognizing 40 basic hand gestures. The main features used are centroid in the hand, presence of thumb and number of peaks in the hand gesture. That is the algorithm is based on shape based features by keeping in mind that shape of human hand is same for all human beings except in some situations. The recognition approach used in this paper is artificial neural network among Machine learning algorithm.

G. Voice & image recognization

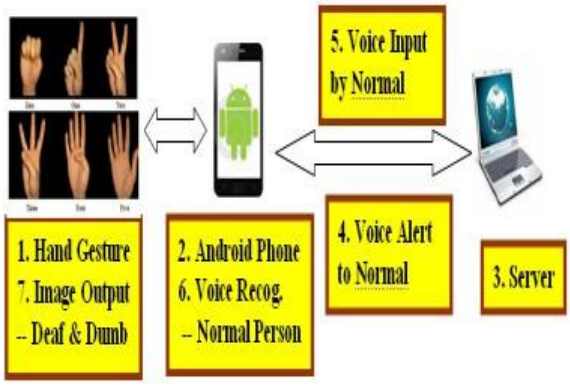
After that the server will recognized the image meaning and produce the result as voice to normal person. Normal Person will speak through the Android Application, which recognizes the Voice input and it converts into Hand Gesture image to the Deaf & Dumb Person. We can also transfer the Hand Gesture input by deaf & dumb person to multiple Android normal people.

IV. FEASIBILITY STUDY

The feasibility of this paper is analyzed in this phase and business proposal is put forth with a very general plan for the paper and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential. Economical Feasibility is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

Technical Feasibity is carried out to check the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system. The aspect of Social Feasibility is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity.

ARCHITECTURE DIAGRAM



V. METHODOLOGY USED

The methodology used in this paper are Gesture Recognition and Voice Playback. Gesture Recognition methodology is used to recognize the gesture images which is given as input by the deaf &dumb people. And Voice Playback methodology is used to play the audio voice for the corresponding gesture image and the voice is played on normal person mobile phone.

Principal Component Analysis (PCA)

We can use PCA to compute and study the Eigenvectors of the different pictures and then to express each image with its principal components [9] (Eigenvectors).It is a way of identifying patterns in data, and expressing the data in such a way as to highlight their similarities and differences. First of all, we had to create the data set.

The aim is to choose a good number of pictures and a good resolution of these in order to have the best recognition with the smallest database. Then, the next step is to subtract the mean from each of the data dimensions. The mean subtracted is simply the average across each dimension. The step three is to calculate the covariance matrix of the database. We could not calculate the covariance matrix of the first matrix, because it was too huge. So we had to find a way to find out the principal eigenvectors without calculating the big covariance matrix. The method consists in choosing a new covariance matrix. Our covariance matrix for A was called C and C is defined by C = A* A' The Eigenvectors and the Eigen values of C are the principal components of our data set.

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The PCA Algorithm :

Training phase:

Step 1: Obtain the training images $I_1, I_2, ..., I_M$

Step 2: Represent every image I_i as a vector G_i

Step 3: Compute the average image vector Ψ:

$$\psi = \frac{1}{M}\sum_{i=1}^{M}\Gamma_i$$

Step 4: Subtract the mean image:

$$\Phi_i = \Gamma_i - \Psi$$

Step 5: Compute the covariance matrix C :

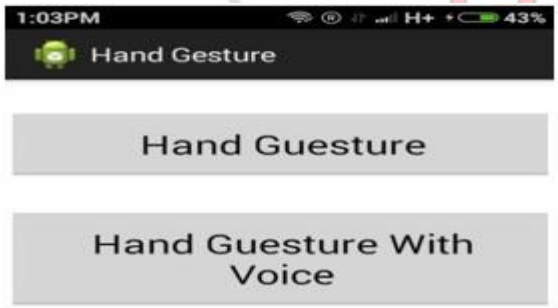
$$C = \frac{1}{M}\sum_{n=1}^{M}\Phi_n\Phi_n{}^T = AA^T \qquad (N^2 \times N^2 \text{ matrix})$$

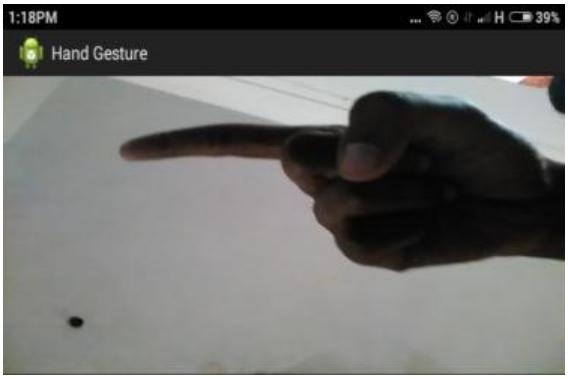
$$where, A = [\Phi_1\ \Phi_2\ ...\ \Phi_M] \quad (N^2 \times M \text{ matrix})$$

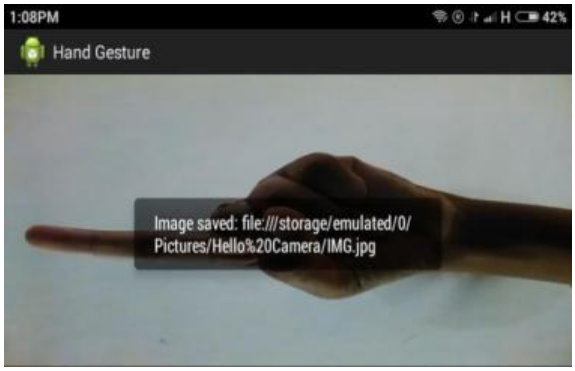
Step 6: Compute the eigenvectors u_i of AA^T

The matrix AA^T is very large. So, compute eigenvectors v_i of A^TA, which has same eigen values and eigenvectors.

VI. IMPLEMENTATION







VI. CONCLUSION

This paper presents an inexpensive, inconspicuous, non-invasive and easy-to-use prototype of an assistive visual hearing aid for the elderly with hearing impairments. This hearing aid exists as an application in a mobile phone or tablet that a user will typically carry. User acceptance tests show that the mobile based app prototype is definitely useful to the elderly and the hearing impaired community, enhancing their lives and providing them with greater independence in going about the routine tasks.

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