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Communication-Translator for Deaf Dumb and Normal People (CommuLator)

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Abstract –*Communication for the deprived people has become a great challenge despite having so much technology acceleration. In order to come over this problem we design an application namely commulator (communication translator).*
Extraction of frame from live video feed using JMyron and applying frame filtering techniques such as blurring, RGB to HSV conversion and removing noise so that the image so obtained would make the gesture detection simpler. After getting the gesture, the database is matched with the gesture and corresponding speech is given out using spchapi. This helps a normal person to understand what the dumb has to say. Vice versa is the conversion of speech to text and corresponding symbol or imageis given as output. This helps for the deaf to understand what the person in front of him is saying.

***Key Words*: JMyron, Blurring,Thresholding, RGB and HSV, Blob detection and Filtration, Serialization, Spchapi, HCI, Image Processing.**

1. INTRODUCTION

The current era is a zoom of technology. Each andevery field has an impact of the technological advancements onto it. One such rapidly growing technical advancement is the increasing impact of camera on human life. The enormous and ever increasing Internet usage along with smart phones has proven a boon to mankind. But despite of these advancements, there is a certain part of the society which is deprived of these benefits.

The hearing disabled and mute people cannot minglewith the social world because of their physical disabilities. Unintentionally, they are treated in an unusual manner by the rest of the society. They cannot be a partof the social events, say students cannot study in schoolswith normal students, elderly persons cannot work atwork places, and much more. A simple activity like going and buying a commodity from the grocery shop is verycomplicated task for the deaf and dumb person. The gapbetween normal human beings and deaf and dumb iswide and ever increasing day-by-day. Today, the nationalcount of hearing disabled and mute persons throughoutIndia is approximately 17 lakh. Despite of this largenumber, very less research is done in order to bridgethe communication barrier. In an attempt to bridge the communication barrier, wepropose an Application which helps normal and deaf anddumb people to effectively communicate with each other.
Human Computer Interaction and Image Processing arethe related areas of research which will help us builda solution to this problem. The rest of the paper isorganized as follows. Section II we will introduce withmodules included in the application and the architecturaldiagrams of the module. In the section III it mainlyconsists of the processing description of the first moduleand section IV contain the module description of thesecond module of project, following acknowledge andconclusion [1].

2. RELATED WORK

Over the decades as the technology is gaining lead in every direction life style has become an ease. Same is very much true for the deprived people of the society. Combining different fields of engineering has resulted for the dumb to speak and deaf to hear.

In April 2014, using hardware as an aid to communicate it was aimed to facilitate people by means of a glove baseddeaf-mute communication interpreter system. The glove isinternally equipped with five flex sensors, tactile sensors andaccelerometer. For each specific gesture, the flex sensorproduces a proportional change in resistance andaccelerometer measures the orientation of hand.

The outputfrom the sensor is analog values it is converted to digital [4].
Recently in July 2014, it was proposed a face and hand gesture recognition system which is able to control computer media player. It used the face recognition scheme for viewer verification andthehand gesture recognition in mechanism of computermedia player, for instance, volume down/up, next music and etc [2]. Hence gestures play an important role in communication and can be used for the deaf and dumb to communicate amongst the society.

In 2013, a hardware named Microsoft Kinect Sensor was introduced that developed the gesture spotting algorithm for Indian Sign Language. In the firststage, hand tracking is carried out using frames of Kinect. In second stage, the features of Cartesian system (velocity, angle, location) and hand with respect to body are extracted. K-meansis used for extracting the code words of features for HCRF.In the third stage, Hidden Conditional Random Field is usedfor classification [3].

And since decades engineers are trying to make the best use of technology for the deaf and dumb to communicate. Considering the fact that if hardware is involved the instrumentation factor hikes the cost factor. Something which is dynamically useful and cost efficient would be very helpful for those who are financially weak.

3. PROPOSED METHODOLOGY

In this paper we try to implement the two way communication bridge i.e. dumb can speak using gestures and deaf can understand what the normal person is trying to say. The application combines two lead modules. One half of the application implicates conversion of gestures into its corresponding text and then reading the same aloud via speech api. This enables a dumb person to put forward his views. On the other hand the a deaf can understand a normal person using the other half of the application where the speech is converted to text and then the text matching the database shows corresponding gestures or images stored in the database.

i. Gesture to Speech

This modules help deaf and dumb to speak by capturing real time video feed as an input from the camera. We apply image processing algorithms. The frames having the gesture are extracted while applying the filters for better detection and accuracy. Gaussian algorithm is used to blur the image for achieving smoothness and hence reducing sharpness.RGB components are separated from the images and depending upon the luminosity the 24-bit is converted to 8-bit grayscale image which is very helpful for feature extraction. Applying thresholding converts the grayscale image to binary image and highlights the part which has to be extracted and rest is all blackened.After getting precise gesture it is then linked with the database. A user can predefine gesture for it corresponding speech and use the same later. Hence for a person who is not able to speak can talk by just doing gestures. The application would give audio output for the same.

This enables full flexibility for the user to customize his own gestures. Since the input is taken from the camera accuracy improves with quality of camera.

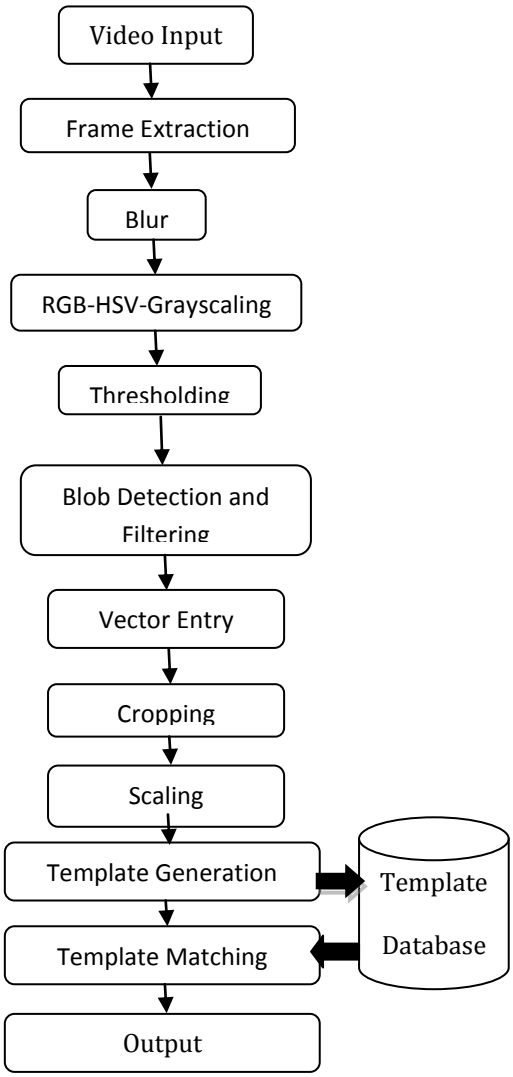

Fig 1. Flow Chart for Gesture to Speech

ii. Speech to Gesture/Image

Now for person who is deaf and is not able to understand what the normal person is trying to say. He/she can use this application to convert the other person's voice into text and the corresponding image or gesture which is stored and linked to the database will be displayed as the output.This half of the application takes the speech as input and spchapi convert the speech into text. The text is then compared with the database and respective image or gesture is given as output. Hence a deaf person can understand what the normal person is trying to say. Although a simple conversion of speech to text is also feasible which is also well supported by the application.

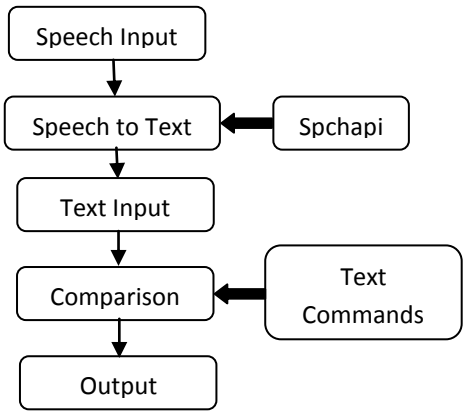

Fig 2. Flow Chart for Speech to Gesture

4. EXPERIMENTAL RESULTS

The above described phenomenon can be illustrated using the application itself. Let's understand how the **gesture to speech works.**

Step 1: We select the pointer.This helps for easier blob detection and separates background and foreground. Selecting the pointer defines the hue, saturation, value (HSV) for which the camera traces that particular color pointer across the camera view.

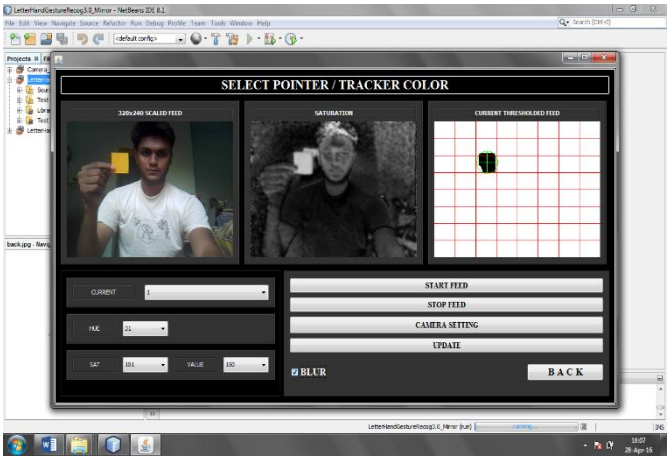

Fig 3. Selecting Pointer Color

Step 2: Next comes the part where we need to add the particular pattern into database. For example, here we have taken 'W' as the pattern for sentence "Good morning. How are you today?" So while actual recognition the application would trace 'W' and give output as "Good morning. How are you today?"

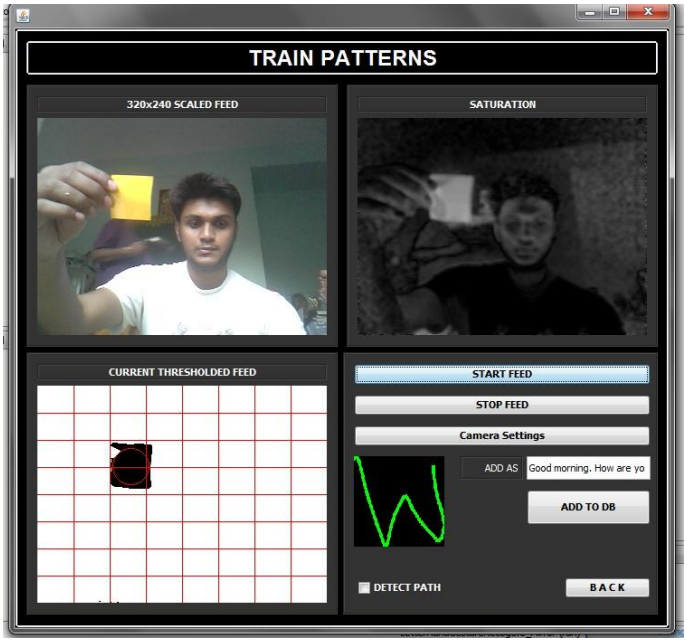

Fig 4. Training Patterns

The image below shows the database where the pattern is saved with its corresponding user defined meaning. The matrix of 0s on the right hand depicts the gesture by 1s.

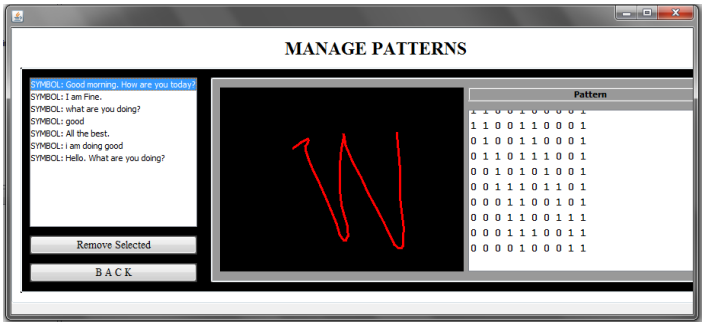

Fig 5. Database Entry

Step 3: After step 2, next part is to detect the gesture drawn in front of the camera and give the corresponding sentence as output that is already stored in the database. For example, previously we stored the gesture 'W' as pattern. Now we draw 'W' and it produces the output for its corresponding sentence from the database.

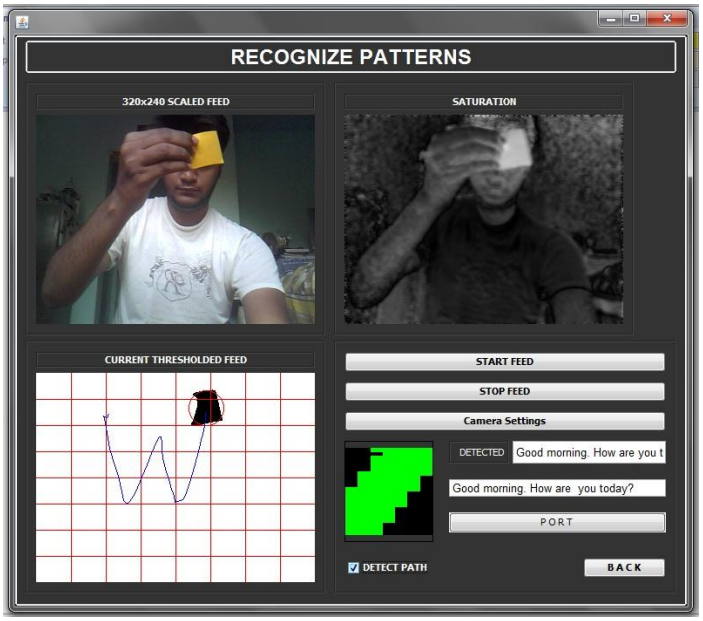

Fig 6. Pattern Recognition

Step 4: The sentence so produced in the previous step is then ported to spchapi that reads the text aloud and hence helps a dumb person to speak his mind via audio from device.

Fig 7. Speech Output

Second part of the application converts speech to gesture. The speech input is given via microphone and its corresponding gesture is given as output. Here we have symbol of Namaste for its speech in English. Hence for a deaf person it becomes easy to understand what the normal person is trying to say simply by looking at the images or gestures.

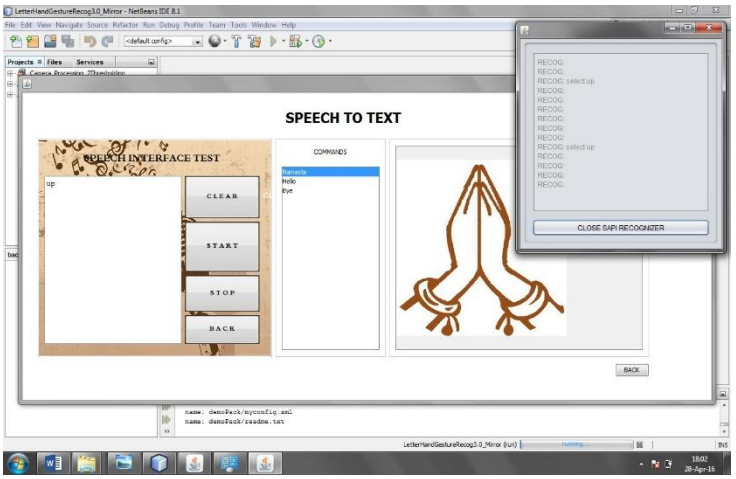

Fig 8. Speech to Gesture

5. CONCLUSIONSAND FUTURE WORK

Commulator, the main aim of our project is to provide a helping hand to the deaf and dumb people. Communication is a key which not only unlocks the lock to every question but it also helps to bind a mutual healthy relationship between each other. Today, where new technology are just a touch away to help the human race, commulator is the creation of such technologies. The deaf and dumb are always

treated as a part of different world, our main moto is to build a bridge and fill up the gap of communication between their world and our world. We as normal human beings too find it difficult to communicate our feelings with them, this application will help us to share our feelings with them.

This application can further be improvised by introducing additional hardware which improves the performance and quality for the end users. Leap motion cameras can be used to introduce whole new dimensions to the application where symbolic hand representation can be done rather than gestures.Use of built in libraries like OpenCVopen a whole new era in open source image processing domain. This project can be improved according to ones needs and budget. Though current version of commulator lacks in accuracy and precision but it uses open source algorithms, is very cheap and easy to understand by any novice level programmer.

The main aim of any technological invention is to help users and make them happy and satisfied. Our intention in this project is that we make our end users, the deaf and dumb and the normal people happy and satisfied while using this application for communication.

6. ACKNOWLEDGEMENT

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