A REAL TIME VISUAL-AUDIO TRANSLATOR FOR DISABLED PEOPLE TO COMMUNICATE USING HUMAN-COMPUTER INTERFACE SYSTEM

Mr. Dikshant B. Patil [1], Prof. G. D. Nagoshe[2]

[1]M.E. student at P.R. Pote (Patil) College of Engg., Sant Gadge Baba Amravati University
[2]Assistant Professor at P.R. Pote (Patil) College of Engg., Amravati, Maharashtra, India.
Department of Electronics and Telecommunication, Amravati University, P.R.Pote (Patil) College of Engineering,
Amravati, Maharashtra, India.

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Abstract - *In this paper, hereby put forward concept of a real-time visual-audio translator interface, as in this modern age the advancement in ubiquitous computing has made the use of natural user interface very much required, as one of the major drawback of our society is the barrier that is created for disabled or handicapped. Here we develop an application which is capable of the gesture recognition in real-time will translate sign language, and hand gestures to English language and it's phrase in the form of text and audio. The image data is pre-processed using a combinational algorithm and recognition is done using ring nodes detection, angles between fingers and template matching this is also called as image processing. The translation in the form of text is then converted to audio given out by speaker, by this a deaf or dumb person can communicate with the blind person and also with other normal people also. In other stage a blind person can also communicate as through speaking, the application take speech voice and convert it to text which is visible. In other stage the input is from microphone and it convert it into text which is visual on the display. By this application we can probably make the communication for disable person much easier with rest of the world.*

***Key Words*: Python, open source CV, image processing, speech processing and Laptop (computer).**

1. INTRODUCTION

In this Paper of research, explains us about the proposed method to assistive for the disabled persons. As we know that for communicating for and between two persons there have to a be a medium, as we know that , a blind person can communicate with the help of speech , and a dumb or deaf person can communicate with the help of hand gestures , but the problem arises when there are having to communicate between with one-another . As dumb or deaf person can only do hand gestures to communicate but blind person cannot see it and blind person speak but the deaf person cannot hear it. In this proposed method, we can select modes and because of this the two persons blind as well as deaf or dumb person can communicate with each other easily, this method is also useful for those persons which does not know sign languages and also hand gestures.

In this modern age the advancement in ubiquitous computing has made the use of natural user interface very much required as one of the major drawback of our society is the barrier that is created between disabled or handicapped .In our country around 2.78% of peoples are not able to speak i.e. Dumb and deaf, and around 1.59% people are blind this makes a huge population of persons. Gesture and sign languages are the mode of non – verbal interaction medium and can provide the most intuitive, originally and natural way to interact with computers.

As in this, human – computer interaction is to be done, python and open cv is used as the language and interacting medium, in this the hand gestures are to be given to be as input through the camera and the system to be used to be converted into text which can be display and then it is to be converted into speech and can be output by the speaker as by this the conversation between dumb or deaf person and blind person as blind person can listen. Also in this when a blind person which can be speak then this speech is converted into text which can be displayed on the screen, in this the input is given to the system with the help of microphone and the output is visible on the screen. As the whole world communicate through verbally, as by this the disabled persons can communicate with the world by physical means non-verbally, as by this the person which is need between the conversion between two disabled person is replaced by other computer based assistive system.

This paper focuses on removing the barrier of communication for physically disabled people. In this the image processing is used for the conversion of image to text, then this text is then converted to the speech. In another, the speech is converted into text using speech or voice processing, this is done to totally using python language. The objective of this to design a system to help the person who are disabled to Communicate with the rest of the world. This system provides us an innovative, natural, user friendly way of interaction with the computer which is more familiar to human beings. And also this method can be implemented in public areas where there are having to be done various interaction between peoples. In the database can be added as the sign languages and hand gestures can be different form one place to another by this it can be accumulated into it , also the barrier between the person who does not know the

sign language or hand gestures can be easily be communicated. This whole contraption can be accumulated in all sorts of wearable devices and hand held devices which can be easily be carried out in public.

2. LITERATURE REVIEW

[1] Firstly by this, Zhi-hua Chen, in their paper presented a real time method for hand gesture recognition. The framework first extracts the hand region from the background using background subtraction method. The output of the hand detection is a binary image in which the white pixels are members of the hand region, while the black pixels belong to background region. Palm point, center of the palm is used to create a palm mask. This palm mask is used to segment fingers and palm. The method is rotation invariant as it uses palm point and wrist point to align the segmented image. Thumb and fingers are detected and a rule classifier is applied to predict the label of hand gesture. As it can tell us about various techniques system and its uses.

[2] Secondly the paper by, Hsiang-Yueh Lai recognized eleven kinds of hand gesture using convex defect character points. The hand is extracted form the background using YCbCr color transformation and hand contours are defined. [3] These hand contours are used to get conves defect character points, and finger angle and fingertip positions are calculated to recognize the hand gesture, here in this it is explained by this color transformation. Another in this is the paper by, Thang B. Dinh used boosted cascade of classifiers to recognize hand gestures . Their system is able to efficiently recognize 24 basic signs of American Sign Language (ASL). Use of AdaBoost and informative Haar wavelet features helped in achieving high computational performance. 24 detectors are trained for 24 gestures with an average number of stages equal to 13. The gesture AEST got a big false alarm because of similarity between them. The system has a correct rate of 83%. Freeman used Orientation Histogram to represent hand posture which has low computational time, but requires the input to be close-up image of the pattern. As this papers are to be used to study the hand gestures. Moreover, Orientation Histogram is similar for signs that are very similar to one another, which makes the classifier inaccurate.

[4] Ahmed et al., introduced the use of a Bayesian technique in order to recognize 3D hand gestures even with large amounts of noise and uncertain or missing input data. As because of this study we can know that can be our system to be implemented further or not. In paper, Vision based hand detection is discussed. As the part of that visual system, the proposed hearty real time algorithm a precise gesture is essential to activate the hand detection followed by tracking. Planned algorithm consists of segmentation process by some features like skin colour and motion etc. Several studies based on computer vision techniques were published in the past decade. A study by Murthy et al., covered the role and

fundamental technique of HCI in terms of the recognition approach, classification and applications, describing computer vision limitations under various conditions.

[5] Another study by Khan et al., presented a recognition system concerned with the issue of feature extraction, gesture classification, and considered the application area of the studies.

[6] Suriya et al. provided a specific survey on hand gesture recognition for mouse control applications, including methodologies and algorithms used for human–machine interaction.

[7] As for the speech (voice) recognition there are many papers, some papers are to be reviewed as, for the feature extraction the paper by Furui 1986; Guyon et al. 2008; Hirsch and Pearce 2000, which tells us about, Feature extraction, in an abstract meaning, is extracting descriptive features from raw signal for speech classification purposes. Due to the high dimensionality, the raw signal can be less informative compared to extracted higher level features.

[8] Feature extraction comes to our rescue for turning the high dimensional signal to a lower dimensional and yet a more informative version of that for sound recognition and classification. As for the other and additional part, D. Yu and Deng 2016; Rabiner and Juang 1993, gave us overview about feature extraction, in essence, should be done considering the specific application at hand. For example, in ASR applications, the linguistic characteristics of the raw signal are of great importance and the other characteristics must be ignored.

[9] As another by, Campbell 1997, in Speaker Recognition (SR) task, solely voice-associated information must be contained in the extracted feature So the feature extraction goal is to extract the relevant feature from the raw signal and map it to a lower dimensional feature space. The problem of feature extraction has been investigated in pattern classification aimed at preventing the curse of dimensionality. Some other prominent works of different types in speech recognition is also having to be done by other members such as, some feature extraction approaches based on information theory by Amisina Torfi, So- leymani, and Vakili 2017; Shannon 2001 applied to multimodal signals and demonstrated promising results by Gurban and Thiran 2009. Also other as, the speech features can be categorized into two general types of acoustic and linguistic features. The former one is mainly related to non-verbal sounds and the later one is associated with ASR and SR systems for which verbal part has the major role.

[10] Another great package is PyAudioAnalysis (Giannakopoulos 2015), which is the comprehensive package developed in Python. However, the issue with PyAudioAnalysis is that its complexity and being too verbose for extracting simple features and it also lacks some important pre-processing and post-processing operations for its current version. By this all paper reviews and study we here analyse the required knowledge about the proposed system in this review.

For the study of Indian Sign Language (ISL), we review some papers which are having roots as, in 1970, linguistic work on ISL began and with contribution of a team of researcher from America and Vasishta et al. It was found that ISL is a language in its own right and is indigenous to the Indian subcontinent and resulted in four dictionaries between 1977 and 1982. It was found that 78.45 % signs are same across the region.

[11] In 1998, another researcher from Germany (Dr. Ulrike Zeshan) compared signs from many different regions across the Indian subcontinent, including regions such as Orissa, Kerala, Jammu and Kashmir, Bhopal, Chennai, Bangalore and Darjeeling. She also found that on an average about 74.96 % of the signs are similar across different regions. Further work was carried out by Zeshan and Vasishta on developing ISL grammar, ISL teaching courses, ISL teacher training program and teaching material that was approved by the Rehabilitation Council of India in 2002. There are many ISL cells working in India for use and awareness of ISL as well as teaching courses of ISL. Ali Yavar Jung National Institute for Hearing Handicapped, Mumbai released "Basic course in INDIAN SIGN LANGUAGE". After survey, it was found that there are around 2589 deaf and dumb schools in India. Most of the schools use their own native sign language as a teaching and learning aid, therefore, for awareness to use of standard ISL as a teaching aid is being done by different ISL cells and NGOs to help Indian deaf and dumb community to bridge the communication gap between them. By this data we can be interpreted the amount of various hand gestures used commonly across the India.

3. OVERVIEW OF PROPOSED METHODOLOGY

As in this proposed system there is having two parts, first, the image processing and voice or speech processing as we know that in this system first of all in this the hand gesture is to be recognized by the system this is done by the help of the camera by which the hand gesture image is given as input and from that by this there is having after that the image is pre-processed as we here uses various techniques such as HOG classifiers and also there is having taken some sort of help of SVM in this to learn and recognize the input image. In this after pre-processing there is having to firstly, the palm of a person is detected, as there are hand is then separated with the background then the figure segmentation is takes placed, as this is done from this the ring nodes of a figures

are to be determined as because of this as we have in this nodes are to be recognized, it becomes easier to calculate or to be separate the figures from palm and also with one another. Also in this the distance between the fingers and also the finger tips can easily be determine. Also in this the image segmentation of fingers and also separation of background with respective technique is used.
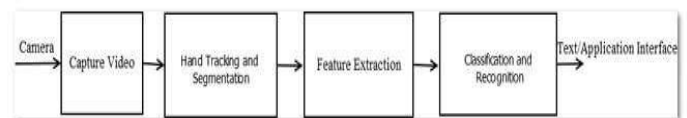

Figure 1: Shows the conversion of image or video into text.

When the hand is recognized then the image processing takes place as here the system can have a limited database or due to the use of machine learning they can increase the database, as by this the image is then compared and tally to the images in database and then the appropriate text is generated and be displayed on the screen, in this the image to text conversion takes place. And after this when the text is displaced the text is then converted into speech with the help of the speech processing. Hence this is the total one part in which there is having the hand gesture is converted into speech because of this a dumb, deaf person can communicate with the blind person.
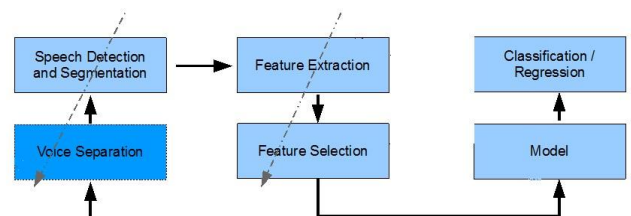

Figure 2: Process of Speech Recognition.

In another process, when a blind person speaks, here the voice or sound is then recognized to the system as input through the microphone as we know here that because of this the respective process is performed on the speech input. After when the speech is recognized then there is having to be converted into text using speech to texted conversion, by this the speech is converted into text which is displayed at the screen as output. By this the blind person can communicate with deaf or dumb person as, they can read what is on the screen.

The Flowchart of the process from image to speech (voice) conversion in first process and in other second process from voice as input, to output as text on screen can be stated and be expressed as flows in Figure 3 and Figure 4, respectively.
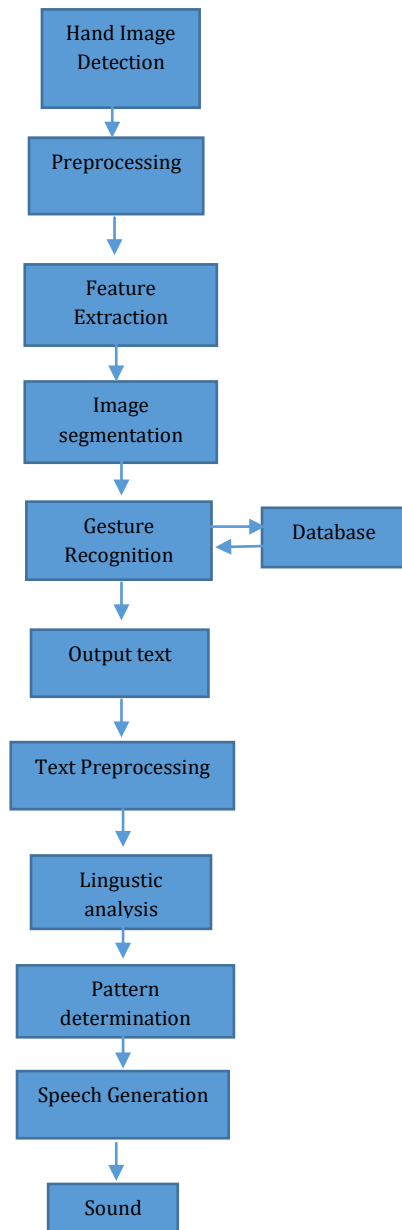
FLOWCHART:

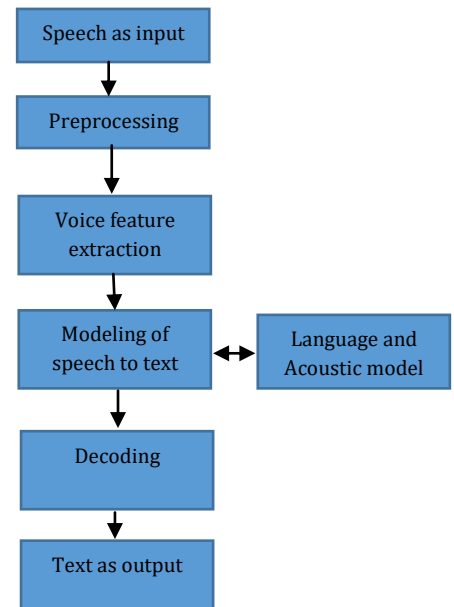Figure 3: Flowchart of Image to Speech (Voice) Conversion Process.

Figure 4: Flowchart of Speech (voice) to Text conversion process.

In this the process, converts the received audio into text as it applies robust neural network models in a convenient API. It enables voice command and control and transcribes audio. The accuracy is unparalleled as the most advanced deep learning neural network algorithms.

4. ADVANTAGES, DISADVANTAGES AND APPLICATIONS.

4.1 Advantages:

1. As here the proposed system can detect the hand more efficiently than the other previous system.
2. This system can better separate the hand from the background, and the accuracy is good, because of which we are using the ring nodes of the fingers and also other features of the hand.
3. The database can be updated easily and various languages can be incorporated in it as for user convenience.

4.2 Disadvantages:

1. This system uses different modes to select which input to be taken, both input simultaneously cannot be done.
2. The system cannot be used to differentiate between the dialects of the same language and the pronunciation can be correct, to be recognized by system.

4.3 Applications:

1. Now a days there are having food centre drive through so if a dumb or deaf person comes and supposed to order a food for it, then this system is very useful for the person.
2. Many video social services can take the advantages of this system as there are having to produce subtitles which can be generated by this system software.
3. This hand gestures are also used in controlling robots and also various tasks are done is we designate a special hand gesture to the each action required, so that there have been perform it.
4. As there are also used for the graphic design as they can be used to control the various graphic instruments in both three dimensional and two dimensional world. As it can track hand movement and also draw shapes and commands for editing graphic system.
5. It can be used in virtual environment for natural human computer Interaction HCI in a real-time from binocular views.
6. It can be used for television control, home automation, for gaming purposes and to do specific tasks assigned to personal computers and tablets.
7. It can be also used for the 3D modelling, as some system used hand silhouette.

5. CONCLUSION AND FUTURE SCOPE

In this modern world , where there are many technologies are at the peak, there are many facilities are available for offering the input to any application which are running on the computer systems, some of the inputs can be as the image or as the voice. Here in this given system the hand gestures are used to take as input and gave voice as output, and it can also take sound as input and gave text displayed on screen as output. In this world it gave the facility for the disabled person to communicate with other person and also other disable persons. The present system which we have implemented although seems to be user friendly as compared to modern device or command based system. As it is a new system but it contents various drawbacks, but in future we can improve this system, try to build more robust algorithm for both recognition and detection evenly in any condition which can be helpful. Through this paper, an unprecedented prototype has been created to aid the visually, vocally and audibly disabled. This project not just focuses on empowering and facilitating the differently abled, it is also compact and resource saver. The overall cost has been cut down by eliminating braille books and the energy spent in understanding them. It is a less costly solution, as all the components used in the device are cost effective and efficient. The latest and most trending technology makes this device portable, adaptable and convenient. The device proposed in this paper can be a major help in solving a few of the many challenges faced by the differently abled. To further extend the project, the device can be made more compact and wearable to make it easy for the user to use.

As this proposed method and its working gave us information about how the system can be work and how it is useful by all this means it can be improved by using better sensors and as this technique uses the python language and open CV over the MATLAB, this system can also be improve by adding various other sensors and further can be develop for all body movement detection, facial detection and also some other gestures, also know from time to time the non-verbal gestures are changes and can be integrated. The device can be integrated as wearable and also wrist fitted.

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