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Real Time Assistive Communicative System for Deaf, Dumb and Blind

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ABSTRACT –

It is true that a linguistic impediment can make verbal communication difficult, but sign language is a structured language that can help overcome this barrier. However, not everyone understands sign language, so there is a need for a system or software program that can detect sign language gestures and facilitate communication. A real-time system has been developed using machine learning and image processing to accomplish this task. Image processing is used to preprocess images and remove multiple hands from the background, while machine learning is used to recognize the 26 English alphabets based on the preprocessed images. A customized dataset and spontaneous hand gestures performed by individuals of varied complexion have been used to evaluate the proposed convolutional neural network. This system has the potential to improve communication for individuals with a linguistic impediment, as well as for those who do not understand sign language.

Keywords - linguistic impediment, image processing, convolutional neural network, verbal communication

I. INTRODUCTION

Perceiving, listening, responding, and behaving appropriately in various circumstances are all essential skills for individuals. Unfortunately, some individuals are unable to develop these skills due to visual, auditory, or vocal impairments. Creating a compact gadget to assist these individuals is a challenging task.

One challenging communication issue is communicating with a deaf-dumb individual. However, a cutting-edge foundation for a combined deaf, dumb, and blind communication system has been proposed. One approach is to use a camera to capture an image of the text, which can then be converted to speech using text-to-speech (TTS) conversion technology. This approach provides a way for a blind person to comprehend text. Additionally, speech-to-text (STT) conversion technology can be used to enable the hearing impaired to read text.

This innovative communication system has the potential to significantly improve communication for individuals with visual, auditory, or vocal impairments.

II. OBJECTIVES

Our project's primary objective is to offer deaf, dumb, and blind people a normal way of life. People who are visually challenged can readily understand the words thanks to this technology. Text and gestures can be used by those who have trouble speaking out loud to convey their message.

The text that is presented can help the deaf understand what others are saying. They are able to live an independent life thanks to this.

To provide a way for the deaf people to hear others speech from text.

To provide a vision-based approach for sign language recognition. To provide the visually impaired people to understand the words easily by tesseract software.

To provide a way for deaf and dumb people to use sign language to express themselves to the people around them with different hand and body gestures.

To provide the vocally impaired people to communicate their message through text which can be read out by espeak. **5.**To provide the vocally impaired people to communicate their message through text which can be read out by espeak.

III. PROBLEM STATEMENT

Addressing the problem encountered by those who are visually and verbally challenged and giving them the aiding tool to systematize their lives. People who are deaf, blind, or dumb use hand signs to communicate, however they may find it challenging for others to comprehend their language from the signs they create, addressing the issue faced by persons who are verbally and visually impaired and providing them with the help they need to organize their life.

IV. SCOPE

The project scope of sign language recognition typically involves developing a software system or machine learning model that can accurately interpret sign language gestures and translate them into written or spoken language. Deaf people utilize gestures to communicate, therefore normal people have difficulty understanding the hand signs they use. As a result, there is a need for systems that can recognize different cues and efficiently connect with people. The software translates hand movements into text for hearing- impaired people, speech into text for the blind, and text into voice for those who are blind. The goal of this initiative is to facilitate communication between people with disabilities. The system facilitates simple communication for specialists. The system is made to be simple to use and comprehend.

V. LITERATURE SURVEY

[1]. The primary form of communication for the deaf and hard of hearing with their family members and the rest of society is sign language, which is essential in transferring meaning through a visual-manual modality. The study of sign languages has shown a new promise with the developments in computer graphics, computer vision, neural networks, and theadvent of new powerful hardware. People can learn, communicate, interpret, translate, depict, record, and developnumerous sign languages and their related skills with the aid of novel technologies. New apps and solutions that enhance the various performance indicators in these sign language- related tasks are being driven by deep learning and image processing.

[2]. It is extremely challenging for intelligent systems to do continuous sign language recognition (CSLR), which needs running computationally intensive video analytics and language modelling. In this paper, we offer a deep learning system dubbed SignBERT that can extract spartial characteristics for CSLR and model the underlying sign languages. SignBERT combines the residual neural network and the bidirectional encoder representations from transformers (BERT) (ResNet). We also offer a multimodal version of SignBERT that incorporates the input of hand images with an intelligent feature alignment in order to close the gap between the probability distributions of the recognition outcomes provided by the BERT model and the hand photos. Using three challenging continuous sign language datasets, experimental results demonstrate that our technique outperforms alternative CSLR.

[3]. One of the non-verbal communication techniques utilized in sign language is the hand gesture. It is mostly used by deaf and dumb individuals to communicate with other people or among themselves when they have hearing or speech issues. Many makers around the world have created numerous sign language systems, however they are neither adaptable nor economical for end users. Therefore, it is software that shows a system prototype capable of automatically recognizing sign language to assist deaf and dumb individuals in communicating with each other or regular people more successfully.Normal people often find it difficult to understand and communicate with dumb individuals, hence they are typically denied regular social interaction. These folks are forced to use visual communication or an interpreter. It won't always be possible to use an interpreter, and visual communication is typically challenging to understand. In the community of the deaf and dumb, sign language is the main form of communication. It is mostly used by their families and/or the deaf and dumb population because the average individual is unable to understand the syntax or meaning of the numerous gestures that make up sign language.

[4]. Speech impairment is a disability that affects an individual's ability to verbal communication. To overcome this issue sign language is used which is one of the most organized languages. This paper is an effort towards filling the gap between differently-abled people like deaf and dumb and the other people. Image processing combined with machine learning helped in forming a real-time system. Image processing is used for pre-processing the images and extracting different hand from the background. These images obtained after extracting background were used for forming data that contained 24 alphabets of the English language. In this paper, machine learning is used along with image processing. Images of the hand are captured and preprocessed for extracting the hand from the background. Computer vision is providing vision to machines so that they can extract important features from the images captured.

[5]. There is an absence of communication with deaf people in our society. To overcome this barrier the introduction of Sign Language (SL) took place. To convey meaning to normal people, sign language makes use of patterns that are visually transmitted sign patterns. Normal people cannot understand the signs used by deaf, as they do not know the meaning of a particular sign. The system proposed here aims at solving this problem. This system uses a camera, which captures various gestures of the hand. Then, processing of the image takes place.

By using various algorithms. As the output is text one can easily interpret the meaning of a particular sign. This also curtails the difficulty to communicate with the deaf. The implementation of the system is by using OpenCV-Python. The system uses various libraries.

VI. METHODOLOGY

The process is performed by assigning a minimum threshold voltage to recognize the voice signal. The input is giventhrough a microphone which is converted into a text format. The device will have the ability to capture hand gestures wheninput data is uploaded to the computer via a webcam. It is an optical character recognition engine for various operating systems. Tesseract can detect whether text is mono spaced or proportionally spaced.

The process starts with the capturing of image. Convert the RGB image into gray scale image for better functioning. The text is printed on display and read out by the Speaker. The Dumb people convert their thoughts to text which could be transferred to a voice signal. The converted voice signal is spoken out by espeak synthesizer. After entering the text from keyboard, the espeak synthesizer converts text to speech.

Fig 01: Data Flow diagram

a. Text to Speech

The first process text to speech conversion is done for the dumb masses who cannot speak. The Dumb people convert their thoughts to text which could be transferred to a voice signal. The converted voice signal is spoken out by espeak synthesizer. After selecting the option OP1 the OS and sub process imported. Call text to speech function and enter the text as input. After entering the text from keyboard, the espeak synthesizer converts text to speech. The espeak is compact open supply software program speech synthesizer for English and other languages for Linux and Windows platform. It is used to convert textual content to voice. The text is given by dumb in the system and using espeak the text is easily converted into voice the voice will comes from the system speaker or the model used speaker.

b. Speech to Text

This is developed for the hearing impairment, people who cannot understand the words of normal people. In order to help them, our project is provided with a switch which is used to convert the voice of the normal people text. We have used speech recognizer for conversion. The process is performed by assigning a minimum threshold voltage to recognize the voice signal. The input is given through a microphone which is converted into a text format. It supports a variety of languages. If the voices signal recognizable it will print the text else it gives the error signal. The user needs to speak nearthe computer system so the computer speaker recognizes the voice and converts that speech to text. This is used by the people of bind to communicate with the deaf peoples having two problems at a time they are unable to hear and speak.

c. Gesture to Voice

It is used for the vocally impaired people who cannotexchange the thoughts to the normal people. Dumb people usegesture to communicate with normal people which are majorlynot understandable by normal people. The process starts withthe capturing of image and crops the useful portion. Convertthe RGB image into gray scale image for better functioning.

For reference, a certain number of gestures are listed on the s ide of the camera.Hand coordination is present in these stand ardised gestures, which will be compared to the dataset to produce the word as the result. We've added a few more keyboard operations, such as "A" for printing a specific letter after a gesture is shown, followed by a repetition of the process for all the letters, "E" for playing whole word, and "Q" for endin g the process Some of the gestures are already trained using machine learning algorithm which is more helpful. The gesture communication is so common for the dumb with their family but is unable to understand for the normal peoples soby using this process the normal people can understand thegesture to text and speech.

d. Image to Voice

The fourth process is developed for blind people who cannot read normal text. In order to help blind people, we have interfaced the Logitech camera to capture the image by using OPENCV tool. An image is captured using camera. It is then transformed from RGB to grayscale, text or words that exist within the image is served as counters. The python Tesseract is an optical character recognition (OCR) engine for a number of OS. Tesseract OCR is the method of electronically extracting text from photographs and reusing it in a variety of ways. Tesseract can be used for Linux, Windows and macOS.It can be used by programmers to extract typed, printed textual content from pictures using an API. The captured image is converted to text sing Tesseract OCR. In OCR, the adaptive thresholding techniques are used to change the image into binary images and they are transferred to character outlines. The converted text is read out by the espeak. The real time textcan also be recognized and read by the system.

e. Dataset generation

It is required to make a proper database of the gestures of the sign language so that the images captured while communicating using this system can be compared. Each hand coordinate is recognized as a point, and its individual x, y, and z coordinates are calculated and recorded. The output is determined by matching this information with the hand coordinates that are provided as the camera's input.

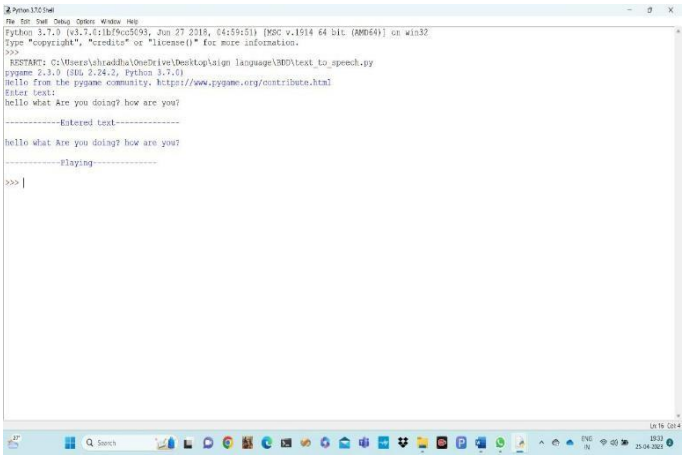
Fraining and testing

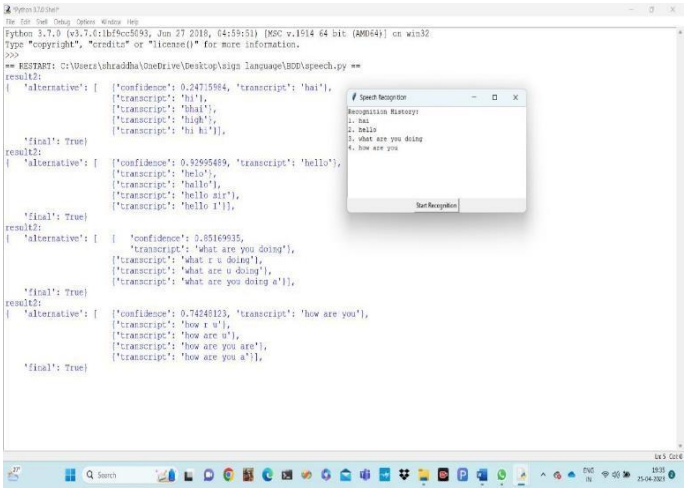
We need to split a dataset into train and test sets to evaluate how well our machine learning model performs. We convert our input images (RGB) into grayscale. We apply adaptive threshold to extract our hand from the background and resize our images to 500 x 500. We feed the input images after pre- processing to our model for training and testing after applyingall the operations.

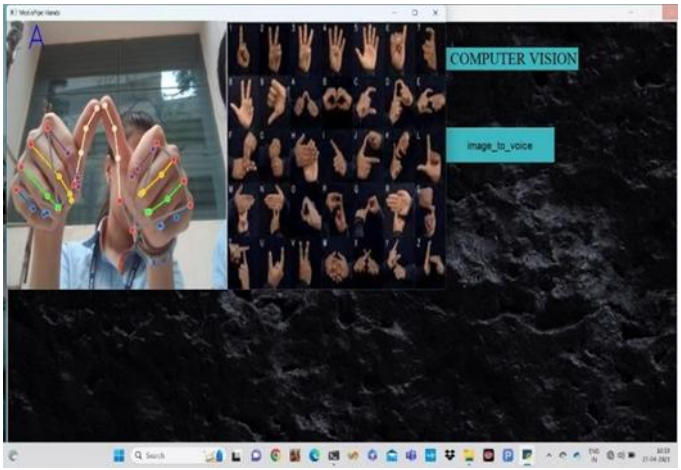
VII. PROPOSED SYSTEM

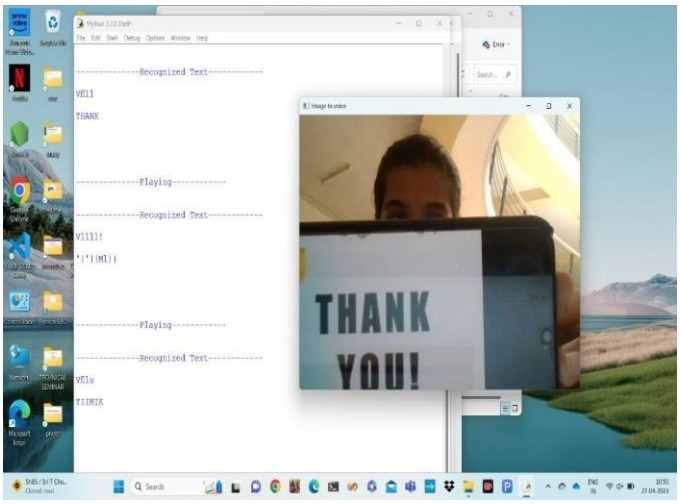
It aim for developing the prototype model for blind dumb and deaf people by employing in a single compact software. The system provides a unique solution for these people to manage their sites by themselves. The system is created with the source code of Python. It is the easiest programming language to interface with the Laptop Application. The system is run by the source code of Python to assist blind dumb and deaf people in a single device which is so compact and easy for them to manage. We have to choose the switch for necessary conversion.

1.Text To Speech (TTS) 2.Speech To Text(STT) 3.Gesture To voice 4.Image to voice.









VIII. HARDWARE SPECIFICATIONS

The proposed framework ran on the server with the following hardware and software specifications:

Tesseract OCR, Open CV, Speech recognizer, Espeak, System: Pentium IV 2.4 GHz or more, Hard Disk: 40 GB, Monitor:15 VGA Color , Mouse: Logitech, Ram:512 Mb.

IX. RESULT

This project aims to lower the communication gap between the deaf, dumb and blind community and the normal world by designing the prototype model for them into a single compact device. The device can be used as smart assistant for differently abled people to communicate with others and it is a language independent system. Basically, it acts as an artificial ear, tongue and eyes to differently abled people. In the first module Text-to-Speech the text entered should be accurate. Second module Speech-to-Text the input accuracy can be affected by the frequency of the voice inputted because different people have different speaking styles and pitches, which can affect the way that the system interprets the input. Additionally, external factors such as background noise and microphone quality can also impact accuracy. Third and fourth module, Image to voice and gesture to voice respectively accuracy in image recognition can be influenced by the background color and positioning of the hand to the camera because these factors can affect the lighting and contrast of the image, which in turn can affect the ability of the system to accurately recognize the object. Hence the accuracy is calculated as 86%.

X. APPLICATION

Speech recognition technology and the use of digital assistants have moved quickly from our cell phones to our homes, and its application in industries such as business, banking, marketing, and healthcare is quickly becoming apparent. Developing aids for the hearing impaired and for recognizing sign language. Medically monitoring patients emotional states, or stress level .

In hand gesture recognition, computer interactions that uses gestures as input data, the information is transmitted to the computer via a webcam.

Automatic number plate recognition

- In airports, for passport recognition and information extraction
- Automatic insurance documents key information extraction
- Traffic sign recognition
- Extracting business card information into a contact
- More quickly make textual versions of printed documents,

e.g. book scanning for Project Gutenberg

- Make electronic images of printed documents searchable,

e.g. Google Books

- Converting handwriting in real-time to control a computer
- Gesture-based Gaming control
- Hand gesture to control the home appliances like MP3 player, TV etc.
- Gesture control car Driving
- Communication

IX. CONCLUSION AND DISCUSSION

This project will make it easier for the deaf or mute community to interact with the rest of society and lead normal deaf, and stupid into a single small device. The technology is able to serve as a smart assistant for people with disabilities and is language independent. In essence, it functions for thosewith abnormalities as a fake tongue, ear, and eye.

X. FUTURE ENHANCEMENT

- The input can be also taken in the form of videos and they are divided into frames and then it is converted into text.
- The system can be made handy by incorporating itinto a mobile phone.
- We can produce a product for blind people that converts the information in any hand-written notes, newspaper or books into an audio signal that these people can here.

XI. REFERENCES

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