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Communication Assistant for Mute People

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Abstract - *People share their ideas, thoughts, feelings, and emotions through communication. They instruct and make requests by communicating with others. Different languages across the world are used to communicate. According to the Linguistic Society of America[7],there are nearly 6,500 languages spoken around the world. Speech is an important medium of communication. Due to the lack of speech, mute people use sign language to express their thoughts and emotions to others. To understand what mute people want to say, it is necessary to have the knowledge of sign language. There are more than 300 sign languages used by mute people for communication around the globe. Very few people have the ability to understand and use sign language. The proposed system aims to bridge the communication gap between mute people and other people which prevents social isolation.*

Key Words: **Sign Language, Equivalent Speech, Images, Text to Speech Converter**

1. INTRODUCTION

The knowledge of sign language is essential in order to understand what mute people want to say. It becomes difficult for mute people to communicate with others who aren't acquainted with this language. The proposed system converts the sign language image selected or instructions given through a keypad by a mute person into equivalent speech with the help of an external device. The proposed system has a touch screen LCD on which the images of hand gestures used in American Sign Language (ASL) are displayed. These gestures are used by mute people on a daily basis. So when a mute person views these images he is able to use this assistant for communicating effectively with others.

2. LITERATURE SURVEY

The Sign Language recognition system proposed by Keni et al.[1] is based on gestures of hand movement. The gestures are captured by a camera attached to the system. The image captured is converted into grayscale and processed using image processing algorithms in MATLAB. Output is generated by using a pattern-matching algorithm from a stored database. The system requires a high-quality camera to capture the sign language gesture. Such a camera increases the overall price of the system making it less affordable. In addition, the orientation of the camera plays an important role in conveying the sign language gesture. Disorientation of the camera may lead to misinterpretation.

Padmanabhan and Sornalatha[2] proposed a technique of using flex sensors and an accelerometer with a Peripheral Interface Controller (PIC) microcontroller to communicate with mute people. The flex sensors determine the amount of finger bend whereas the accelerometer measures the position of the palm. Each sign language gesture has fixed values of flex sensors and accelerometer, which were stored in a database. The gesture performed by a user wearing hand gloves generates the value of flex sensors and accelerometer. These values are compared with pre-stored values in the database. If a match is found the respective audio file is generated. Incorrect calibration of the sensor will give the wrong result.

Pigou et al.[3] proposed a sign language recognition system based on the Convolutional Neural Network (CNN). Two different CNNs are used in the model, one for extracting upper body features and the other for extracting hand gesture features. CNN with Artificial Neural Network (ANN) provides the final classification from the preprocessed dataset.

Butte et al. [5] proposed a gesture recognition and speech recognition method based on image processing. An image is captured which is converted into text format using various digital image processing techniques. The image is further converted into speech format which is generated by the speaker.

3. PROPOSED SYSTEM

The section describes the working of the proposed system that is used to convert sign language images or the query entered by a mute person into speech.

When a mute person wants to convey any message, he selects the respective image corresponding to the message displayed on the touch screen Liquid Crystal Display (LCD). The Graphical User Interface (GUI) on the LCD is linked with Raspberry Pi with the help of the Tkinter package in Python. All the images are mapped with suitable unique instructions and pre recorded sound in the MySQL Python database. The audio of these instructions is the final output from the speaker.

The system also provides a keypad option with sign language alphabets. If the message cannot be conveyed through the given set of images displayed on the LCD, the mute person can make use of the Keypad functionality and type his message by selecting the sign language alphabets displayed on the screen .The instructions are converted from text to speech using the Google Text to Speech (gTTS) package in python. In this case, the typed message is converted to its speech equivalent and can be heard through the speaker.

3.1 Block Diagram

The block diagram of the proposed system is shown below.

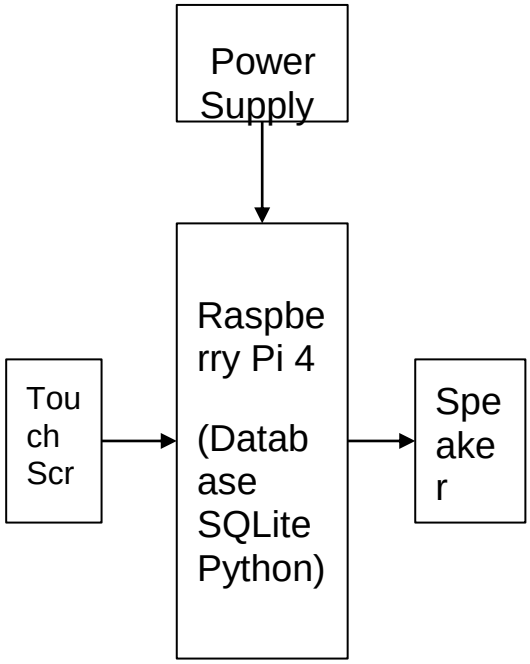

Fig 1: Block Diagram of the proposed system

As shown in the block diagram, Raspberry Pi is used as the controller for the operation of the system. The interactive touchscreen display is connected to the Raspberry Pi at the input and a speaker is connected at the output of the Raspberry Pi controller to give the audio output.

3.2 Flow Chart

The architecture of the system is based on two processes. One is the creation of a database which is used to display images on the touch screen and the other one is the keypad functionality.

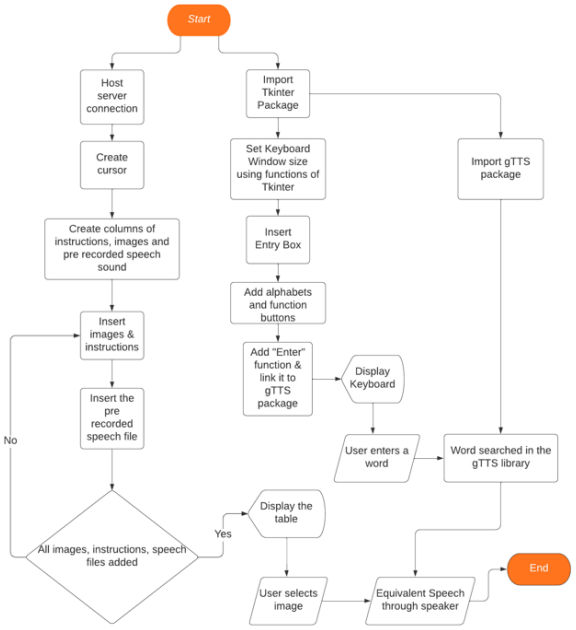

Fig 2: Flow Chart of the proposed system

MySQL Python is used for a database. The table consists of images and their respective pre-recorded audio. Images are instructions used to convey messages using hand gestures. Its equivalent audio is given out through the speaker whenever the user selects any image.

Another important functionality our system provides is touchscreen keypad functionality. The alphabets displayed on the keypad are sign language alphabets (letters displayed using hand gestures). The Pillow library from python allows adding images to the keypad. Tkinter package assists in the programming of the keypad. For converting messages to speech, the "Enter" button is linked to the gTTS package. Once the user types the word, on hitting the "Enter" button, the word is sent to the gTTS package. gTTS searches the word in its dictionary and gives an equivalent speech as output.

3.3 Advantages

- The proposed system device is portable i.e. can be carried anywhere by the mute person thus making it easy for him to communicate anywhere.
- Complex image processing algorithms are not used in our system hence reducing the costs of the system.
- Our system also provides a better user experience via our interactive touch screen display of hand gesture images.

4. CONCLUSION

Our proposed system has a touch screen LCD on which we will display the American Sign Language (ASL) images. These images are the hand gestures used in ASL. The images displayed on the touch screen are the gestures used by mute people on a daily basis. So when a mute person views these images he is able to use this assistant for communicating effectively with others.

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