

# ASSISTIVE SYSTEM FOR DEAF, DUMB OR BLIND

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## Abstract:

One of the challenging task for the individuals who are having impairment in visualise, hear ability and vocal ability is to design a single system that aids all these problems. Even in the recent areas of the researches these issues aren't addressed by using single system. This paper mainly concentrate on designing a single system that will have the ability to help the people who are visually impaired so that they can hear the text shown and this can be achieved by capturing the image by using camera and converts the text captured into voice or audio signals. The people who are having hearing disorder will be able to see or read the information in the audio form by speech to text conversion method and also shows how the vocally impaired people can represent their voice with the help of text to voice conversion technique. These three activities can be coordinated with the use of raspberry pi.

*Index terms –Tesseract, Espeak, Speech texter, raspberry pi*

## I INTRODUCTION:

The goal of this paper work is to design a helpful system for dumb or deaf or blind person as normal person. Through this device the visually impaired person can be able to understand the words in an easy way. The vocally impaired person can convey their message through text and gestures. The deaf people are going to be ready to understand others speech from the text that's displayed. This helps them to experience the important life's feeling, there's tons of invasive presence within the human environment of things or objects, described general overview of internet evolution with several Internet of things services with the utilization of radio-frequency identification (RFID) tags, actuators, smart embedded devices, sensors etc. Tesseract software for blind, Espeak for dumb and Speech texter are interfaced to raspberry pi Board to build this assistive system.

## II OBJECTIVES AND METHODOLOGY:

### Objectives of the proposed system:

1. Uses Tesseract software in order to allow visually impaired people to understand words easily.
2. Espeak will read out the vocally impaired people can convey their message through text.
3. Though Speech texter the deaf people are going to be ready to hear others speech from text.

### Methodology of the proposed system

#### RGB Image to Grayscale:

An RGB image are often seen as a combination of three images (a red, a green and a blue scale images) placed on top of one another. In MATLAB, an RGB image is  $M*N*3$  array of colour pixel, in which each pixel of colour may be a triplet which has red, blue and green colour components of RGB image at a specified spatial location. Similarly one layered image corresponds to Grayscale image. In MATLAB  $M*N$  array has the values that are scaled so that it will represent the intensities corresponds to grayscale image.

Function `rgb2gray()` in MATLAB that converts RGB image to grayscale image. Here it'll be shown on converting an RGB image to grayscale image without using `rgb2gray()` function. The concept is to convert an RGB image pixel which a triplet value like red, blue and green colour component of a picture at a specified spatial location to one value by calculating a weighted sum of all three colour component.

**Algorithm :**

1. The first step is to read the colour image in its RGB format in the MATLAB environment.
2. The colour components from the RGB image are extracted those colours are red, green and blue and then they are transformed into three different 2 dimensional matrices.
3. Form a zero matrix that is create a new matrix by appending zeros and the dimension of this matrix should be same as the dimension of RGB image.
4. The pixel values at the location (i, j) of the RGB image is converted to its grayscale value. This can be done by performing weighted sum of components of red, blue and green components and it is placed in the location (i, j) in the new matrix.

**Espeak synthesizer:**

Espeak is an open source speech synthesizer that consist of multiple platforms and multiple languages in compact which employs method of formant synthesis. In formant synthesis, voice speech (vowels and sonorants consonants) is generated using formants. Consonants that are unvoiced are generated by using sounds that are pre-recorded. Formant-based sonant mixed with a pre-recorded unvoiced sound are used to create voiced consonants. The formant files in the eSpeak Editor supports individual vowels and voiced consonants in the form of sequence of key frames and these key frames defines the sound variations of formant peaks (peaks within the frequency spectrum). A sequence of formant frames is often generated with a version of Praat that has been modified, for the analysis of speech in phonetics there is a free scientific computer software package. The formant frames of Praat are saved during a spectrum.dat file, these are converted into key frames of formant with eSpeakEdit.

**Tesseract OCR:**

Different operating systems consist of an engine that can be used for the recognition of optical character and that engine is called as Tesseract OCR. Single column text inputs which has straight forward TIFF images are accepted by Tesseract version 2 and its previous versions.. These are the earlier versions and there were no inclusion of layout analysis, then giving multi-columned text, images, or equations as inputs that are produced garbled output. The advanced versions from version 3.00 Tesseract will support formatting of output text, positional information of hOCR and page-layout analysis. Leptonicalibrary is used to add variety of new image formats. Mono spaced or proportionally spaced text can be detected by the Tesseract.

This algorithm is in a position to accurately decipher and extract text from a spread of sources! As per its namesake it uses an updated version of the tesseract open source OCR tool. We also automatically binarize and pre-process images using the binarization so tesseract has a neater time deciphering images. Not only are we ready to extract English text, but tesseract supports over 100 other languages as well! provides it an attempt to do not forget to go away a comment if you wish it or have a suggestion/comment.

**Spechtexter:**

Speech texter is web multi-language speech recognizers which will assist you type books, long documents reports, blog posts together with your voice. Detailed information is often found at <https://www.speechtexter.com/help> .Over 60 different languages are supported by this app.

1. To get better results a top quality microphone should be used, remove any ground noise, and speak clearly and loudly.
2. It can create text notes/ sms/emails/tweets from user voice.

**III IMPLEMENTATION:**

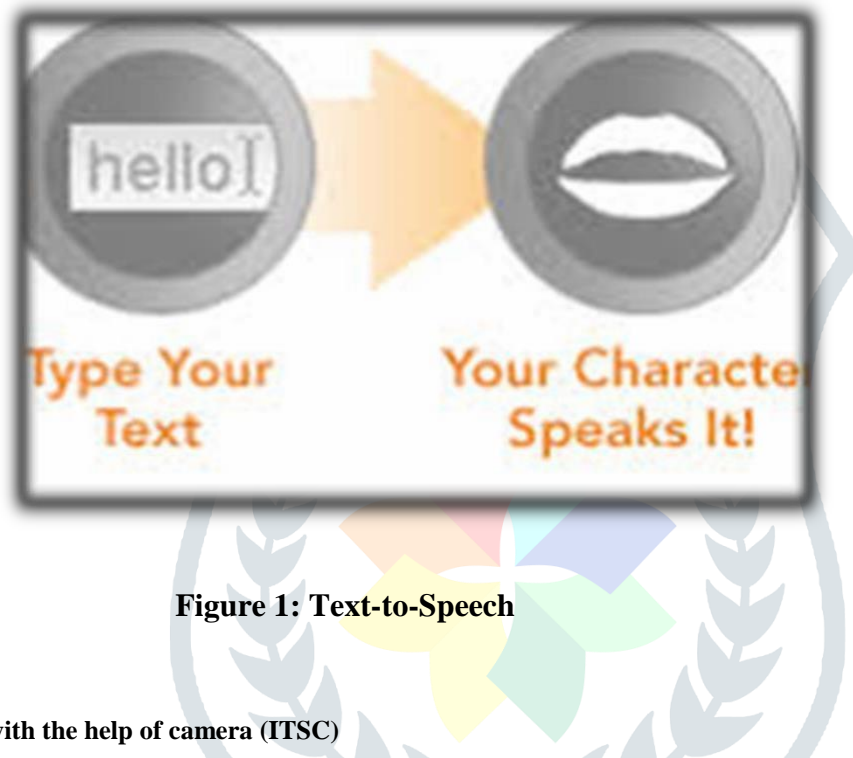
The system module is divided into 4 different modules:

1. Text is converted to Speech that is Text-to-Speech (TTS)

2. Image-to-Speech with the help of camera (ITSE)
3. Gesture-to-Speech (GTS)
4. Speech is converted to Text that is Speech-to-Text (STT)

### Text-to-speech Conversion (TTS)

The first step is to convert text to speech for those people who cannot speak. The thoughts of dumb people are converted into text and then it is transferred to a voice signal. The espeak synthesizer will speak out the voice signal converted. The OP1 will select the OS required and the sub process. The text is entered from the keyboard. After this the espeak synthesizer will convert text to speech. This can also be done by Ctrl+C.



**Figure 1: Text-to-Speech**

### Image-to-speech with the help of camera (ITSC)

For the blind people who cannot read the normal text this process is implemented. The Logitech camera is interfaced with the computer so that image can be captured using OPENCV tool. The Tesseract OCR is used to convert the image that is captured into text and the text is saved to exit.txt. After opening the document the saved paragraph is split into sentences and saved. The adaptive thresholding technique is required in OCR so that it can be used to change the image into binary images and then they are transformed into character outlines. The espeak synthesizer will speak the converted text.



**Figure 2: Image-to-Speech**

### Gesture-to-speech (GTS)

The people who have vocal impairment can exchange their thoughts using this process. This gesture to speak cannot be understandable by the majority of normal people. This method can be called as sign language. At first the gesture image is captured and then useful portions are captured. For better functioning RGB image is converted into gray scale image. The Gaussian blur function is used to blur the cropped image and then it is passed through the edge function in order to get the image part that is highlighted. Contours and angle between the fingers are identified. Implementation of the finger point is done using convex hull function. Quantities of angles that are less than 90 degree are counted which shows the amount of defects. By considering these defects the text is displayed and read out by the speaker.

### Speech-to-Text Conversion (STT)

For the people who are having the hearing disorder this process is implemented. These people cannot understand the words of normal people. For this purpose a switch is implemented that converts voice to text. Chromium browser is used which automatically connects to the URL of speecheater.com. A minimum threshold voltage is assigned for the acknowledgement of the voice signal. The speech signal given to the microphone is converted to text. The selection of languages is supported by the URL. If the voice signal is recognized then it will be printed otherwise error signal is produced.



Figure 3: Speech-to-text

### IV RESULT

The gesture is captured and the useful portion is cropped. It is converted to RGB image as shown in figure 4. The gesture is converted to text as “HAD BREAKFAST”.

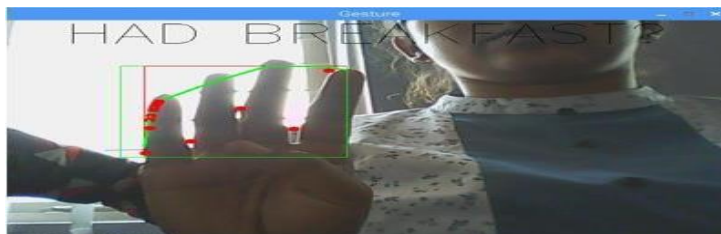


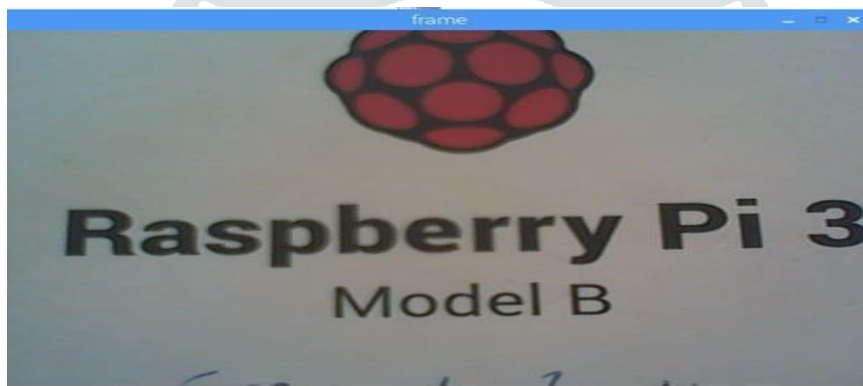
Figure 4: Gesture to text for deaf or dumb people

If the gesture captured is not recognized by the system it shows as “OTHERS” as shown in figure 5.



**Figure 5: Gesture to text if it is an invalid signature**

The image will be captured by the Logitech camera, using E-speak synthesizer text will be converted to speech. The image captured is shown in figure 6.



**Figure 6: Image text to voice Conversion for Blind person**

When user wants to give speech as input and get text as output he/she can open chrome browser and open website [Speechtexter.com](https://www.speechtexter.com) as shown in figure 7. Speechtexter takes the input from user and gives the output in the form of text. There are more than 100 languages in Speech texture.



**Figure 7: Conversion of Speech to text is successful**

## V CONCLUSION:

This Paper aims to lower the communication gap between the deaf person and therefore the normal world, help them to live normal lifestyle. The device will convert text/image to voice for blind, speech to text conversion for deaf and conversion of hand gestures to text (Kannada words) for dumb people. Prototype model has been designed for blind or deaf or dumb people into one compact device. The advantage of this device is that it is often easily carryable (portable) thanks to its less weight and size. The device are often used as smart assistant for differently abled people to speak with others and another major advantage is that it's a language independent system.

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