

Aid for The Blind's Using Raspberry Pi

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Abstract: - Text consisting of letters and Speech with any language are the prime sources for communication in humans. To access the text information and to recognize the faces or any other things any individual needs vision. If any person has poor or loss of vision can access the information only from hearing to the voice. This project paper proposes assistive text reading system with the help of camera to help the blind person and visually weakened individual to read the text information existing on the image taken from the camera. The faces and currency notes will be able to sensed and recognized by capturing the image of the face and currency notes from camera. The proposed idea involves extracting the text from the captured image is done with optical character recognition (OCR) then transforming extracted text into speech using a speech synthesizer e-Speak tool. Image processing techniques and face detection and recognition is used to recognize the currency and face respectively with the help of open CV software. This paper presents a prototype to assist and help the people suffering from the loss of vision to get the text data and to recognize the currency notes and known faces. This prototype comforts lots of individuals suffering from vision loss and disorders.

Key Words: — *Raspberry Pi, Pi Camera, Ultrasonic Sensor, Push Button, Power Supply, OCR.*

I. INTRODUCTION

In recent years many people are suffering with the problems related to eyes like congenital diseases, loss of vision, vision disorders, night blindness, Glaucoma, blurred vision etc.

Eye disorders are common in all age individuals, the main reason is unrestrained diabetes, age related problems in senior individuals, each year number of accidents are increasing by this number of visually damaged individuals rose each year.

The major problem of visually diminished individual is to read out for them. Modern improvements in mobile phones, modern pcs, and digital cameras can make some ideal change in blind peoples. Here camera applications in combine with vision tools and other inventions like Optical Character Recognition-OCR is used.

The text identification is carried out by Open Computer vision (open CV), it is collection of events applied for executing image processing techniques. Image processing is method of applying numerical processes within the image.

The image processing produces the different factors related to image and its different physical characteristics of image. Image processing execute plenty of purposes like text recognition, scanning, computer graphics, facial recognition

and more. On an image after image processing different element on it matters like background of the image and font size of the characters present in the image and also the alignment. OCR is used for extracting the text from the image.

Here OCR is used to build an application for blind people so that they can communicate with others. Where the application can be performed on any text printed notices, papers, books. To identify the slope, pitches, white spaces and joint letters, binary image is translated into text by Tesseract library in OCR machine. Tesseract machine also verifies the quality in the identified text. E-speak procedure is used to translate text to voice output.

TTs engine called e – speak tool is used to translate text into speech. Speech synthesis is nothing but simulation of human voice with the help of software otherwise hardware.

The loading of entire words and sentences helps the system to provide good output quality. Speech synthesizer can synthesis the voice similar to human voice.

The proposed paper uses an inexpensive camera to assist the people. It includes text extraction from image taken by a camera. Text obtained after the extraction process is converted into the audio signals and then transformed it into the output voice.

The faces and currency notes will be able to sensed and recognized by capturing the image of the face and currency notes from camera.

Raspberry pi is used as prime unit of the system in order to achieve Compactness and portability. The image is treated for the currency detection and translating out loud via a speaker. An ultrasonic sensor is given for obstacle prevention while walking.

II. PROBLEM STATEMENT

To develop an assistive technology for VIP's (visually impaired persons) to perform some of their daily tasks like text reading, detecting the obstacles while moving and recognition of currency and known or unknown faces. To develop an assistive text reading device to assist the blind's and visually diminished individual to read the text present on the image captured from the camera and correspondingly to recognize different currency notes and the faces of the known and unknown persons.

III. METHODOLOGIES

The goals are as follows:

- Text - to - speech conversion.
- Currency recognition using Raspberry Pi.
- Face using Raspberry Pi.
- Obstacle detection in Raspberry Pi.

Objective-1:

Text to speech conversion:

- Capturing the image of the text is the first step. Image is taken with the help of camera.
- Text is extracted from the image taken from the camera. Text extraction and recognition is carried out by OCR (optical character recognition).
- OCR is a tool used to convert the image of text or handwritten image into the text.
- Text is converted into the speech output with the help of e-Speak algorithm.
- Speech output is taken out from the speaker.

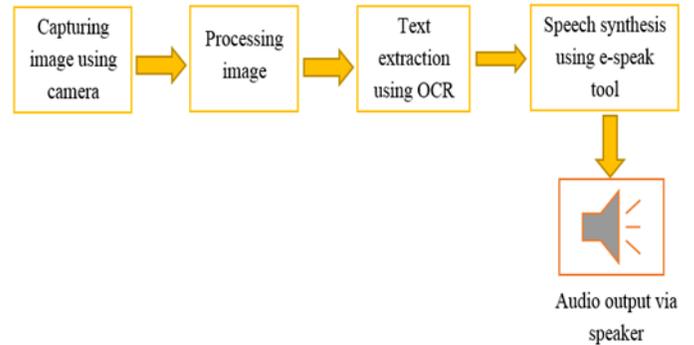


Fig.1. the TTS mechanism

Objective 2

*Currency Recognition:-*In currency recognition, currency note is detected and recognized the value of the currency with the help of image processing.

Steps involved in currency recognition:

Image Acquisition:

The initial stage is to acquire the image of currency note using a pi camera. Acquired image cannot be recognized directly so image processing is done in further steps.

Image processing:

The image processing is performed to improve the features of the image acquired by the camera. Correcting the distortion, removing of noise in the image and other image processing functions are performed.

Image Segmentation:

Here the processed image is divided into various segments. Image segmentation is done in order to simplify the image into somewhat that is more significant and not complex to examine.

Feature Extraction:

Feature extraction is an exceptional form of dimensional reduction. The acquired image of the currency has various features extracting the feature of the currency note which is to be used for recognize the denomination of the currency.

Comparison:

Extracted feature from the acquired image is matched with the features of the image in the dataset to recognize the currency.

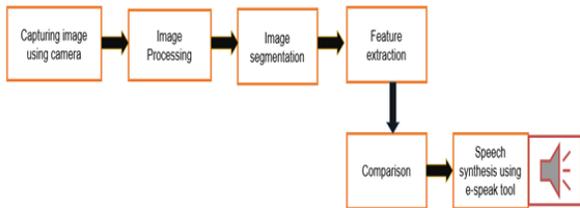


Fig.2. the currency recognition flow

Objective-3:

Face recognition:

The first step in face recognition is face detection where face is to be detected. Here faces detection is very difficult process because it has some complication like background, lighting, poses.

Steps in Face Recognition:

Camera is used continuously takes pictures ("frames") After capturing the image, Face detection algorithm using Open CV is activated to detect the faces in the image captured.

If the image does not have any faces in it, then the image or frame is dropped, if the face is present then the rectangle cut out is placed around the detected face and then moved on to recognize the face using face recognition algorithm.

In order to recognize the face Fisher face algorithm is employed.

It results in either the face as unknown if it is not registered or it recognize the person and name is revealed if the face is registered.

Recognized face has name registered hence the name is converted into voice and output is taken from the speaker.

Here the hardware employed is raspberry pi and camera and software is python.

CNN –Face Recognition:

With the growth of convolutional neural networks, the successes made in several races are making safer and better, becoming it the aim of research. In order to develop the training operation of the forward BP algorithm, a useful method is to lower the number of discovering parameters. This can be done by complexity of the spatial connection of the neural network. Convolutional neural network, the network configuration is proposed, it reduces the input data pre-treatment. In the composition of convolution neural network, the input files are input from the early input layer, through each layer handling, and then into the other order, each layer has a convolution kernel to get the most substantial data characteristics. The earlier mentioned obvious elements such as translation, rotation and the like can be achieved by this method.

Objective 4:

Obstacle Detection:

High frequency sound waves is created by ultrasonic sensor. It computes the echo which is gathered back by the sensors. Time gap between transfer of signal and receiving echo is computed by sensor to decide the gap to an object. Ultrasonic is like an infrared where it will reflect on a side in any shape, but ultrasonic has a sharper range recognition equated to infrared. In mechanical and automation industry, ultrasonic has been extremely accepted because of its use. In our Plan, the Ultrasonic sensor gap size Module deals with the distance measurement between the obstacle and the blind individual. Firstly, once the device starts on, the sensor will spontaneously provide the distance measurement of the hurdle in front of the blind. Here the hardware used are ultrasonic sensor and raspberry pi and software used is python.

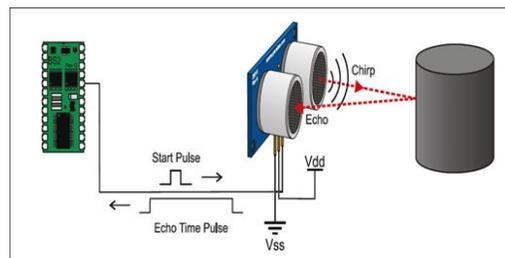


Fig.3. Ultrasonic sensor mechanism.

IV. PROPOSED METHODOLOGY

The block Diagram represent the Hardware components used for the specific actions to be performed. We have used Raspberry PI as the heart of the system which can be used for procession images captured via camera and turn out those captured images into useful data. In this case we have Mode Buttons for selecting the mode of operation of the system to react to the images captured.

Software required:

- Raspbian Operation system
- Anaconda software (SPYDER)
- Python Language
- Open CV for image processing
- OCR for text processing

Hardware required:

- Raspberry PI
- Ultrasonic Sensor
- Pi Camera
- Ultrasonic sensor
- 4 Push Buttons for modes
- 4 Push Buttons for text mode
- Battery for power supply

Modes of Operation:

Mode 1: button when clicked it goes to Image processing for book reading or any text reading where we process the image and read out loud, under this mode we provide 4 buttons for text reading which is previous page, previous line, Next line, and Next page respectively.

Mode 2: Corresponds to face detection for the known faces to be recognized.

Mode 3: Corresponds to the currency detection of any of the given currency notes.

Mode 4: is termed as walking mode for obstacle detection and intimation via buzzer.

Flow Chart:

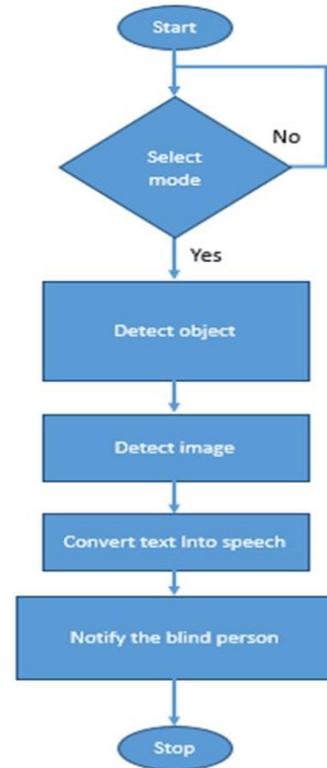
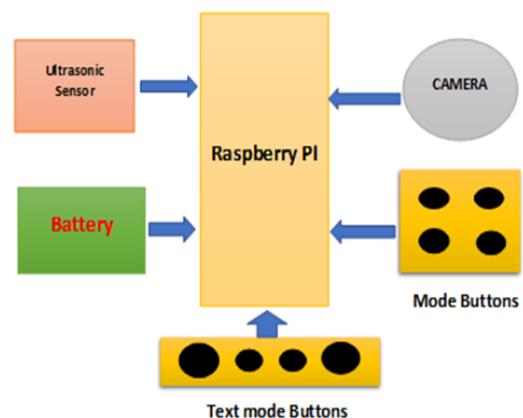


Fig.4. Block Diagram of the proposed system



V. CONCLUSION

This paper offers the technology to assist the blind and visually impaired person with an incapacity to work around their challenges. This prototype system is described to help the visually impaired persons to get assistance to perform few basic tasks like recognizing the currency and known faces and to read the text information.

The future work can be evolving the systems that perform text extraction from videos instead of static images. To recognize the currencies of different countries.

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