Product Label Reader for Visually Impaired

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***Abstract*— Product Label Reader for Visually Impaired is a Raspberry Pi based device that would allow a visually impaired person to understand the text written on the product held in his hand as an audio output from the device. When a person holding the device starts the device the camera mounted on device would capture an image and then the image will be processed by python libraries like pyTesseract and Open CV. This processed image will be then be fed to Google Text to Speech Converter and the device would generate and audio signal. This generated signal would then be played via on board speaker. Thus enabling the person know what product he/she is holding.**

***Keywords*— Raspberry Pi, Image to Speech, pyTesseract, Open CV, gTTS.**

I. INTRODUCTION:

Interaction is essence of mortal human life. The way we perceive is the world depends totally upon our interaction with the world. God has gifted humans the best of senses like to hear, to touch, to smell, to taste and the most important is to see. But are all human being that blessed to have the sense to see in the best of its condition? WHO states 285 million people are visually impaired and estimated that the number is going to increase. So here we propose a device that would read the label name for all such people who face difficulty to to read. This Raspberry Pi based device simply will take the image of the product that the person is holding in his/her hand. Then the device will decode what the is written on the label of the product. at last the device will play the audio of the decoded image.

The major part of the device is the image processing that will be preformed by the Open CV and pyTesseract library of python. These libraries are supported by the Raspberry Pi and can optimally function to produce the output. Our aim is to propose a user friendly device that will allow the user to easily know what he/she is holding. Also the advancement in the computer vision will enable us to perfect currently available solutions and make them cost efficient.

II. LITERATURE SURVEY:

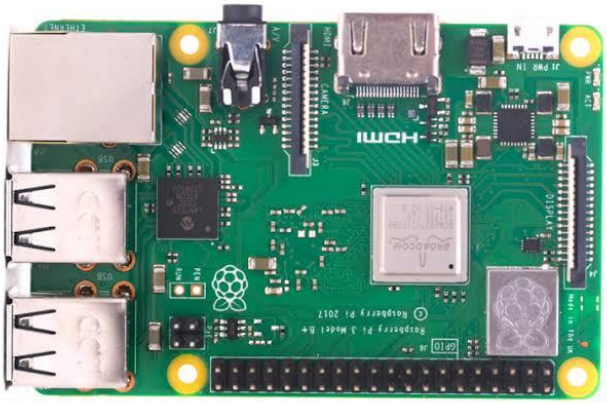
[1] 'Liya George' proposes a system based on Raspberry PI that wouldwork as a Reader for Blind. In their idea they used google cloud vision, OCR and fleet algorithm. Many more attempts are made to enhance the perception of the visually impaired people like [2] 'Supriya Kurlekar' proposed a idea about a device that will use OCR, GTTS and python for the image to speech conversion. Their idea is based on OCR that would read the images and then process it like wise. Increasing demand has compelled researchers to find various ways to overcome the lack of sight and developed many assertive device like [3] 'Michael McEnancy' presented an idea about a device that asks the user

to slide the index finger over the region of interest of the use and then the device would read the characters that it recognized. [4] 'Roberto Neto' proposed a camera based reader that uses iPhone5 for its functioning. Many such advance devices help a lot of people in their daily lives.

III. METHODOLOGY

A) THIS SECTION DESCRIBES ABOUT THE HARDWARE AND ITS SPECIFICATIONS:

- Raspberry Pi: Raspberry Pi is a single chip minicomputer developed by Raspberry Pi foundation. It has high processing power and supports 40 extended GPIO pins. It provides inbuilt Wi-Fi, Bluetooth, HDMI port, USB port, headphone jack, plug and use camera socket and many other ports. It can be powered up by upgraded Micro USB power source, power bank, etc. Due to its high end processor, plug and play camera socket and headphone jack it is becomes the best candidate for this device.

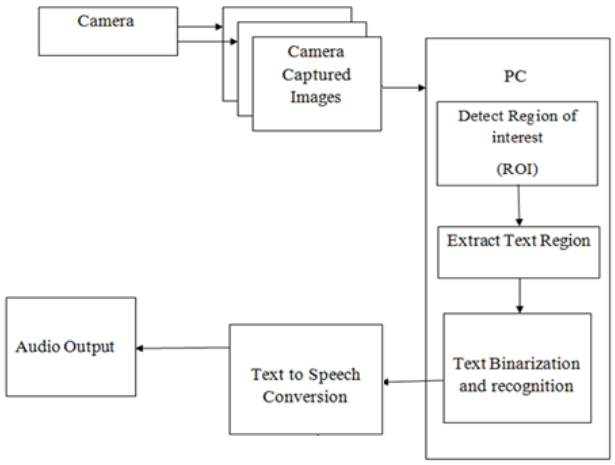


- Raspberry Pi Camera Module: Raspberry Pi Camera Module V2 is an optimal camera module with 8 MP still resolution. It uses SONY IMX219 Sensor. It is extremely light weight with approx. weight of 3gm. It supports various image formats like .jpeg, .gif, .png, etc. The module can be triggered by a key press, timeout or UNIX signal. Also it is a simple plug and use device that need no extra circuit for its functioning.

- Speaker: The speaker is the component that will give the output as a speech signal to the person using the device. As Raspberry Pi has an inbuilt headphone jack so we don't need to build an external circuit for connecting the speaker or headphone to the Pi. The audio jack present on Raspberry Pi is 3.5mm, so any speaker/headphone having this specification can be used as an output device for the proposed system.

- Power Source: Raspberry Pi can be powered in multiple ways. The easiest way is to use a power bank with specifications of 5V as output voltage and a recommended input current of 2A. Thus the entire device is dependent on the power bank for its working.

B) BLOCK DIAGRRAM:



C) WORK FLOW:

- Camera will capture the image
- The image will be sent to the Raspberry Pi
- Pi will identify the REGION OF INTEREST(ROI)
- Text will be extracted from ROI
- The extracted text will then be recognized and converted into string
- gTTS will convert text into speech
- Speaker will give the output

D) Woking:

- Capturing Image: This is the first step of functioning of the device. As discussed earlier the camera used will be Raspberry Pi Module V2. This module will capture the image when powered up. As the device will be hand held the recommended distance between the device and the product is less than than 0.5m for optimal capture of the image. Once the camera captured the image it will be then send to the Raspberry Pi for further processing.

- Image Processing: The entire image processing can be further divided into two parts, firstly the recognition of the characters in the image followed by the converting those characters into a string which will be then converted to audio form using text to speech. The image processing is basically done by the python libraries like pyTesseract and Open CV. Open CV reads the image and then recognizes the area of interest. The characters present in the area of interest are then bound into rectangular boxes. The characters inside the boxes are then decoded by the processor and then at last these recognized characters is converted into strings with the help of pyTesseract library.

- Text-to-Speech: The next function performed by the device is to convert the string of characters into a audio format using Google text to speech library. This library takes a string as an input and then coverts it into an audio output. This audio output is then stored as a .wav file. This file is then sent to the speaker/headphones. and then the speaker/ headphones play the audio file which is then heard by the person using the device

RESULTS:

- Here we have taken the above image for testing the device. The image taken is sent to the processor for image processing

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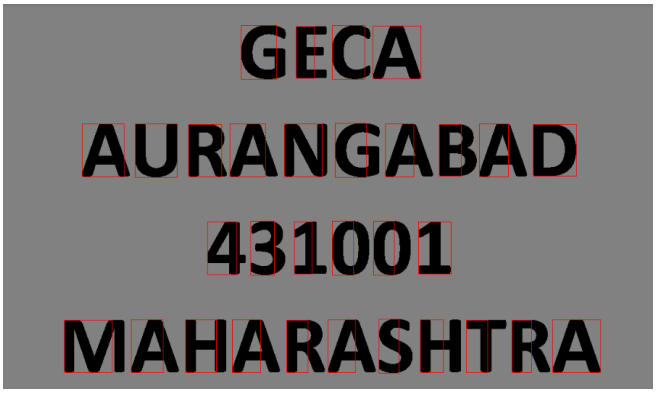
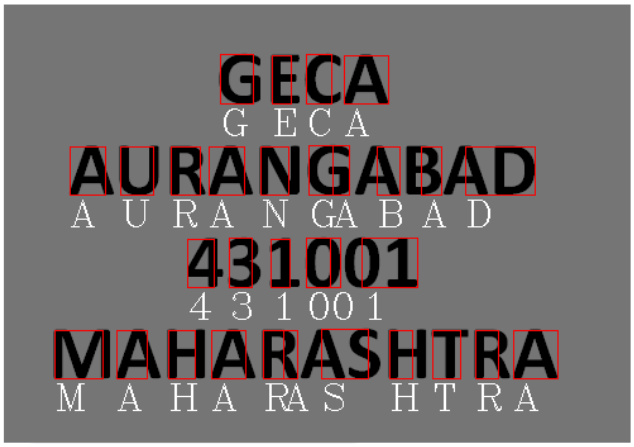
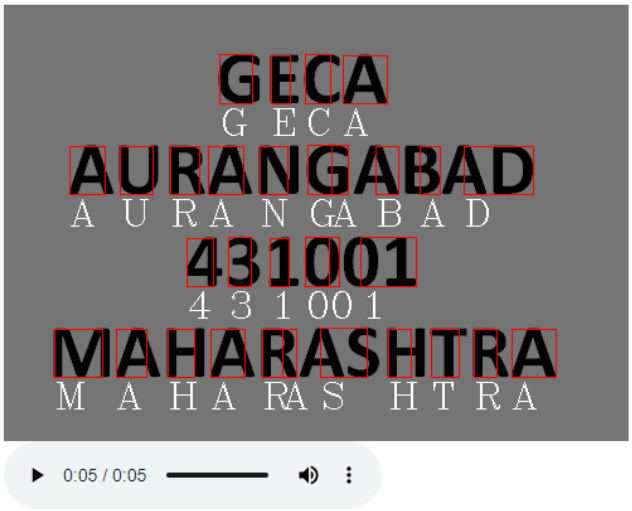
- When the processor receives the image, it first detects the ROI, followed by making rectangular boxes around the characters



- Then the processor recognizes the characters and prints them below the rectangular boxes



- After this is done the processor has converted the recognized text into a string and an audio file is generated which is played by the speaker



FUTURE SCOPE:

- The proposed system is a easy to use and user friendly.
- Still it is in Mid-Range Price.
- They future scope of this device can be cost efficient and with high accuracy.
- Also the size could be further reduced in future models of the proposed device.
- The device might finds it difficult to read blurry images so in future a higher image processing model could be developed for analysing noisy/blur images

CONCLUSION:

Product Label Reader is a daily need of visually impaired people. Thus the proposed idea is a good alternative currently complex systems available in the market. Also the device is quite user friendly so it becomes very easy for the operator to use the device. With better advancement in computer vision it will be easy to develop more advance systems as per the increasing need of the people. Nevertheless the proposed idea works quite good and has a large potential to solve some of the problems of visually impaired people.

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