Reader for The Sightless (ROST)

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Abstract : In this world 285 million people are estimated to be visually impaired. It becomes harder for them to read in the real world where braille system is hardly used. A huge population of this world is unable to read from things in their surroundings like advertisement posters , road signs, menu cards etc. Reader for the sightless has embedded camera and audio system. It is a device which will help the visually impaired to read from the objects they held their hands against. Reader for the sightless will capture an image by the users perspective and read to the user through headphones, pods,speakers etc. As our aim is to develop it for visually impaired population belonging to India, Reader for the Sightless also covers Indian languages like Hindi,Marathi and Tamil.

IndexTerms **-** OCR, Speech Synthesis, raspberry pi, image Processing, text extraction

I. PROBLEM STATEMENT

This To develop a system for visually impaired people which will have text recognition inbuilt feature and convert the text to voice for visually impaired efficiently. To carry out test analysis of project of developing a system for visually impaired people which have text recognition inbuilt feature and convert the text to voice for visually impaired efficiently.

II. INTRODUCTION

Of what use is the knowledge if you cant utilize it for the betterment. Many challenges are faced by a visually impaired person in his/her day-to-days life while interacting with the world every day. Visually impaired people usually rely on their partners or sense the scenario by their senses. In order to make a visually impaired people more and more independent we developed this system. Braille system helps them to adopt the process of reading via touch senses. We believe there has to be something more developed for them so that they can work with the real world. Reader for the sightless (ROST) is a system for visually impaired people which will read for them from real world objects. Eg. It can read out bus name plates, Hotel menus for them.

We have attached a web cam of 30MP with night vision capability for better capturing of image. The system can be implemented in the real Environment. Image to text conversion is done by using Tesseract tool. Python pyttsx and Google Text to Speech have been used in the system for Speech Generation. Google Text to Speech Requires an active Internet Connection. In case of connection unavailability system will simply use pyttsx speech engine to generate speech. Optical Character recognition is used for detecting text from images. Font and Background Color Independent Text Binarization technique is used to generate a processed image. This processed image is then forwarded to the speech Engine. Incase of Alphabet detection error the system will simply say out 'Failed'. As India is belived to have maximum of visually impaired population of the world, we decided to develop a system which can operate mainly on Indian languages. ROST can read Hindi, Marathi, English and Tamil.

The system will be attached to users palm via a glove or belt. The User has to click a button which will capture the image. After capturing the image, the image will be sent to image processing module. A new proceesed image will be the output of this module. This new image is sent for in the text extraction module. And the extracted text is sent to the speech generation module, the output of the speech generation module is given and played to the user through earphones. So whenever a user captures any image, whatever text is written on the image is read out to the user. Innovation is that the image is of any real world object like a electricity bill for example and that it can read from various languages provide. ROST is battery powered, and so it can be carried everywhere. The compete flow diagram is explained in Fig. 1.

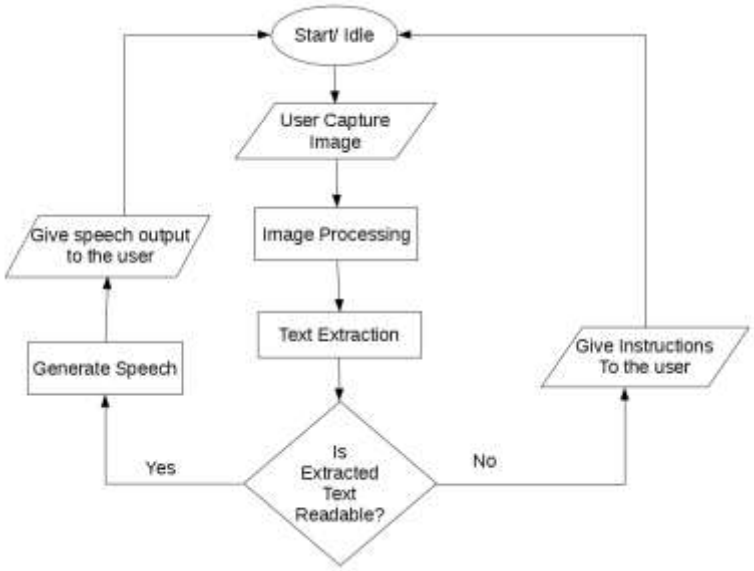

Fig 1 : ROST Flow Diagram

III. IMAGE PROCESSING

Whenever an image is captured the first module it undergoes is of Image Processing. In image processing we have used pre-processing technique "Font and Background Color Independent Text Binarization" as discussed by T Kasar, J Kumar and A G Ramakrishnan in their paper [1]. This technique is mainly useful for extracting text from images captured in digital camera's. As the image captured in digital camera can lack proper lighting, blur, resoultion defects etc. this technique uses binarization to overcome the challenges.

Traditional binarization technique is of global thresholding which uses histogram analysis. It works well with images which have well defined foreground and background intensities. A camera captures images in various environments which may vary in light intensities therefore global thresholding method may fail to work properly in case of processing images for OCR in our system.

Similarly [1] explains most of the binarization techniques and their comparison to the proposed technique.

Algorithm for image processing :

1) Take two image files as input
2) If input is true goto Step 4.
3) If inputs are improper abort and play error code.
4) Load the Image.
5) Add Border to the image.
6) Calculate width and height of the image in ’imgy’ and ’imgx’ variables.
7) Split the image RGB channel wise.
8) Apply Canny Edge Detection Algorithm on each channel.
9) Join RGB edges back in new image ’edges’.
10) Find Contours of ’edges’ in ’contours’.
11) For each contour find bounding angle.
12) If contour is appropriate add it to ’accepted’.
13) Else add it to ’rejected’.
14) Create a new image ’new’ and add ’edges’ to it.
15) Find foreground and background intensity of each pixel in ’contour’.
16) Determine if the pixels box colour need to be inverted.
17) If yes Invert.
18) Blur for improving OCR by smoothening.
19) Write ’new’ to ’output’ image.

Fig 2 and Fig 3 show the transformation of the image

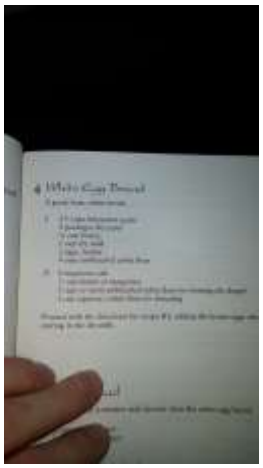

Fig 2 : Original Image

Fig 3: Processed Image

IV. TEXT EXTRACTION

We have used tesseract to extract text. Its inbuilt library in python is pytesseract. Tesseract is an open source library for Optical text recognition by Apache. It is operable on various operating systems. To install on linux platforms simply use 'pip install pytesseract '. Syntax for using pytesseract for text extraction in english language :

text = pytesseract.image_to_string(Image.open(imagename.extension'),lang ="eng")

Algorithm for text extraction :

1. Pass the processed Image to pytesseract which will convert image to text.
2. Print the text / pass it to the speech engine.

Fig 4 shows the extracted text from Fig 3 using pytesseract.

```
[aishwarya@localhost ~]$ python extract_text.py
4 WkiJre €99 Bread

A good, basic white bread.

with

I. 21/2 cups lukewarm water
2 packages dry yeast
1/4 cup honey
1 cup dry mile
2 eggs, beaten
4 cups unbleached white flour

II. 4 teaspoons salt
1/3 cup butter or margarine
3 caps or inore unbleached white flour for forming the dough
1 cup (approx.) white flour for kneadian

Proceed with the directions for recipe #1, adding the beaten eggs afte
stirring in the dry milk.



is moister and chewier than the white e ;g bread.

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[aishwarya@localhost ~]$
```

Fig 4 : Text Extracted from Fig 3

V. SPEECH GENERATION

For generation of speech we have used google text to speech engine. Its library in python is gTTs. But for using gTTs we need continuous internet connection. In case of unavailability of internet the system uses pyttsx speech engine. The speech is delivered to user using earphones.

VI. HARDWARE

Hardware components :

1) Raspberry pi 3
2) Quantum hi-tech 30MP camera
3) 2GB micro SD card
4) Power Bank
5) Switch Buttons

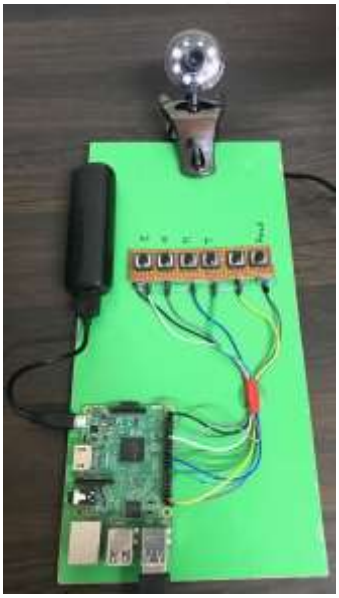

Fig 5 : Hardware arragement and ROST system.

VII. Testing of system

1	Process Flow Test
Result	Success
Description	The System Works Properly and in flow.

2	Internet Connectivity
Result	Success
Description	The System works fine in case of no Internet Connection for English Language.

3	Inappropriate Switch pressed
Result	Success
Description	If a wrong switch is pressed no action is carried out and system waits for the user to press the right switch.

4	Image processing module
Result	Success
Description	Using the robust Algorithm the image is processed to only text areas properly. Algorithm aborts in case of failure or infinite loop.

5	Hardware on baterry
Result	Success
Description	Turns on properly on battery. Works 3 hours continuous while functioning and 6 hours on standby.

VIII. Verification and Validation of the System

Verification :

1) If the system is not able to generate text out of image then a failed message is delivered to user.

2) In order to generate proper text edges in the image have to be specific. For this a robust algorithm to generate processed image is used.

Validation :

1) The system is user friendly and simple to use.
2) The system captures the image.
3) System successfully gives speech output.
4) System is applicable in real world and on real world objects.
5) System has benifits of Indian Society languages.

Acknowledgment

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Conclusion

In proposed system we will apply a simple and fast method which works suitably for recognize image and convert it into text as well as speech. The system will prove useful for the visually impaired people to learn texts in their surroundings. In the future scope of our system we will help the user recognize text from from image captured in any aspect. System's future aspect is to also be able to translate from various languages. So the system will become useful not just for the visually impaired but will also come handy for travelers and non-locals.

References

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