Portable Camera based Assistive Text and Label Reading for Blind Persons

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Abstract - *This paper presents a camera-based label assistive system to help blind persons to read names on the products through image capturing. The portable system captures the images and text written which are placed in front of the Pi camera can be read out using speakers interfaced to the Raspberry Pi model. The Image is fed to input of Raspberry Pi processor OCR .OCR used to convert virtually images containing written text into machine-readable text data. Then Google Text to Speech Convertor (GTTS) is used to convert text entered in to the audio .That audio blind person get audio through speaker.*

Key Words: Raspberry PI, Optical character recognition (OCR), Google Text to Speech Convertor (GTTS), Speaker

1. INTRODUCTION

Globally, at least 2.2 billion people have a vision impairment or blindness, of whom at least 1 billion have a vision impairment that could have been prevented or has yet to be addressed. A major part of this population is still blind even in developed countries. If blind people or people with significant visual impairment can read from hand held objects, nearby sign posts or product labels then this will enhance their independent living and thereby faster economic and social self-sufficiency. It is a fact that all over the world that the visually impaired (partially or completely blind) people face a lot of difficulties in reading, identifying a product, and avoiding the obstacles. According to the development in today's technology towards the computer vision, digital camera and portable computers it is feasible to develop a camera-based technology that combines computer vision technology with other commercial products such as OCR systems.

2. BLOCK DIAGRAM

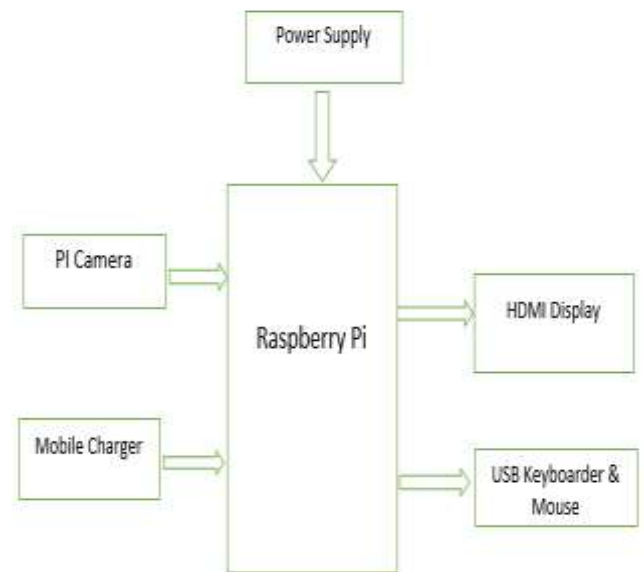Figure shows the Block diagram containing Raspberry PI, PI camera, HDMI display.

Fig-1: Block Diagram of Portable Camera based assistive system for blind persons

3. WORKING PRINCIPLE

The system captures the document and image which place in front of PI camera. It connected to Raspberry PI model in that Optical Character Recognition (OCR) present .The Image is fed to OCR, It is electronic conversion of image and document in to the computer language. The Goggle Text to speech converter is used to convert the data in to the audio .The audio is then listen by earphone or speaker connected to the Bluetooth.

4. OPTICAL CHARACTER READER (OCR)

Optical Character Reader (OCR) is the electronics or mechanical conversion of imaged type, handwritten or printed text in to a machine encoded text .OCR is used for first scanning the data then converting in to the text. Widely used as a form of information entry from printed paper data records whether passport documents, invoices, Bank Statements computerized receipts, business cards, mail, printouts of static-data, or any suitable documentation
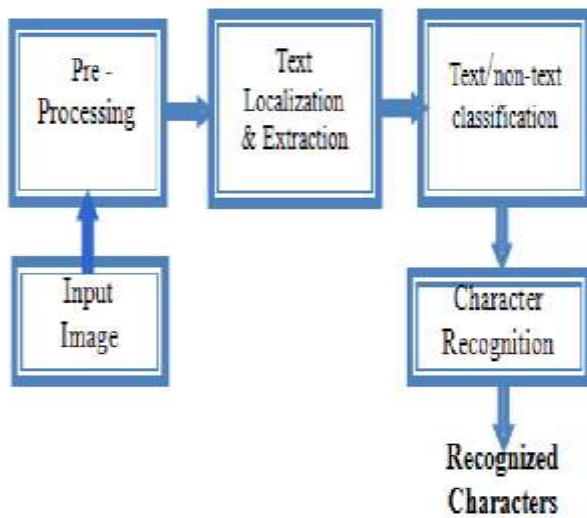
Fig 2 –OCR Process Flow

4.1 Pre –Processing:

OCR software often "pre-processes" images to improve the chances of successful recognition Segmentation of fixed pitch founts is accomplished relatively simply by aligning the image to a uniform grid based on where vertical grid lines will least often intersect black areas. For proportional founts more sophisticated techniques are needed because whitespace between letters can sometimes be greater than that between words, and vertical lines can intersect more than one character

4.2 Character Recognition:

Matrix matching involves comparing an image to a stored glyph on a pixel-by-pixel basis; it is also known as "pattern matching", this relies on the input glyph being correctly isolated from the rest of the image, and on the stored glyph being in a similar font and at the same scale. Software such as tesseract use a character recognition, this is the advantage for unusual founts or low quality scans where the fount is distorted. The OCR result can be stored in ALTO format.

4.3 Post –Processing:

OCR is the process of turning a picture of text into text itself—in other words, producing something like a TXT or DOC file from a scanned JPG of a printed or handwritten page

5. RASBERRY PI

The Raspberry PI is small single board computer developed in the Kingdom, it is small in size, low cost and it works as a normal computer at low cost server to handle web traffic. There are two models - Raspberry Pi 2 and Raspberry Pi 3

Advantages are as bellow

• A 1.2GHz 64-bit quad-core ARMv8 CPU • 802.11n Wireless LAN • Bluetooth 4.1 • Bluetooth Low Energy (BLE) • 4 USB ports • 40 GPIO pins • Full HDMI port • Ethernet port • Combined 3.5mm audio jack and composite video • Camera interface (CSI) • Display Interface (DSI) • Micro SD card slot • Video Core IV 3D graphics core

Fig 3-Rasbperry PI for Blind persons

6. SOFTWARE IMPLEMENTION

Operating system: Raspbian (Debian) Language: Python2.7 Platform: Tesseract, OpenCV Library

6.1 Import Os:

The OS module in python provides functions for interacting with operating system. OS, comes under Python's standard utility modules. This module provides a portable way of using operating system dependent functionality. os.system () method execute the command (a string) in a subshell

6.2 Import time:

The import system Python code in one module gains access to the code in another module by the process of importing it. The import statement is the most common way of invoking the import machinery, but it is not the only way. When the Import statement is executed, the standard builin_ Import_ () function is called.

6.3 Import GPTO:

The GPIO pins on a Raspberry PI are a great way to interface physical device like buttons and LEDs with the little processor .In python there's a library called RPi GPIO that handles interfacing with the pins.

Import RPi.GPIO

6.4 Import CV2:

OpenCV-Python is a library of Python bindings designed to solve computer vision problem solve computer vision problem .All the OpenCV array structures are converted to and from Numpy arrays. This also makes it easier to integrate with other libraries that use Numpy such as SciPy and Matplotlib.

6.5 Import tesseract OCR:

Python – tesseract is an optical Character recognition (OCR) tool for python .It will recognize and read the text embedded in image

7. OPERATING SYSTEM

7.1 Software - Raspbian OS:

Rasbian is a Debian –based computer operating system for Raspberry PI.Since 2015 it has been officially provided by the Raspberry PI foundation as the primary operating system for family of raspberry Pi single board computers .It is highly Optimized for Low performance ARM CPU .It is light weight as it is main desktop environment.
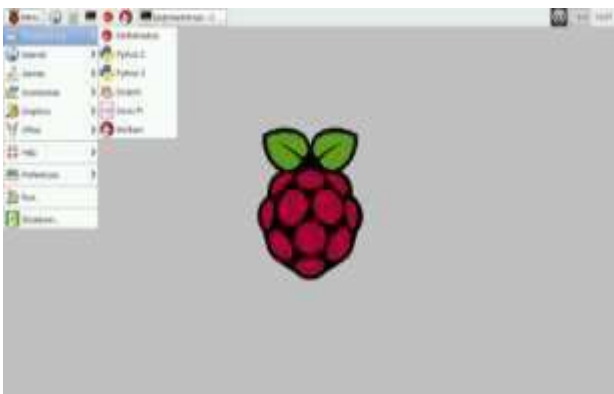

Fig 4 Rasbian OS

7.2 Hardware

7.2.1 Win32 Disk Imager

Win32 Disk Imager is a compact application that allows us to create an image file from a removable storage device such as a USB drive or an SD memory card. It can be used to back up the information stored on the device in order to restore it later.

7.2.2 Platform: Open CV

Open CV (open source computer vision) is a library of programming function for real time computer vision.

Advantage of Open CV over Matlab is that, Matlab is built on Java and Java is built on C, when we run Matlab program our computer is busy trying to interpret all the mat lab code, then it turns in to Java and finally execute the code. In other hand

Open CV function is written in C/C++ so computer directly execute the program, so Image processing is done with not more interpreting other function .So program written in Open CV run faster than Matlab.

8. PROGRAMMING -PYTHON

Below Python program is used to get the audio output after Image capturing in PI camera

```
one.py *    1.py

from gtts import gTTS
import os
import time
os.system('sudo fswebcam aa.jpg')
#os.system('sudo tesseract a.jpg pag')
#f=open('pag.txt','r')
#mesg=f.read()
#print(mesg)

tts=gTTS("  Raspberyy Pi")
time.sleep(1)
tts.save('a.mp3')
time.sleep(1)
os.system('sudo omxplayer a.mp3')

f.close()
```

Fig 5 Python Programming

9. RESULT /OUTPUT

In below Image camera captured the photo of Raspberry PI 3 in Pi camera, that feed to the Raspberry PI model, OCR converts the image file in to the machine code that recognize by the computer and converted in to the text with the use of GTTS (Google text to speech converter) the text data is converted in to the speech and output audio is audible by Bluetooth or speaker connected to it.
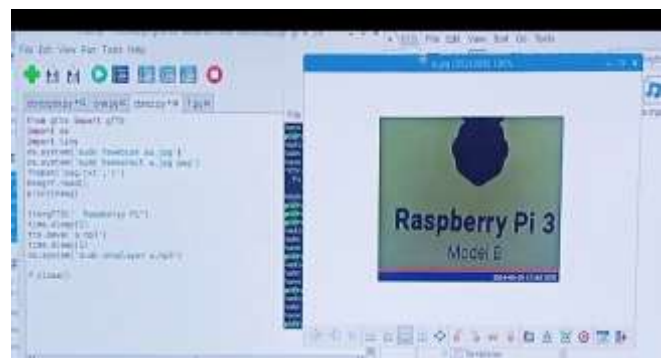

Fig 6 Captured Image as Output

10. CONCLUSION

The proposed system is designed to help blind persons to read the text label from hand held object in their daily life. So there in depend living should enhance and increase the social growth.

The system captures the image of any hand held object placed near the camera of Raspberry PI and with the use of OCR, GTTS final audio output will be audible to the blind persons.

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