INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume 5, Issue 2)
Available online at: www.ijariit.com

A text reader for the visually impaired using Raspberry Pi

C. Ebenezer Durai
ebenezer13579@gmail.com
Panimalar Institute of Technology, Chennai, Tamil Nadu

A. Selvarani
selvaranime2001@gmail.com
Panimalar Institute of Technology, Chennai, Tamil Nadu

S. Siva Suthan
sivasuthan1198@gmail.com
Panimalar Institute of Technology, Chennai, Tamil Nadu

M. Anwin Kushal
anwinkushal7@gmail.com
Panimalar Institute of Technology, Chennai, Tamil Nadu

ABSTRACT

In this paper an innovative, efficient and real-time beneficial technique that enables the user to hear the contents of text images instead of reading through them has been introduced. It uses the combination of Optical Character Recognition (OCR) i.e. Tesseract and Text to Speech Synthesizer (TTS) in Raspberry Pi. This kind of system helps visually impaired people to interact with computers and day-to-day text effectively through vocal and keyboard interface. Text-to-Speech is a device that scans and reads English alphabets and numbers that are in the image using the OCR technique and changing it to voices. We are including obstacle detection via ultrasonic sensor and colour detection. This device consists of three modules, image processing module, a voice processing module and an object detecting module. The device was developed based on Raspberry Pi 3 Model R, Clock Speed of 1.2 GHz.

Keywords— *Raspberry Pi, OCR, Camera, Image processing, Tesseract, Voice processing, Obstacle detection, GPS detection*

1. INTRODUCTION

The complexity of the existing braille system for the visually impaired people is that it requires the text to be translated to braille literature. Translating a book or a document into braille literature is a complex, time-consuming and expensive process. Day to day information cannot be translated into braille literature. To ease the process of reading for the visually impaired people, this prototype has been proposed. Using this prototype, text information can be converted into its equivalent audio format. This is done by integrating camera module and speakers to raspberry pi 3 model b which is a credit card sized single board computer. Also, two other software called Tesseract and TTS Engine (Text to Speech Synthesizer) is installed to the Raspbian OS.

2. EXISTING SYSTEMS

In the existing system, the user can identify conversion of text messages into speech. The main goal of the project is to help reading aids for the blind. In the existing system, it uses ARM microcontroller and voice board. Invoice board, they feed the Input, so that ARM microcontroller will process and output is heard through the speaker.

In this work, it aims to study the image recognition technology with speech synthesis and to develop a cost-effective, user-friendly image to speech. The project has a small inbuilt camera that scans the text printed on a paper, and it processes the paper and it converts it to the audio format. It is used for reading out the scanned text translating books, documents and other materials which are used in daily life, especially away from home or office. Not only does this save time and energy.

There are numerous language translators available where we have to manually enter the content and the application do whatever is left of the work of making a translation of the content into the desired language. Some translation platforms even charge for this process. For example, the most popular Google translate API charges calculated as per the usage.

3. PROPOSED SYSTEM

The below figure 1 shows that block diagram of the proposed system.

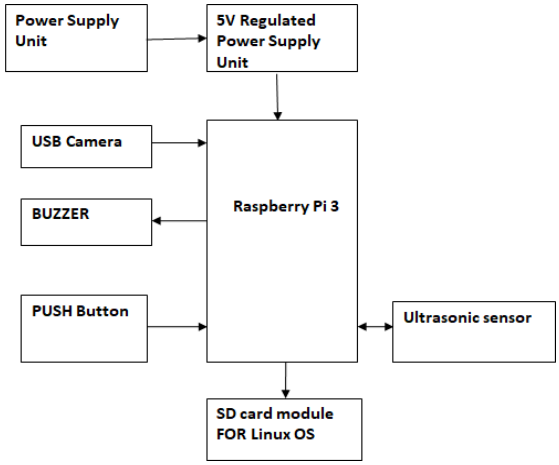

Fig. 1: Block diagram of text to speech conversion and object detection

3.1 Raspberry Pi

Fig. 2: Raspberry Pi

The Raspberry Pi 3 Model B which is the third generation Raspberry Pi is employed here. It is a powerful credit-card sized single board computer that can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B whilst maintaining the popular board format, the Raspberry Pi 3 Model B brings a more powerful processor, 10 times faster than the first-generation Raspberry Pi. It adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerfully connected designs. The technical specification of Raspberry Pi 3 model B includes Broadcom BCM2837 processor, quad-core ARM Cortex-A53, the clock speed of 1.2GHz, 1 GB RAM, RJ45 port for network connectivity, wireless LAN (Wi-Fi) and Bluetooth 4.1, four USB Ports, GPIOs and a Camera Interface with a 15-pin MIP.

3.2 Camera Module

Fig. 3: Raspberry Pi Camera Module

The Raspberry Pi camera module size is 25mm square, 5MP sensor much smaller than the Raspberry Pi computer, 5-MP native resolution sensor-capable of 2592 x 1944-pixel static images. Supports 1080p30, 720p60 and 640x480p60/90 video Camera is supported in the latest version of Raspbian, which is the 3rd generation Raspberry Pi's preferred operating system

3.3 Image Processing

Optical character recognition, or OCR, is a current technique of changing a scanned image of a picture or into text. When a page is scanned, it is typically stored as a bit-mapped file in TIF format. When the image is displayed on the screen, we can see it. But to the processor, it is a series of black and white dots. The computer doesn't acknowledge any "words" or "letters" on the image. This is what the algorithm does. OCR looks at each line of the image step by step and attempts to determine if the black and white dots represent the shape of a particular letter or number.

3.4 Optical Character Recognition (OCR)

Optical character recognition, or OCR, is a technique of changing a scanned image into text. When a page is scanned, it is typically stored as a bit-mapped file in TIF format. When the image is displayed on the screen, we are able to scan it. But to the pc, it is just a series of black and white dots. The computer doesn't acknowledge any "words" on the image. This is what OCR does. OCR appearance at every line of the image and makes an attempt to work out if the black and white dots represent a selected letter or numerical number. OCR was truly developed originally to help sight-impaired people gain access to written info.

3.5 Tesseract

Tesseract is a free software package optical character recognition engine for varied in operating systems. Tesseract is taken into account collectively of the foremost correct free package OCR engines presently out there. It is out there for the UNIX system, Windows and Mac OS.

Tesseract is an associate in nursing optical character recognition engine for varied operating systems. It is free software, discharged beneath the Apache License, Version 2.0, and development has been sponsored by Google since 2006. Tesseract is executed from the command-line interface. While Tesseract isn't equipped a GUI, there are several other separate projects which give a GUI for it.

3.6 Text to Speech

Text to speech, abbreviated as TTS, is a kind of speech synthesis that changes text into a spoken voice output. Text to speech systems was 1st developed to assist the visually impaired by providing a computer-generated spoken voice that will "read" text to the user. TTS shouldn't be confused with voice response systems. Voice response systems synthesize speech by concatenating sentences from Associate in Nursing data of pre-recorded words and square measure used for various functions than TTS systems, that based sentences and/or phrases based mostly on a language's graphemes and phonemes. Voice response systems area unit restricted to synthesizing sentences that contain solely words that are planned by the system.

TTS systems, in distinction, are on paper capable of "reading" any string of text characters to make original sentences.

3.7 Ultrasonic Sensor Module

Fig. 3: Ultrasonic Sensor Module

Rotobotix Ultrasonic Sensor Module - Hc-Sr05. This supersonic module measures the gap accurately that provides 0cm-1500mm non-contact activity perform, the move accuracy will reach to 3mm. It has excellent performance and features non-blind operation (i.e., from 0-1cm the measurement results are not accurate when we test, but more than 1cm are accurate) design

3.8 GPS Module

Fig. 4: SIM800C GSM Module

The SIM800C GSM GPRS Module is used to insert the sim card. The GPS unit which is incorporated in an IOT module. It uses sim card which is a GSM module which tracks the location of the place. Once the location is tracked the IOT module sends the data and it is processed. Once the data is processed it gives the

output by telling the coordinates which the latitudes and longitudes of the position.

4. SOFTWARE USED

Raspbian is that the counselled software system for traditional use on a Raspberry Pi. Raspbian is a free operating system module based on Debian, optimized for the Raspberry Pi hardware. Python is also used for coding in image processing. Raspbian comes with over 35,000 packages: precompiled software bundled in a nice format for easy installation on the Raspberry Pi. Raspbian now is a community project underneath active development, with stress on improving the steadiness and performance of as many Debian packages as attainable. Python is a howling and powerful programming language that is simple to use (easy to read and write) and with Raspberry Pi let's connects to the project to the important world.

5. EXPERIMENTAL RESULTS

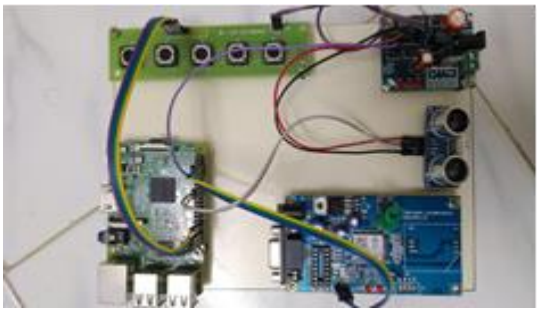

Fig. 5: Circuit

In this experiment, the camera captures the pictures and sends the received data to the processor. The Converting module which converts the image to the Voice process modules. So that every letter in the image are converted into the voice. The camera used in this project takes time because each frame takes about 5 seconds to get a detailed view of the image. Once the image is captured the tesseract converts captured text into voice via the speaker.

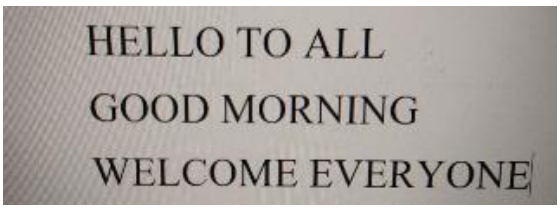

Fig. 6: A captured image

Then by using the switch button, the ultrasonic sensor module is turned on. Changing the directory in the Raspbian OS to ultrasonic sensor codes, the module will be working now of there is any obstacle is detected the sends the data to the processor and converts the data and gives an alarm to the user by speaking the word 'OBSTACLES AHEAD'.

The GPS unit which is incorporated in an IoT module. It uses a sim card which is a gsm module which tracks the location of the place. Once the location is tracked the IoT module sends the data and it is processed. Once the data is processed it gives the output by telling the coordinates which the latitudes and longitudes of the position.

6. CONCLUSION

By implemented this system visually impaired can easily listen to whatever they want to listen. And locate their location with the help of the gsm module and also if there is an object comes in the way the ultrasonic sensor gives the alarm, thus giving a safe environment for the user in their daily life.

7. FUTURE SCOPE

In future, there is a scope that it can also be extended for the long distance capturing, and it can also be implemented in a way a fashion of glasses

8. REFERENCES

[1] Pooja P. Gundewar and Hemant K. Abhyankar, "A Review on an Obstacle Detection in Navigation of Visually Impaired", International Organization of Scientific Research Journal of Engineering (IOSRJEN), Vol.3, No.1pp. 01-06, January 2013.

[2] Amjed S. Al-Fahoum, Heba B. Al-Hmoud, and Australia a. Al-Fraihat, "A Smart Infrared Microcontroller-Based Blind Guidance System", Hindawi Transactions on Active and Passive Electronic Components, Vol.3, No.2, pp.1-7, June 2013.

[3] Bhuvanesh Arasu and Senthil Kumaran, "Blind Man's Artificial EYE an Innovative Idea to Help the Blind", Conference Proceeding of the International Journal of Engineering Development and Research(IJEDR), SRM University, Kattankulathur, pp.205-207, 2014.

[4] Michael Mc Enancy Finger Reader Is audio reading gadget for Index Finger IJECCE Vol. 5, Issue 4 July-2014.

[5] Dimitrios Dakopoulos and Nikolaos G. Bourbakis Wearable Obstacle Avoidance Electronic Travel Aids for Blind IEEE Transactions on systems, man and Cybernetics, Part C (Applications and Reviews). Vol. 40, issue 1, Jan 2010.

