ijRASET

International Journal For Research in
Applied Science and Engineering Technology

Portable Gadget Based Assistive and Label Reading For Blind Person: A Review

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Abstract:This project describes a camera-based assistive device which will help the blind people to read text labels and product packaging from handheld object .The portable system which captures the image and text written which are placed in front of the camera can be read out or announced out using earphone or speaker interfaced to the raspberry pi processer. The raspberry pi processor takes the responsibility for authentication of image which is fed as input to it and also alerts the blind person through voice message using earphone or speaker. The proposed system aims at designing an innovative system which is very helpful for the physically challenged like blind persons to recognize the text from captured image and read out using earphone or speakers connected to the raspberry pi processor.
Keywords: TTS Engine, TESSERACT-OCR, PI Camera, Raspberry Pi, IOT

I. INTRODUCTION

Blind people and visually impaired people face a lot of unfavourable challenges in their routine . Vision is most important part of human Physiology as 83% of human gets information from the environment via sight. The visual impairment is most common disability in the world .As per the 2012,WHO report there are 285 million people visually challenge in the word ,out of them 39 million people are blind &246 are having low power of vision. The Oldest and Traditional mobility aids for visually impaired people are walking stick and guide dogs. The guide dogs are assistance dogs and they are trained to lead visually. The main Drawback of this aids are necessary skills, training phase, impaired around obstacles motion and very little information conveyed. Also this White cane has several restrictions such as long length if cane, limitations in recognizing obstacle and difficulty to keep in public places. The Advance modern technologies are introduced some software and hardware technologies for visually impaired people. For visually impaired people Recently there has been lots of Electronic Travel aids (ETA) designed and devised to help visually impaired people navigate independently and safely. Embedded system are integrated part of human life making it smarter and comfortable .the visual impairment is most common disability in the word The existing electronic product available for them have some drawback like complexity in operation ,higher cost ,expensive methodology & installation& tough maintenance. So embedded system for visually impaired & blind people will be our chance to do something for the these people .

Shopping is one of the most interesting thing and also one the most essential part of life for every human. But this simple task cannot be easily achieved by the blind. They need others help for satisfying their own requirements .At present in the case of shopping there is no such embedded product which can help them in this regard. Supermarket is the perfect option for them as almost all essential items are available under one roof. But inside the super market it is not possible for them to know what products is in front of them. They need to seek other's help for it. Hence we are proposing a system by which these people will be able to read the name of the product. This way our aim is to provide the shopping assistant for the blind and the visually impaired.

II. LITERATURE REVIEW

Literature review is carried out to gain knowledge and skill to complete this project. The main sources for this project are the previous publications related to this project. And the other sources are journals and articles. Therefore the analysis of the project did by other researches, these is the possibility to know are lacking in their projects. It is very important to improve and to develop a successful project.

Information about few research papers or previously implemented projects that we have used as a reference for making our project is mentioned below:A number of portable reading assistants are designed specifically for the visually impaired. "K-Reader Mobile" is a mobile application which allows the user to read mail, receipts, fliers, and many other documents[1]. But these systems/device fail to give an economic solution of the problem and are available on specific platforms. No smart phones have designed for blind person until now. Thus accessibility of the Mobile application is a different question However, the document to be read must be nearly flat, placed on a clear, dark surface and contain mostly black text printed on white background and it does not reads from complex backgrounds.

Willis et al. [11] implemented a system for visually impaired using RFID technology. It uses the concept of formation of information grid and encoding schemes for installation. It is self-describing and not depends on wireless infrastructure or centralized database.

[2]Darshan, a Navigation System for blind people to navigate safely and quickly, in the system obstacle detection and recognition is done through ultrasonic sensors and USB camera. The proposed system detects the obstacles up to 300 cm via ultrasonic sensors and sends feedback in the form of beep sound via earphone to inform the person about the obstacle. Raspberry Pi Embedded board is connected with USB webcam, which help to captures the image of the obstacle, which is used for finding the properties of the obstacle (Human Being). Human presence is identified with the help of human face detection algorithm written in Open CV. The constraints coming while running the algorithm on Embedded System are limited memory and processing time and speed to achieve the real time image processing requirements. The algorithm is implemented in Open CV, which runs on Debian based Linux environment.

Chucai Yi, Student Member, IEEE,2013 [3] in the work proposed a camera-based assistive text reading framework to help blind persons read text labels and product packaging from hand-held objects in their daily lives. This paper proposes a Gaussian based approach in which initially the object of interest is identified , followed by region of interest identification and performing various image processing operations on the identified image to retrieve the desired text Here the object from which the text is to be extracted is isolated[4][5] from the background by shaking the object using motion based object detection . The captured series of frames are analysed to find the foreground object followed by applying mean of the estimated foreground masks. Then the region of interest is found where the text is localized based on edge or textural properties and finally the desired text is extracted[6]. But the above paper has few a imitations because it uses a separate system for processing, a camera and a Bluetooth earpiece which increases the hardware utilization

K. Matusiak, Lodz University of Technology, IEEE 2013[7] ,in his work he describes main features of software modules developed for Android smartphones that are dedicated for the users. The main module can recognize and match scanned objects to a database of objects , e. g. food containers. The two other modules are capable of detecting major colors and locate direction of the maximum brightness regions in the captured scenes but it merely helps in object recognition by matching objects with database objects , other achievability or communication issues are not addressed

MohsinMurad et al. [8] describe RFID Based Navigation and Object Recognition Assistant which use online location monitoring and server for collecting database. It was implemented for home and office buildings. The design methodologies of this system require Visual Basic as front end language and database management tools. It was designed by using FM transmitters and receivers which leads to practical design problems.

Mohamed Manoufali et al. [9] developed an intelligent guiding system for blind people. It facilitates a blind person to move freely in the outdoor environment by knowing about nearby obstacles. PIC microcontroller and ultrasonic sensors were used to provide the obstacle information. It mainly identifies the obstacles and not specifically used for application.

D. Dakopoulos et al [10] proposed a camera based technique to identify the hand-held objects. From cluster of background an object is identified. For that region of interest (ROI) are used. Novel text localization algorithm is used to get the gradient features of edge pixels using Adaboost model and region of interest (ROI) is found out. These texts are binarized and threshold value is obtained for that text character. Finally speech output is obtained from the binarized text character. This project also used for the blind person in their daily lives. Firstly, we have to shake the object to recognize the text. But, now it will automatically recognize the text character in the hand of blind person. It is also converting the text into binaries but optical character recognition (OCR) software is used here. Then finally speech output is obtained.

III. PROPOSED SYSTEM

The architecture of the system includes Raspberry Pi,TTS Engine, TESSERACT-OCR. The Block Diagram of this Intelligent System is as Follows.
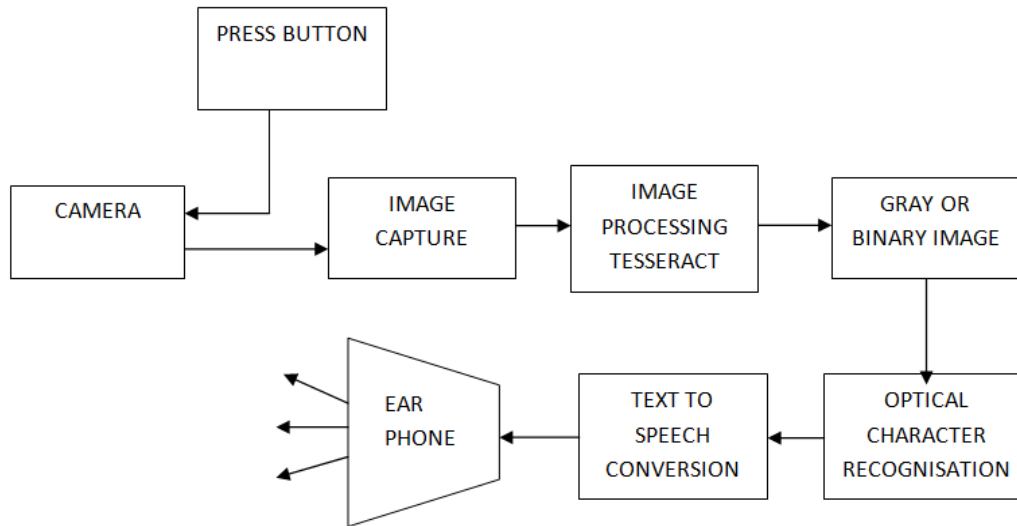
International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 5 Issue XII December 2017- Available at www.ijraset.com

Fig. 1 Proposed system structure

II. HARDWARE DESCRIPTION

A. . Raspberry-Pi 3

The Raspberry Pi is nothing but a series of small single-board computers developed by Raspberry Pi Foundation of United Kingdom to provide low cost solution for teaching of basic computer science in schools and in developing countries. The processor used in RPi 3 is a Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor, with 512 KB L2 cache. It has potentially fast enough to decode H.265-encoded videos in software. The GPU in the RPi 3 runs at higher clock frequencies of 300 MHz or 400 MHz than previous versions which run at 250 MHz The Raspberry Pi primarily uses Raspbian, a Debian-based Linux operating system. Raspberry Pi 3 has the functions over other models of RPi such as

1) A 1.2GHz 64-bit quad-core ARMv8 CPU
2) 802.11n Wireless LAN
3) Bluetooth 4.1
4) Bluetooth Low Energy

Fig. 2.Raspberry Pi 3

B. USB Camera

Input from camera is given to the raspberry pi module via USB cable. For USB camera, we are using high quality wide angle lens. Snapshot button for stillimage capture is provided. This captured image then will be the main source of data for our system.

C. Earphones

In raspberry pi module, the processing output is listened over here which is connected to audio jack of the raspberry pi .This is used to get the proper audio output for the blind person.

III. SOFTWARE DESCRIPTION

A. Tesseract

Open source OCR engine is Tesseract. Tesseract works with independently developed Page Layout Analysis Technology and accepts input image as a binary image. Tesseract can handle both, the traditional- Black on White text and vice-versa. Text lines are analyzed for fixed pitch and proportional text.

B. OCR Technology

The mechanical or electronic conversion of images of typed, handwritten or printed text into machine-encoded text is called as Optical character recognition (OCR) . It is used as a form of data entry from printed paper records like passport documents ,business cards etc. The advantage of this technology is that printed texts get digitized. This digitized data can then be searched, sorted & analyzed easily and also digitized data can be compactly stored and processed speedily making it perfect for use for Raspberry based system.

C. Text To Speech

For reading any text aloud, A Text-To-Speech (TTS) synthesizer is used which is nothing but a computer-based algorithm.
This feature of TTS system is used by us to enable the blind person to know what product is in front of him by converting digitized text received from OCR unit into voice.

IV. WORKING

A. The blind person can have our system which is portable and easy to use. As his he/she has to carry the module with them for assistance.

B. In our project, the camera module is used to capture the real time image of the product. Which is the given to the main module.

C. The main module is of raspberry pi which is on its own a mini-computer, which processes the image captured by the camera.

D. Raspberry pi module, which contains the image processing code loaded, optical character recognition technique, is used to process the image. The raspberry pi hardware processes the image is internally to separate the label from the captured image by using TTS Engine library. The letters found in the label is identified by using Tesseract-OCR (optical character recognition).

E. The text is converted to voice using text to speech platform and then is heard from the audio jack port using ear phones.Pico is use for converting machine monotonic voice into normal female voice.

V. CONCLUSION

The System proposed the design of a new concept for blind People. This is an application for the blind and visually impaired to provide complete assistance while shopping by reading the label. The advantage of the system lies in the fact that it can prove to be very Effective solution to millions of blind and Visually Impaired People worldwideand to provide constructive assistant and support for blind and visually impaired people, a simple, configurable, easy to handle Intelligent system is proposed herewith.

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