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# Portable Gadget Based Assistive Text and Label Reading For Blind Person

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**ABSTRACT:** The project describes framework, a camera-based helpful device which can facilitate the blind people to read text labels from handheld object. This system which is interfaced using raspberry pi, captures the image placed in front of the camera and text in the image is read and can be heard using earphones. The raspberry pi processes, image captured by the camera which is given as input to it and send voice message using earphone or speaker to the blind person. The system's main motive is to style a system that is useful for the physically challenged person like blind persons or visually challenged person to acknowledge the text from captured image and read out with the help of headphone or speakers connected to the raspberry pi processor.

**KEYWORDS:** TTS Engine, TESSERACT-OCR, PI Camera, Raspberry Pi, IOT

### I. INTRODUCTION

In the smart world, blind and visually impaired people face a lot of difficulty in their day to day life. Although all the seven senses have their own importance in our day to day life, Vision is the most important part of human life as 83% of human gets information from the environment via sight because vision is the maximum source of data reception to the brain. The visual impairment is most common disability in the world. As per the 2012, WHO report there are 285 million people visually challenged in the world, out of them 39 million people are blind and 246 are having low power of vision. The traditional systems for visually impaired people are walking stick and walking stick guide dogs and they are only useful for about five years. To assist blind or visually impaired people dogs are used and they are trained to lead visually. The main drawbacks of these aids are requirement of necessary skills, training phase. Visually impaired people generally use either the typical white cane but it provides some restriction as long length, recognizing obstacle, difficulty in public places. The advanced technologies have introduced some software and hardware technologies for blind and visually impaired people. Embedded products are integrated part of human life making it smarter & comfortable. The visual impairment is most common disability in the world. The existing electronic products available for them have some drawbacks like complexity in operation, higher cost, expensive methodology & installation & tough maintenance. People who are visually impaired still struggle every day in performing actions that can be as simple as moving from one point to another without falling down, So it's our chance to do something visually impaired people or blind people.

Shopping is one of the most interesting thing and also one of 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 are in front of them. They need to seek other's help for it. Hence we are

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proposing a system by which these people will be able to read the name of the product. The aim is to provide the shopping assistant system 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 assistants system are designed specifically for the visually impaired.

To read mail and receipts and fliers and many other documents, the mobile application name as “K-Reader Mobile” is developed [1]. But these systems/device fail to give an economic solution of the problem and are available on specific platforms. Until now there is no smart phone design for blind or visually impaired person. 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] perform a system for blind person 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 design for blind people or visually challenge people to navigate safely in surrounding, in the system obstacle detection and recognition is done through ultrasonic sensors and USB camera. The system detects the obstacles up to the range of 300 cm via ultrasonic sensors or 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). With the help of open CV Human presence is identified. 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.

Chucui 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 isextracted[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 enveloped for Android smart phones that are dedicated for the users. The function of main module is that it will identify and match the product to the data base, 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

Mohsin Murad 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.

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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. Obtained text will be binarized and then threshold value obtained from it. 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. 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.

priya Narasimhan implemented a system called TRINETRA based on assistive embedded technologies [12].it provided the barcode based solution for blind to identify the product in the supermarket .barcode system need line of sight to retrieve product information .at the time of implementing this RFID was used as heavy cost .so they designed by using bar code-scanning pencil cell phone and Bluetooth headset.

## III. SYSTEM ARCHITECTURE

The architecture of the system includes Raspberry Pi, TTS Engine, TESSERACT-OCR. The Block Diagram of this Intelligent System is as Follows.

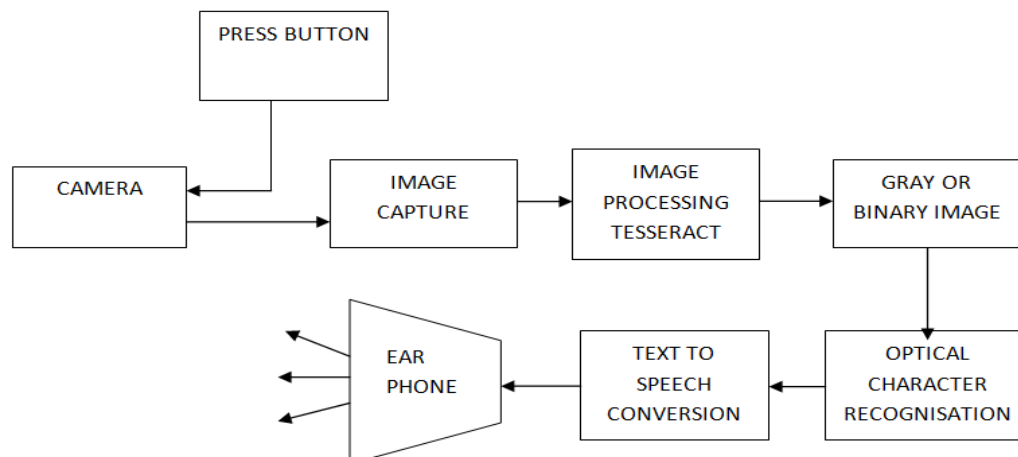


Fig. 1 Proposed system structure

In this block diagram, camera is triggered with the help of button .after pressing the button image will be captured by the camera and then goes toward image processing TESSERACT and then it convert captured text into gray or binary code after that with the help of OCR ,optical character will be recognise .OCR then goes to the TTS engine with the help of TTS engine ,it will convert text into speech. then audio output is heard with the help of earphones provided with system.

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## 1. Hardware Description

### 1.1 Raspberry-Pi 3

The raspberry pi is small board measuring 56 by 85mm, about the size of a standard credit card, 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. As for the specifications, the Raspberry Pi is a credit card-sized computer powered by the Broadcom BCM2835 system-on-a-chip (SoC). This SoC includes a 32-bit ARM1176JZFS processor, clocked at 700MHz, and a Video core IV GPU. It also has 256MB of RAM in a POP package above the SoC. The Raspberry Pi is powered by a 5V micro USB AC charger or at least 4 AA batteries.

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 Model B

### 1.2 USB Camera

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

### 1.3 Earphones

Earphone is used to listen over audio jack of raspberry pi board. This is used to get the proper audio output for the blind person.

## 2. Software Description

### 2.1 Open Cv

Open CV (Open Source Computer Vision) is a library for real time computer vision. Advantages of Open CV is built upon C. On the other hand, Open CV, is basically a library of functions of C/C++. You are closer to directly provide machine language code to the computer to get executed. So you get more image processing done for your computers processing, and not more number of interpreting. As a result of this, programs written in Open CV run much faster. Hence we have used Open CV as stand here for image processing.

### 2.2 Python

Python is used high-level, interpreted dynamic programming language. the code designed by the system is in the form of code readability and its syntax also give permission to programmers to express concepts in languages such as java or C++ . It provides constructs that enable clear programming on both small and large scales

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Vol. 7, Issue 3, March 2018

## 2.3 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.

## 2.4 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.

## 2.5 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

1. 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.
2. In our project, the camera module is used to capture the real time image of the product label. Which is the given to the main module.
3. The main module is of raspberry pi which is on its own a mini-computer, which processes the image captured by the camera.
4. Raspberry pi module, which contains the image processing code loaded, optical character recognition technique, is used to process the image. The image is processed is done internally in the raspberry pi hardware, then it will separate the label from the captured image. by using TTS Engine library. The desired letters in the label is identified by using Tesseract-OCR (optical character recognition).
5. Text To Speech Module: Text-to-Speech (TTS) Platform is a modular hardware design for text-to-speech applications. It provides Platform which is fully integrated module that converts a stream of digital text into speech. The text is converted to voice and then is heard from the audio jack port using ear phones. Pico is use for converting machine monotonic voice into normal voice.

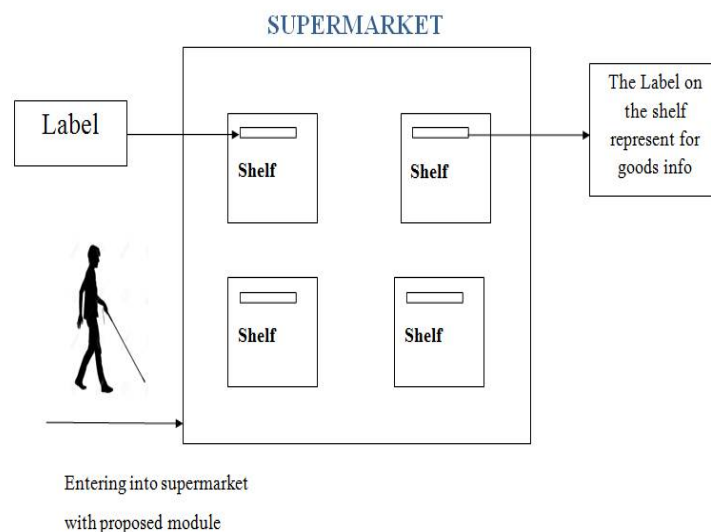


FIG 3. WORKING OF OUR PROJECT

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### V. EXPERIMENTAL RESULTS

The proposed system employs key technology of TTS Engine, TESSERACT-OCR, IOT. The system consists of webcam which can help to captured image. Figures show the results of text detection from an image by using TESSERACT OCR algorithm. Hardware module of proposed system is done with raspberry pi board. Figs(a) shows the command window. (b) Captured image obtained camera. (c) output /simulation result. Text is detected from the image.

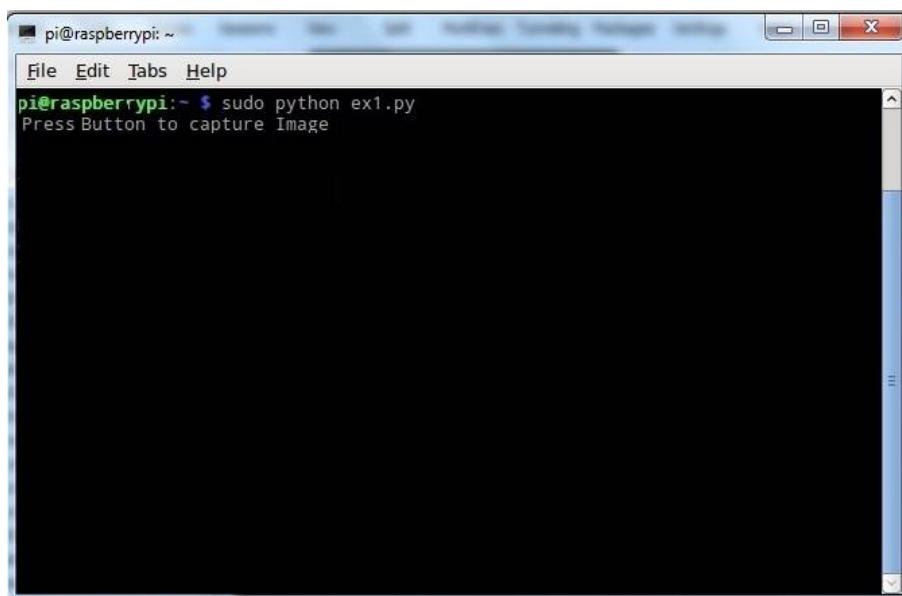


Fig a. Command window

In the command window, the command is entered then programme get triggered. After entering that in command audio is heard by the person that press button to capture the image.



Fig b. Captured Image by camera



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After hearing that audio output, person will take snap of product with the help of webcam .that captured image is shown in fig b.

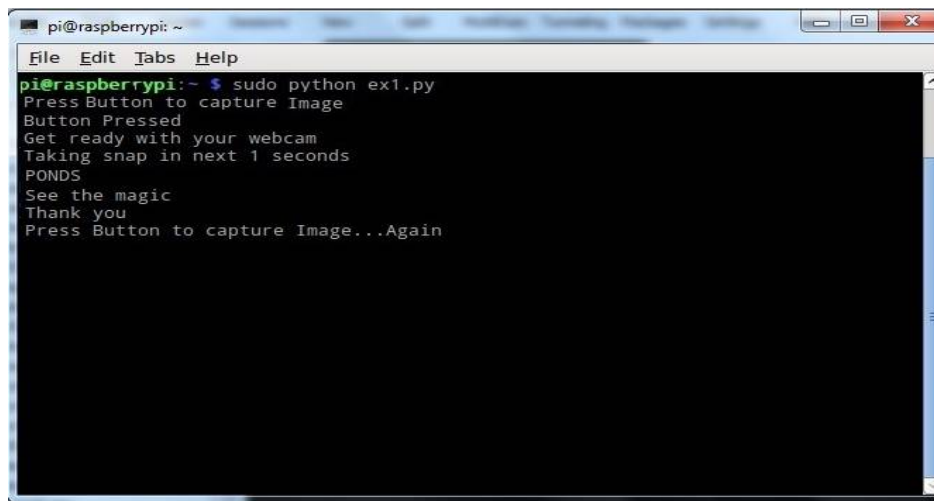


Fig c. Result of system Architecture

System shows the final output as fig c. in which the output of product is given as pond. after that camera again ready to capture image it shown in the above fig.

## VI. 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 worldwide and 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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**Vol. 7, Issue 3, March 2018**

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