A Unique Virtual Eye And Smart Stick For Visually Impaired People

Divyashree R[1], Karan S Gowda[2], Babitha R[3], Mrs Anu D[4]
[1, 2, 3] Dept of Information Science and Engineering
[4]Asst. Professor, Dept of Information Science and Engineering
[1, 2, 3, 4] East West Institute of Technology, Bengaluru

Abstract- *In this paper, we propose an intelligent assistance system for visually impaired/blind people, which is composed of wearable smart glasses, an intelligent walking stick, mobile devices application, and on-line information platform. When visually impaired/blind people wear the proposed smart glasses and holding the proposed intelligent walking stick, thus the obstacles can be detected. If a visually impaired/blind person is fall down, then the related information (GPS, fall down, etc.) will be recorded and uploaded to the on-line information platform. Related information can also be viewed by the proposed mobile devices application. This is a unique smart glass for visually impaired people to overcome the travelling difficulties. It can detect the obstacle and measure the distance perfectly using the ultrasonic sensor and a microcontroller. After receiving information from the environment, it passes to the blind person through a headphone. The GSM/GPRS SIM900A module is used to collect the information from the internet. A switch is connected to the system which is used for an emergency task like sending SMS, including time, temperature and location to the subject's guardian when visually impaired people fall into any danger. By using the smart glass visually impaired people can walk in an indoor and outdoor environment.*

Keywords- smart glass, smart stick for visually impaired, python, IOT, impaired people,stick dimension ratio, person fall down, obstacle detection, sensor monitoring, image to speech, home automation, OCR

I. INTRODUCTION

Over 285 million people are visually impaired worldwide: 39 million of them being blind and 246 million have low vision. There is no text reading option for blind person except Braille. 90% of the world's visually impaired live in developing countries.

The blind traveler should depend on any other guide like blind care, people information, trained dogs, etcBraille has however successfully confronted the barriers to education and employment for visually impaired people up to a certain degree. But the availability of only a selected number of books in Braille format poses a great problem creating the need for development of some other auxiliary reading means for visually impaired people. Also, most of the day-to-day encountered written material is readily converted into Braille. Moreover, the problem of Braille illiteracy limits its success so far.The **O**ptical **C**haracter **R**ecognition (OCR) technique used to extract text out of a printed or electronic document is promising but the way it has been integrated in the form of usable devices is neither satisfactory nor user-friendly. The conventional device available like Kurzwiel reading machine is bulky, costly, non-portable and heavy in power consumption. Some other conventional devices are made in the form of a tabletop scanner, bigger in size of that a table lamp and need computer support for its operation. The advanced versions of these devices employing OCR technique are better and portable. OrCam is such a device but its usability is limited to people with low vision where the user can somehow differentiate the contrast of black and white. People with complete blindness i.e. with zero reception of light, cannot make use of it. Another renowned device, Finger mounted text reader was introduced overcoming these limitations, wherein a tiny camera is attached to the user's finger and while it navigates through the text line of a document, the text is narrated with the aid of earphones attached.The device also has its own light source to support reading in low-light/dark conditions. But this device too suffers from many shortcomings. The user is supposed to navigate the finger with camera mounted on it across the line of text, which is narrated in due time. Whenever the user deviates from the horizontally aligned text, it guides the user by means of audio or haptic instruction to move the finger up or down accordingly, thus making the device very tedious and time-consuming to use. Plus, the device is also not rugged, and it becomes hard for the blind user to find the initial line of text.The devices that exist till today have one or more of these constraints, viz., limited scanning field, high cost, high operation time, tedious in operation, the involvement of external aid, portability issues and limitations in some not to be used by blinds but low-vision people. These problems restrict their utility in mass. Table I. enlists the comparable difference between existing devices and proposed device. The present scenario of the digital world demands an automated device free from these restrictions. In this context, an innovative work is designed and developed for the visually impaired people to overcome the challenges pertaining to the existing devices. The proposed auxiliary reading device is portable, very easy to handle, designed in the form of a wearable glass with low cost of development having wide scanning area which allows the user to listen to the contents of text containing images to efficiently read books, labels, bills, newspapers and any sort of printed or electronic document in near-real time. The device can also be used by people with healthy eyesight to reduce the amount of stress on their eyes.

II. LITERATURESURVEY

This paper investigates methods and procedures to construct an efficient system to assist blinds in their everyday life. In particular, various technologies that can be utilized to build a wearable system are examined.This also explains as it is a part of our effort to develop a navigation system to aid the visually impaired using SONAR. SONAR (SOund Navigation And Ranging) system plays a significant role in widespread applications in underwater scenarios. Blind people need assistance in detecting obstacles, finding locations, and getting directions while moving around to reach their specified destination. Based on this persistent need, we suggest a navigation system to facilitate these requirements. We provided this navigation system to blind students, employees, or guests within King Saud University campus area.Blind navigation is an accessibility application that enables blind to use an android Smartphone in an easy way for indoor navigation with instructions in audio form.

III. EXISITINGSYSTEM

In the existing system, blind cane the persons awkwardness and recongnition of obstacles upto knee level. The person does not protect from obstacles at torso and face level. Any person might prone to injuries. Earlier the trained guide dogs were in the usage of 1% , while expensive to train dogs. The training period was on an average of 6 months, and it was difficulty in handling the dog up-keeping costs and their lifestyles. The human guidance was always dependency, where the blind person was feeling of being a burden.

IV. PROPOSED SYSTEM

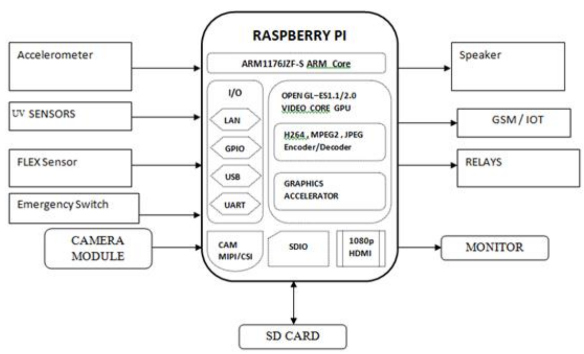
Implementing a Reading System for Blind person Using Python and Raspberry Pi

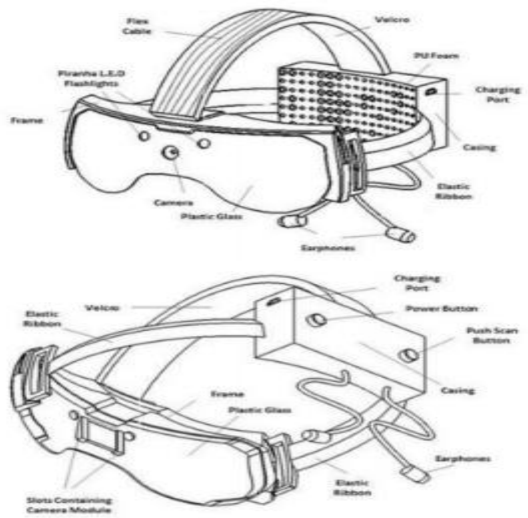
A. Image Capture
B. Convert to Text
C. Convert to voice
D. Object classification

Helping blind person to walk with Electronic Stick.This system also involves in Informing the blind person about the location of the obstacle, when using this smart glass and smart stick. Telling blind person about the location of the obstacle in Voice, through the headphones which is connected to the smart glass.Detection of fall of blind person using Accelerometer, and message will be sent to caretaker . Rescue blind person immediately from any exceptional condition.

V. ARCHITECTURE

DESIGN





HARDWARE:

- ARM11 Raspberry Pi board
- Accelerometer
- Ultrasonic Sensor
- Flex Sensor
- Relays
- Camera
- Speaker
- Keyboard

SOFTWARE:

- Putty Software
- Noobs OS
- OpenCV

FUNCTIONAL REQUIREMENT:

- Raspberry pi
- Camera
- Speaker

NON-FUNCTIONAL REQUIREMENT:

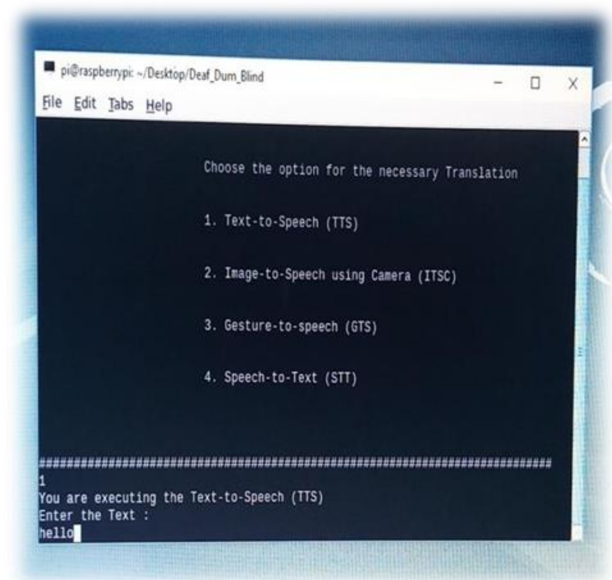
- Monitor
- HDMI to VGA
- Mouse

VI. IMPLEMENTATION

MODULE 1

Text to Speech

Step 1: Start
Step 2: Choose option OP1 to convert text to voice.
Step 3: Call the function Text-to-Speech ().
Step 5: Convert text to speech using e-speak synthesizer.
Step 6:Voice is generated.
Step 7: Stop

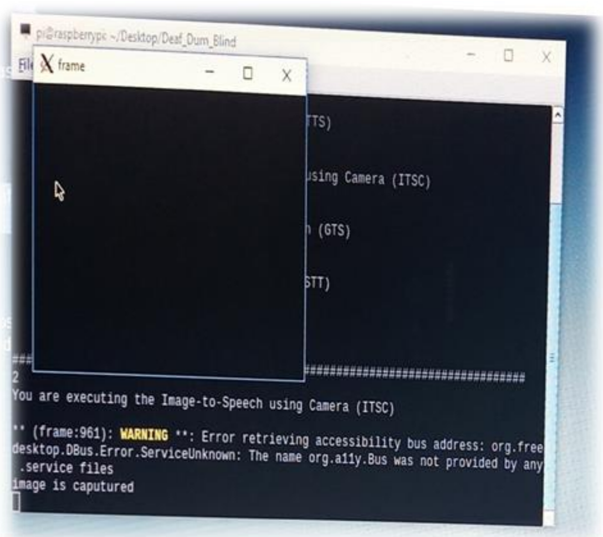


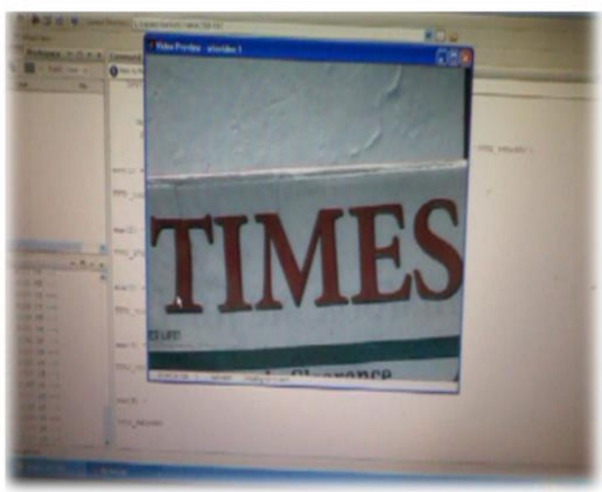
MODULE 2

Image to Speech using camera

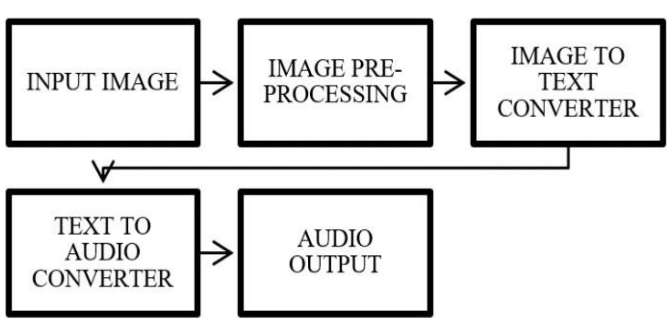
Step 1: Start
Step 2: Choose option OP2 to convert image to speech
Step 3: Call the function Image-to-Speech ().
Step 4: Capture the required image.
Step 5: Convert image to text using Tesseract OCR.
Step 6: Split the text into paragraph.
Step 7: Text is displayed on the screen.

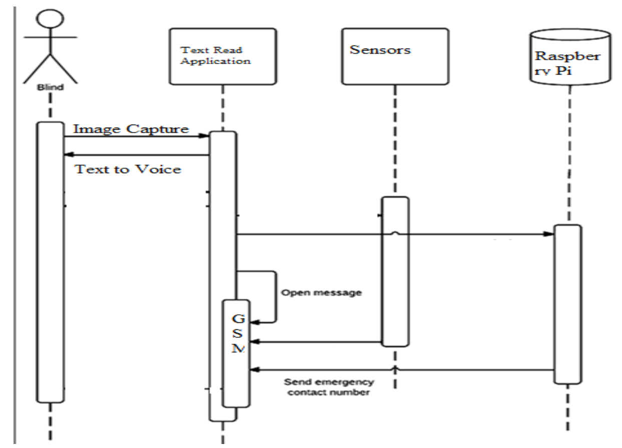
Step 8: Next, call Text-to-Speech () function.
Step 9: Convert text to speech using e-speak synthesizer.
Step 10: Voice is generated.
Step 11: Stop



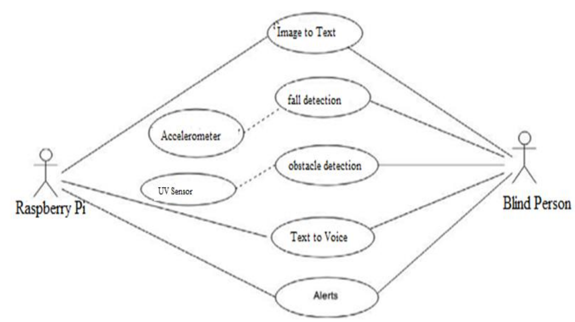


Text Reading





Sequence Diagram



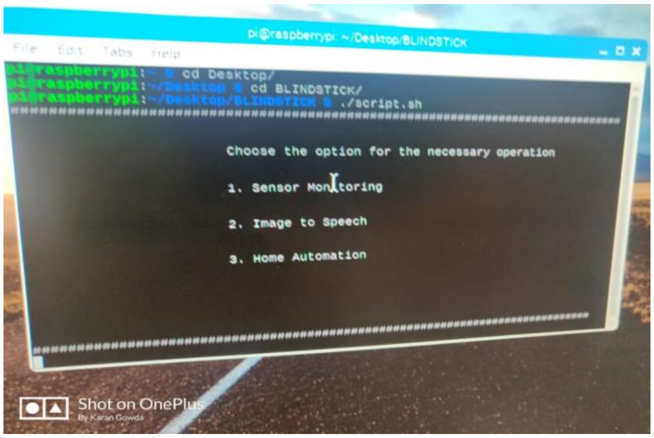
Use case Diagram

MODULE 3

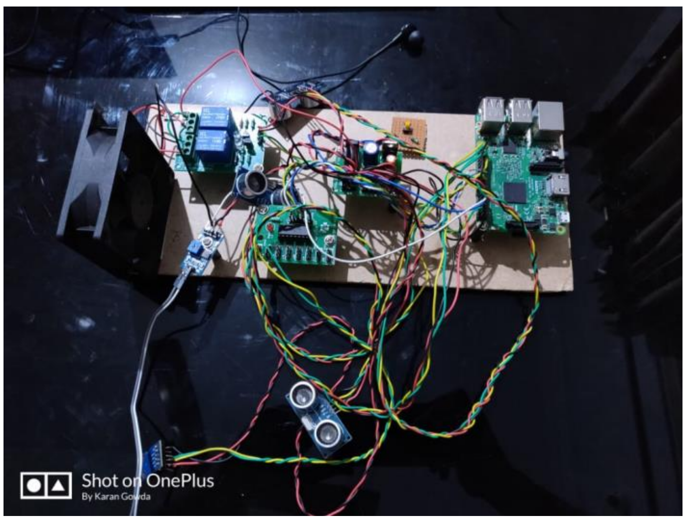
<u>Home Automation</u>

The process starts when power is supplied to the Raspberry Pi. As Raspberry Pi boots up its operating system, it triggers the ultrasonic sensor to start sending burst signal.All the sensors are triggered at approximately the same time thus, there is very less delay. After the signal returns back to the receiver of the sensor as an echo, the Raspberry Pi calculates the time taken from transmitting and receiving the echo. Using this time we calculate the distance of an obstacle from any of the sensors. Next, it checks if any of the distance calculated is less than the minimum distance specified i.e. 0.5m in our case. If none of the sensors have distance less than the minimum distance, the entire process starts again. However, even if one of the sensors detects distance less than 0.5m, it triggers the pre-defined conditions.

VII. RESULTS

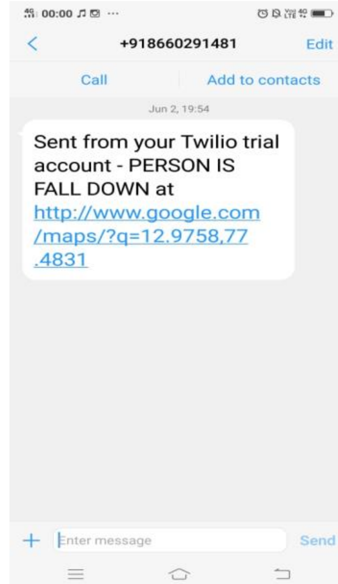


3 Modules Implemented diplayed on monitor



Raspberypi connections

The process starts when power is supplied to the Raspberry Pi. As Raspberry Pi boots up its operating system, it triggers the Flex sensor to start sending burst signal. All the sensors are triggered at approximately the same time thus, there is very less delay. After the signal returns back to the receiver of the sensor as an echo, the Raspberry Pi calculates the bending of flex sensor. If the flex sensor bending is detected then relay turns on.



Message sent to the caretaker

VIII. CONCLUSION

The project proposed the design and architecture of a new of Smart Electronic Guiding Stick for blind people.The advantage of the system lies in the fact that it can prove to be very low cost solution to millions of blind person worldwide. The proposed combination of various working units makes a real-time system which assist for a blind person to read something. It can be further improved to have more decision taking capabilities by employing varied types of sensors and thus could be used for different applications. It aims to solve the problems faced by the blind people in their daily life. The system also takes measures to ensure their safety.

IX. ACKNOWLEDGEMENT

Any achievement, be it scholastic or otherwise does not depend solely on the individual efforts but on the guidance, encouragement and cooperation of intellectuals, elders and friends. A number of personalities, in their own capacities have helped us in carrying out this project.

We would like to take this opportunity to thank them all. First and foremost we would like to thank Mrs Anu D, Asst. Professor, EWIT, for her moral support and valuable suggestions and expert advice. towards completing our project work. and constantly guiding me to organize the project in a systematic manner.

REFERENCES

[1] Chaudhry M., Kamran M., Afzal S., “Speaking monuments — design and implementation of an RFID based blind friendly environment”, 2nd ICEE International Conf. on 25-26 March, 2008.

[2] Velázquez R., “Wearable Assistive Devices for the Blind.” Chapter 17 in A. Lay-Ekuakille & Mukhopadhyay (Eds.), Wearable and Autonomous Biomedical Devices and Systems for Smart ronment: Issues and Character ization, LNEE 75, Springer, 2010, pp 331-349.

[3] World Health Organization (2009) Visual impairment and blindness- Fact Sheet N°282. Available online at: http://www.who.int mediacentre/ factsheets/fs282/en/

[4] Johann B. and Iwan U. “The GuideCane — A Computerized Travel Aid for the Active Guidance of Blind Pedestrians”, Proceedings of the IEEE International Conference on Robotics and Automation, Albuquerque, NM, Apr. 21-27, 1997, pp. 1283-1288.

[5] Sandra M., Nik A. M., Maxim M., Aaron S. “BlindAid: An Electronic Travel Aid for the Blind”, The Robotics Institute, Carnegie Mellon University, Pittsburgh, Pennsylvania 15213.

[6] B.R.Prudhvi and Rishab B. “Silicon Eyes: GPS-GSM based Navigation Assistant for Visually Impaired using Capacitive Touch Braille Keypad and Smart SMS Facility” Computer and Information Technology (WCCIT), World Congress on 2013, Pages: 1-3, DOI: 10.1109/WCCIT.

[7] Dionisi, A & Sardini, Emilio & Serpelloni, Mauro. (2012). “Wearable object detection system for the blind”. 2012 IEEE I2MTC - International Instrumentation and Measurement Technology Conference, Proceedings. 1255-1258. 10.1109/I2MTC.2012.6229180.

[8] Nada, Ayat & Mashali, Samia & Fakhr, Mahmoud & Seddik, Ahmed. (2015). “Effective Fast Response Smart Stick for Blind People”. 10.15224/978-1-63248-043-9-29.

[9] M.Everingham, S.M.A.Eslami, L.Van Gool, C.K.I.Williams, J.Winn, and A.Zisserman. Th pascal visual ob-ject classes challenge: A retrospective. International Journal of Computer Vision, 111(1):98–136, Jan. 2015. L. Chen, J. Su, M. Chen, W. Chang, C. Yang and C. Sie, "An Implementation of an Intelligent Assistance System for Visually Impaired/Blind People," 2019 IEEE International Conference on Consumer Electronics (ICCE), Las Vegas, NV, USA, pp. 1-2, 2019.