# Navigation System for Visually Impaired People by using raspberry PI

Gowthami D[1] Indhumathi J[2] Kalidas M[3] Kavinmuthu S[4] Priyadharshini V[5]
[1]*Assistant Prof. in Department of ECE, KSRCE TIRUCHENGODE, Tamil Nadu, India*
[2,3,4,5]*Student in Dept. of ECE TIRUCHENGODE, Tamil Nadu, India*

**ABSTRACT - This project describes ultrasonic blind walking stick with the use of Raspberry Pi. Smart walking cane acts an Electronic Travel Aid (ETA). Smart walking cane solves the challenge by detecting both indoor and outdoor obstacles and by providing level crossing guidance and current position of the visually challenger. Obstacles are detected using Ultrasonic sensors and Water sensorsNavigation information and instructions is intimated to the user of the Smart walking cane by text-to-speech converter through stereophonic Headphone. This Smart walking cane meets the mandatory requirements of the blind people to navigate as well as to know the position and orientation of the visually challenged.**

**Keywords:Raspberry Pi, Navigation, Stereophonic Headphone**

## I. INTRODUCTION

Visually impaired persons have difficulty to interact and feel their environment.Physical movement is a challenge for visually impaired persons,because it can become tricky to distinguish where he is, and how to get where he wants togofromoneplacetoanother.To navigate unknown places, he will bring a sighted family member or his friend for support. They are relying on their families for mobility and financial support. Their mobility opposes them from interacting with people and social activities. In the past, different systems are designed with limitations without a solid understanding of the non-visual perception. Some of the systems are only for indoor navigations, and has no hurdle detection and determining location feature in outdoor environment.Over the last decades, research has been conducted for new devices to design a good and reliable system for visually impaired persons to detect obstacles and warn them at danger places. There are some systems which has some deficiencies. This system is an obstacle avoidance wearable portable computer which is only for indoor navigation. The system is equipped with two modes. One sound for free for travel direction and other for blocked, it was difficult for the person to differentiate the sounds.

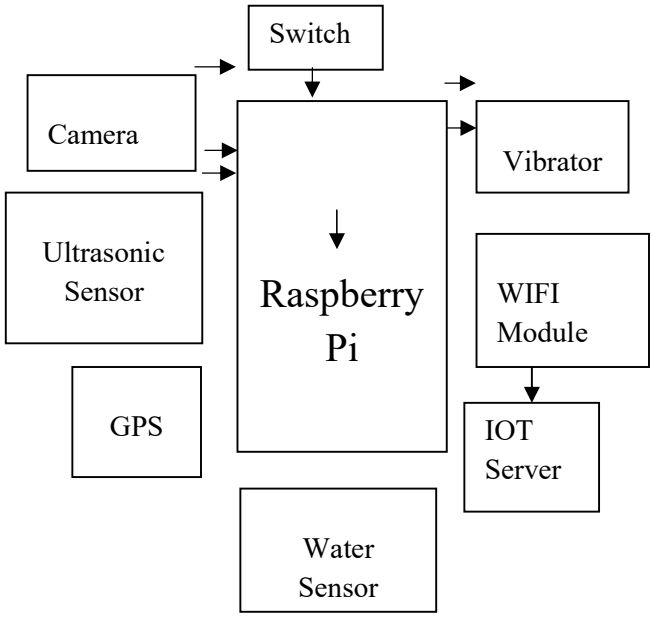
## II. RELATED WORK

The barrier is detected by this system using IR, ultrasound, and water sensors. However, thissystem only sounds a buzzer to warn the blind person when any one of the sensors istriggered. No location identifiers or location indicators are used by this system. The proposedsystem has been tested in different types of floor conditions and a field trial on five blindparticipants has been conducted. The experimental results demonstrate its reliability incomparisontoexistingsystems.

a. DISADVANTAGE

They can’t detect obstructions that are hidden but very dangerous for the blind such as downward stairs, holes etc.

3. BLOCK DIAGRAM




## III. PROPOSED METHODOLOGY

The main objective of this work is to build a low-cost system for helping visually impaired people and blind people. The camera has been connected through USB port within hardware for capturing the images. The image is then fed internally within the raspberry pi board to inform the blind and visually impaired people how many persons are around within the image. Using OpenCV library and Haar cascade classifier, the total number of people around will be identified and then the identified number will be announced by speech using earphone which is connected to audio port within hardware.

a. Face Detection Algorithm

This work concentrates on face detection using haar cascade algorithm and OpenCV using python. Basically, the face detection is sophisticated process, and the algorithms used for face detection are always beginning by searching for eyes. Eyes are creating what is called as a “valley region” which represent the easiest characteristics to be detected. When eyes detected, the algorithm can go to detect facial regions and find eyebrows, nose, mouth, iris and the nostrils.

b. OpenCV

OpenCV represents processing library for video and image used in C++, C, Python, and Java. OpenCV library can be used for analysis of video and image, like facial detection and recognition, reading bar code, editing of photo, robotic vision, recognition of optical character, and a lot more. OpenCV uses three builds in classifier for faces (Eigen Faces, Haar Cascade, Fisher Faces and Local Binary Patterns Histograms (LBPH)) which are open-source coding, anybody can use by simply varying in code B. Haar Cascade Classifier Haar Cascade Classifier is a very popular classifier which is introduced by Paul Viola and Michael Jones in 2001 in, "Rapid Object Detection using a Boosted Cascade of Simple Features”. This classifier represents an algorithm based on machine learning, begins with training a cascade function of a lot of images in term of positive and negative. Then it will be used to make objects detection in other images. Haar is more accurate, but at the same time it is much slower than others. The OpenCV package has all information which will be required to apply Haar effectively. Basically, the need for an XML file with the right face information within it and it can be also created by the user if he hasknown what he was doing or can just use what comes with OpenCV. Initially, this algorithm needs set of positive images with faces and many negative images without faces to train the classifier. After that features extraction from them will be made. They are similar to the convolutional kernel. Each property represents aone value that got by subtracting summation of pixels in white rectangle from blackone.

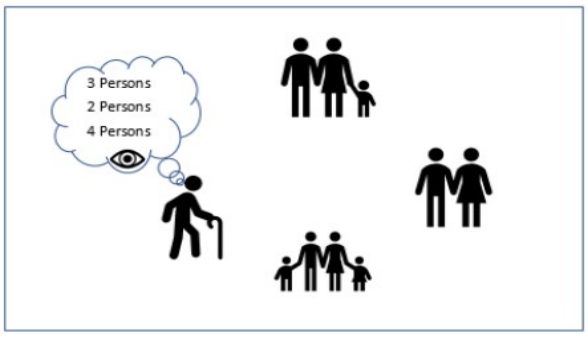



Fig. 4.1 System overview

## IV. RESULT

The object detection is done by usinga ultrasonic sensor connected to raspberry Pi 23 and 24 pins and water sensor to 25th pin, a python code is written to scan the sensors and if the readings are near then a voice message is playedthrough the headphones.

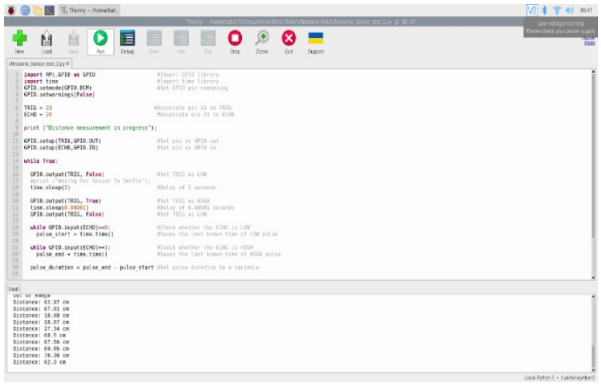


Fig. 5.1Python Code running on Raspberry Pi

To sense the people in front of the blind person, a Pi camera is used which is connected to the camera port of the Raspberry. Python code captures the image from the camera, process it through viola jones algorithm and finds the number of people before the blind person and indicates the number through voice in the headphone.

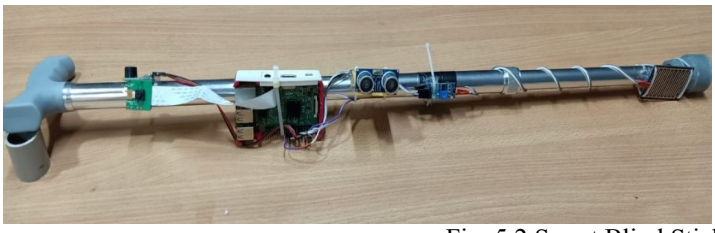


Fig. 5.2 Smart Blind Stick Project

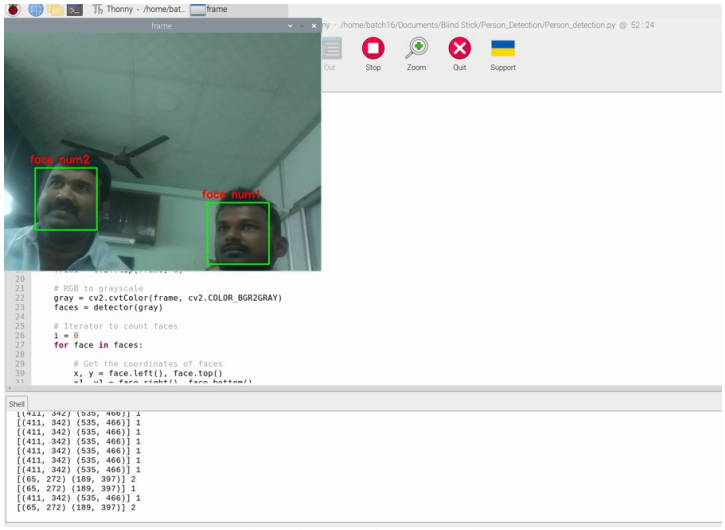



Fig.5.3 Number of person detection using Open CV

## V. CONCLUSION

The main purpose of this project is to produce a prototype that can detect objects or obstacles in front of users and feeds warning back, in the forms of voice messages and vibration, to users. If constructed with at most accuracy, the blind people will able to move from one place to another without others help. The developed prototype gives good results in detecting obstacles paced at distance in front of the user and also the obstacles which are on the sides. The end product of project that meets all the goals. However, there are still some considerable adjustments that can be made. With more time and resources,we would like to create a custom walking stick for the blind. The Smart Stick acts as a basic platform for the coming generation of more aiding devices to help the visually impaired to be safer. It is effective and afford. It leads to good results in detecting the obstacles lying ahead of the user in a range of four meters, detecting stairs and water pits. This system offers a low-cost, reliable, portable, low-power consumption and robust solution for navigation with obvious short response time. Though the system is hard-wired with sensors and other components, it's light in weight. Further aspects of this system can be improved via wireless connectivity between the system components, thus, increasing the range of the ultrasonic sensor and implementing a technology for determining the speed of approaching obstacles. While developing such an empowering solution, visually impaired and blind people in all developing countries were on top of our priorities.

## REFERENCES

[1] Shinohara,K. ―Designing assistive technology for blind users‖ In Proceedings of the 8th International ACM SIGACCESS conference on Computers and accessibility, ACM, 293–294, 2006.

[2] Benjamin J. M., Ali N. A., Schepis A. F., ―A Laser Cane for the Blind‖ Proceedings of the San Diego Biomedical Symposium, Vol. 12, 53-57.

[3] Johann B., Iwan U., ―The Guide Cane ―A Computerized Travel Aid for the Active Guidance of Blind Pedestrians‖ Proceedings of the IEEE International Conference on Roboticsand Automation, Albuquerque, NM, 1283-1288, 1997.

[4] C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - *Journal of ELECTRICAL ENGINEERING,* Vol.63 (6), pp.365-372, Dec.2012.

[5] C.Nagarajan and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- *Springer, Electrical Engineering*, Vol.93 (3), pp.167-178, September 2011.

[6] Nagarajan C., Neelakrishnan G., Akila P., Fathima U., Sneha S. "Performance Analysis and Implementation of 89C51 Controller Based Solar Tracking System with Boost Converter" Journal of VLSI Design Tools & Technology. 2022; 12(2): 34–41p.

[7] C. Nagarajan, G.Neelakrishnan, R. Janani, S.Maithili, G. Ramya "Investigation on Fault Analysis for Power Transformers Using Adaptive Differential Relay" Asian Journal of Electrical Science, Vol.11 No.1, pp: 1-8, 2022.