# Obstacle Avoidance and Detection for Blind People

[1]Apurwa Anand, [2]Soumya Ranjan Rout, [3]Siddarth Tyagi, [4]R. Rajyashree

[1,2,3]Students, [4]Assistant Professor
SRM Institute of Science and Technology, Chennai

***Abstract*: By using the smart walking cane blind people can perform their work in a convenient way. Smart walking stick can able to support Object identification by the help of image processing and mainly the output would be in the form of Voice output. In proposed system, cam plays a major role in spotting the objects. The stick calculates the distance between objects and Smart Walking Stick by Ultrasonic sensor. When an obstacle is detected in the range of ultrasonic sensor, the obstacle name will be given as output in the earphones. Images will be captured using a camera and the camera is connected to the Raspberry Pi. Later on, it checks with the database and gives the output. If any object which is not stored in the database is encountered, then it says unknown object identified. For example, instead of GSM this raspberry pi can send alert message and also it does the work of Arduino and microcontrollers. We are also giving voice output based on image recognition for identification of object which is connected to earphones. We are using IR sensor to detect light.**

***Keywords*: Object avoidance, raspberry pi, light sensors, IR sensor, image processing.**

## Introduction

In day to day life activities the technology has been changed a lot. First, the evolution of technology is beneficial to humans for several reasons. New inventions pop up every day to help people navigate the ever-changing world. For the disabled, who must often rely on others for basic tasks, this technology helps in making their work easier. People who are completely blind or have impaired vision usually have a difficult time navigating outside the spaces that they're accustomed to. In fact, physical movement is one of the biggest challenges for blind people, explains World Access for the Blind. Traveling or merely walking down a crowded street can be challenging. Because of this, many people with low vision will prefer to travel with a sighted friend or family member when navigating unfamiliar places.

Also, blind people must memorize the location of every obstacle or item in their home environment. Objects like beds, tables and chairs must not be moved without warning to prevent accidents. If a blind person lives with others, each member of the household has to be diligently about keeping walkways clear and all items in their designated locations. Even those who, although not completely blind, have extremely poor vision, may have difficulty with small fonts, interpreting icons and perceiving the colours used by many sites, according to the University of Wisconsin. People who have very poor vision will typically need special equipment or software that can enlarge screen images, so they're easier to see. There many walking sticks for blind people which has many advantages and options. But, according to the present needs and technology this smart walking stick has been updated and designed. The stick consists of 4 ultrasonic sensors, one camera and an earphone. Out of 4 sensors 3 of them used for obstacle detection and the last one is used for pothole detection. The camera is used for text and object recognition. Thus it works as a virtual eye for blind people. The output will be from an earpiece. In this smart walking stick we use Raspberry pi to control the sensors and camera. The feature of object identification helps the blind people to recognize what kind of object is before them and helps them to move around safely. Text reading helps them by reading out the reading out the texts before them and finally colour identification helps them to identify the colours before them.

There are over 284 million people who are visually impaired and there are over 39 million people who are totally blind. The lack of visual capabilities has limited these individuals from completely perceiving their immediate surroundings which has potential safety concerns and also lowers their quality of life since they must rely on some sort of aid to get around. An Intelligent Mobility Cane, or "Smart Cane" is a cane designed for the visually impaired which can offer the user the ability to navigate their surroundings, rather than simply avoid hitting things. Smart Canes can offer blind and visually impaired users a means of independent personal mobility outside of the home, and at a normal walking speed.

These devices are able to accomplish this by using an ultrasonic transducer to detect both low overhanging objects that do not have a contact point at ground level, and objects that are directly in front of the user, and relaying the information back to the user via tactile vibrational feedback in the handle. A product called Ultra cane was developed in 2011 in the UK. It is, however, rather expensive and considerably heavier than traditional canes The goals of this project are to analyze the current design, explore the patent and MSD database, and identify opportunities to make the device lighter and cheaper to manufacture without taking away from its key functionality, such as energy efficiency, ease of use, obstacle detection, and feedback. The expected outcome is a prototype that meets the budget and production constraints of the customer, and can be manufacturing by visually impaired workers. The final design and prototype must also be mindful of patent infringements. Currently in order for visually impaired individuals to get around, they rely on walking canes, guide dogs, and/or personal human aids for assistance. While these walking canes and guide dogs may allow the individual to get around independently, they each have a common drawback. These aids lack the intelligence to provide directions to unvisited locations and cannot completely warn individuals of obstruent objects in their vicinity. A human aid provides this intelligence but makes the visually impaired individual very dependent on the human aid.

Basic White Cane

- • Lacks sensory capabilities
- • Auditory Intelligent Cane
- • Not usable by auditorily impaired, or in noisy environments
- • Tactile Feedback Cane (From Britain)
- • Too Bulky, and Expensive
- • Tactile Feedback SmartCane (from India)
- • Tactile Feedback Intelligent Mobility Cane from previous MSD

Desired State

- • Device is inexpensive
- • Device provides tactile feedback
- • Device detects obstacles and overhangs in front of the user
- • A functional prototype which is manufacturable by a visually impaired person.

**Object Detection Algorithm**

The novel electronic travel aid system we realized consists of two cameras, a portable computer and an earphone. The device has the features of obstacles detection, traffic light recognition and road edges detection. Obstacles detection algorithm we proposed is based on self-adaptive threshold image segmentation. The input image is gray style and preprocessed using median filter.

The gray image was intersected with region of interest (ROI) firstly. ROI is set by the designer before detection. A self-adaptive threshold determination algorithm was used in

obstacle detection. The self-adaptive threshold determination algorithm is described as follows:

(a) Set the gray scale of the image as 0 to m, and k is the pixels number of gray value i. The total number of pixels in the image is M, then the probability of pixel with gray value i is shown in (1).

$$pi = k/M \qquad (1)$$

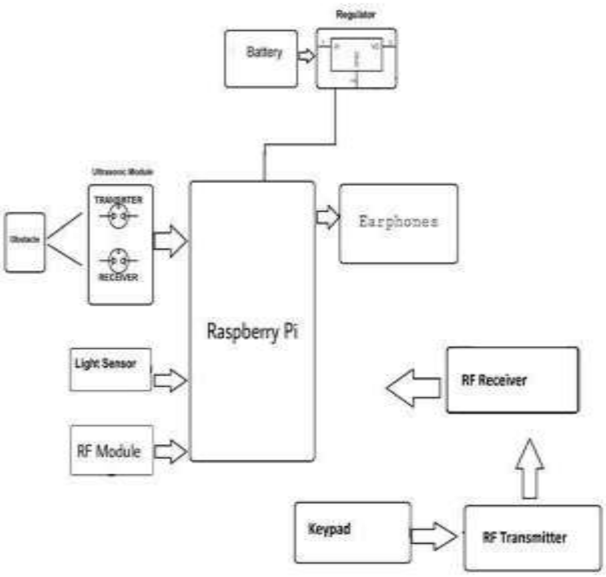
(b) The gray values of the pixels in the image were divided into three classes C0, C1and C2, according to the gray value thresholds n and n+ q (here q is set as 50 according to experimental results). The gray value scale of class C0 is (0, n), C1 for (n+1,n+q)and C2 is (n+q+1,m). The probabilities of C0, C1 and C2 are p0 (t), p1 (t) and p2 (t) separately

The square difference between three classes C0, C1and C2 is σ2, as shown in

$$\sigma 2 = p(t)[\mu(t) - \mu(t)] + p(t)[\mu(t) - \mu(t)] + p(t)[\mu(t) - \mu(t)] .$$

Change n and n+q continuously to make σ2 maximal, we can get n and n+q, which are the determined thresholds in the image.

**System Architecture**



In the proposed system the power supply is connected to a RASPBERRY PI in which ultrasonic sensor, IR sensor, GPS, camera and RFID are attached. The output will come through earphones and vibrator as soon as it receives signal from raspberry pi. The stick measures the distance between objects and Smart Walking Stick by Ultrasonic sensor. It is a wearable device in the form of a waist belt that has ultrasonic sensors and raspberry pi installed on it. This device detects obstacles around the user up to 500cm in three directions i.e. front, left and right using a network of ultrasonic sensors. These ultrasonic sensors are connected to raspberry pi that receives data signals from these sensors for further data processing. The algorithm running in raspberry pi computes the distance from the obstacle and converts it into text message, which is then converted into speech and conveyed to the user through earphones/speakers. This design is beneficial in terms of its portability, low-cost, low power consumption and the fact that neither the user nor the device requires initial training.

**Conclusion**

This project has been built around Raspberry Pi processor board. It is controlling the peripherals like Camera, speaker and LCD which act as an interface between the system and the user. Optical Character Recognition or OCR is implemented in this project to recognize characters which are then read out by the system through a speaker. As shown in the project setup, the camera is mounted on a stand in such a position that if a paper is placed in between the area marked by angular braces, it captures a full view of the paper into the system. Also, when the camera takes the snapshot of the paper, it is ensured that there is good lighting conditions. In this analysis, we've got represented an epitome system to scan written text and handheld objects for helping the blind individuals. To extract text regions from advanced backgrounds, we've got projected a completely unique text localization formula supported models of stroke orientation and edge distributions. The corresponding feature maps estimate the worldwide structural feature of text at each component. Block patterns project the projected feature maps of a picture patch into a feature vector. Adjacent character grouping is performed to calculate candidates of text patches ready for text classification. Associate degree Ad boost learning model is utilized to localize text in camera-based pictures. OCR is employed to perform word recognition on the localized text regions and rework into audio output for blind users. During this analysis, the camera acts as input for the paper. Because the Raspberry Pi board is high powered the camera starts streaming. The streaming knowledge are going to be displayed on the screen victimization GUI application. Once the item for text reading is placed ahead of the camera then the capture button is clicked to produce image to the board. Using Tesseract library, the image is going to be born-again into knowledge and also the knowledge detected from the image are going to be shown on the standing bar. The obtained knowledge is going to be pronounced through the ear phones using Text to-speech synthesis.

**References**


[1] Osama Bader AL-Barrm International Journal of Latest Trends in Engineering and Technology (IJLTET) .

[2] B.Mohan Sitaramaiah, M.Naganaik-International Journal of Advanced Technology in Engineering and Science www.ijates.com Volume No.03, Issue No. 01, January 2015 ISSN (online): 2348 – 75501q.

[3] F. van der Heijden, P.P.L. Regtien, "Wearable navigation assistance - a tool for the blind" MEASUREMENT SCIENCE REVIEW, Volume 5, Section 2, (2005).

[4] 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.

[5] 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.

[6] Madad A. Shah, Sayed H. Abbas, Shahzad A. Malik , ―Blind Navigation via a DGPS based Hand-held Unit‖ Australian Journal of Basic and Applied Sciences, 4(6): 14491458, 2010.

[7] Kulyukin V., Gharpure C., and Nicholson J., ―Robo-Cart: Toward Robot-Assisted .