INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume 4, Issue 2)
Available online at: www.ijariit.com

Advanced Walking Stick for Visually Impaired

Tony Jose Eluvathingal
tonyjoseelu@gmail.com
Sahrdaya College of Engineering and Technology, Kodakara, Kerala

Misab P. V
pv.misab@gmail.com
Sahrdaya College of Engineering and Technology, Kodakara, Kerala

Vishnu T. S
vishnuvichuz232@gmail.com
Sahrdaya College of Engineering and Technology, Kodakara, Kerala

Anusree K
anusreek@sahrdaya.ac.in
Sahrdaya College of Engineering and Technology, Kodakara, Kerala

ABSTRACT

The generally available blind walking sticks are suitable for finding an obstacle that touches the stick physically. It is helpful to a blind person but we here propose an advanced blind stick system that allows a blind person to sense objects before stick touches them. This blind walking stick can sense what object it is. It uses Haar Cascade Classifier method to find out what he object is. Also, it includes GPS tracking feature to find lost person along with other useful features. The system uses a microcontroller based circuit to handle the entire system functioning. The transducer is used to sense objects within the certain range of the person and alarms the blind person. The type of object is announced through its speaker. Now, this system also has a light sensing feature to give the blind person a sense of light.

It signals the person if there is light or darkness so that he/she can know if it is night or has entered a very dark room/facility. If the person loses the stick the person can use an RF remote so the stick starts beeping and the person can find it. One more important feature of the proposed system is that it allows the visually impaired one to send out an SMS message to his/her GPS location to the caretaker/relatives/loved ones of the person in case of trouble or being lost.

Keywords: *GPS Tracking, Haar Cascade Classifier, RF Remote, Ultrasonic Sensor.*

1. INTRODUCTION

Walking sticks are used to guide blind people in their difficulties. The world is changing and the changing world needs to contribute to the aid for the visually impaired according to the technological advancements. That is where the new object detection walking stick comes into play.

The ultrasonic sensor is used to detect the presence of obstacles. Image processing module gives information to the blind person about the obstacle. The information is given through the speakers. The hazard system consists of a GPS module and a GSM module. The GPS module traces the location of the blind person. It is sent to the caretaker.

The purpose of implementing this project is to achieve a blind walking stick with special characteristics. Existing walking sticks can detect obstacles only when they touch the obstacles. But the proposed system is very efficient. It can detect the obstacles a few distances away from them. Besides that, the blind person is informed what type of object it is. The new system gives very much importance to the safety of the user. There is a hazard button attached to the system. It can be used in the hazard situation. Whenever the concerned button is pressed, the location of the blind person is sent to the caretaker and to the police. Then the caretaker can help the person.

This project has a worldwide scope. According to the survey, about 0.48 percent of the world is visually impaired. It may be a small number in percentage. But when we convert it to number, we find that the number of visually impaired people is 0.48 percent of 7.1 billion that is 12 million. So, there are many people in the world who requires proper assistance. This project will definitely help

them to overcome their difficulties and make the world better place.

2. EXISTING SYSTEM

In the previous versions of the walking stick for the visually impaired, there was little to no technology involved. In the previous version, the walking stick used the ultrasonic transmitter sensor, which is the sensor used for finding the distance or if any obstacle was in front of the user. We know the visually impaired people rely on their other senses other than seeing for their works. But if the user's walking stick is misplaced and if he wants to find on his own, in the previous versions it was almost impossible to find the stick. And if he was estranged from places he doesn't know, and he requires assistance it will be difficult to contact his/her caretaker.

3. TECHNOLOGY AND CONCEPT USED

A. MODULES USED

i. Ultrasonic sensor

Ultrasonic Sensor (transducers) is a type of sensor that uses sound waves to detect an object or target. It works on the similar principle of radar or sonar which generates high-frequency sound waves and evaluates the echo which is received back by the sensor. Sensors measure the time interval between sending the signal and receiving the echo to determine the distance to an obstacle.

Ultrasound can be used for measuring wind speed and direction (anemometer), tank or channel fluid level, and speed through air or water. To calculate velocity or direction, a device uses multiple detectors and assesses the speed from the relative distances to particulates in the air or water. To measure tank or channel level, the sensor measures the distance to the surface of the fluid. Other implementations are sonar, humidifiers, medical ultrasonography, burglar alarms, non-destructive testing, and charging.

Systems typically use a transducer which generates sound waves in the ultrasonic range, above 18 kHz, by turning electrical energy into sound, then upon receiving the echo turn the sound waves into electrical energy which can be computed and exhibited.

The technology is limited by the shapes of surfaces and the density or consistency of the material. Foam, in particular, can distort surface level readings. This technology, as well, can detect approaching objects and track their positions.

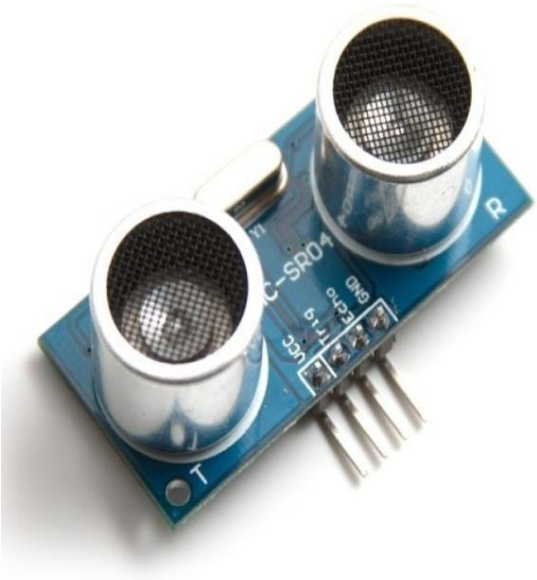

Figure 1 Ultrasonic sensor

ii. GPS and GSM Modules

A GPS tracking module is usually brought by a toddling vehicle or person, that uses the global positioning system to determine and track its precise location, and hence that of its carrier, at intervals. The recorded location data can be stored within the tracking unit, or it may be transmitted to a central location database, or Internet-connected computer, using a cellular (GPRS or SMS), radio, or satellite embedded in the component. The traced location is exhibited against a map either in real time or when computing the track later, by the use of GPS tracking software. The concerned software is made available for smart phones with GPS facility. A GPS tracker includes a GPS module to receive the GPS signal and compute the coordinates. It has a large memory to store the coordinates and data pushers.

GSM (Global System for Mobile Communications) is a standard put forward by the European Telecommunications Standards Institute to characterize the protocols for second generation cellular networks used by mobile phones first brought into action in

Finland in December 1991. As of 2014, it has been made the effective global standard for mobile communications. 2G networks developed as a replacement for first generation analog cellular networks, and the GSM standard originally described as a digital, circuit-switched network optimized for full duplex voice telephony.

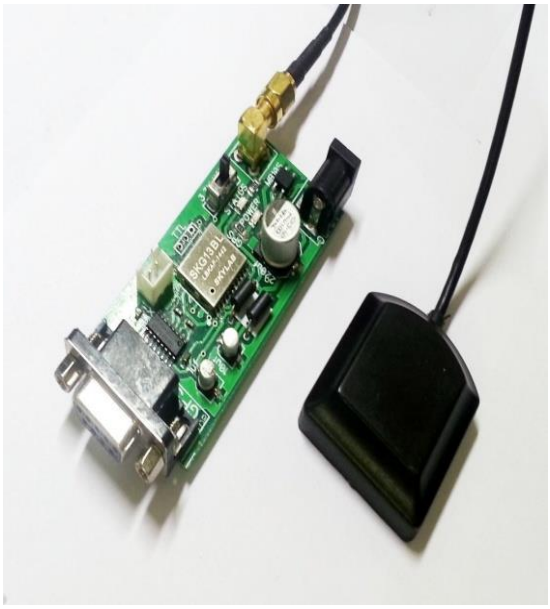

Figure 2(a) GPS module

Figure 2(b) GSM module

iii. Raspberry Pi

There are many versions of Raspberry Pi. The raspberry pi is just like a computer. Its OS is raspbian. Many external devices can be connected to the raspberry pi. It has more than one USB ports. The Ethernet cable can be connected to the concerned module. It is equipped with a WiFi adapter. The monitor can be connected to the module through VGI cable. Keyboard and mouse are connected through USB ports. Likewise, almost all the peripheral devices can be connected. The audio devices also can be attached. The programming is taken place through the attached keyboard for attaining desired functionalities. We can use any programming languages. The raspberry pi is available in many models. In model A, A+, and the Pi Zero, the USB port is paired directly to the system on a chip (SoC). On the Pi 1 Model B+ and then fabricates the USB/Ethernet chip encloses a five-point USB hub, of which four ports are available, whilest the Pi 1 Model B only provides two. On the Pi Zero, the USB port is also paired directly to the SoC, but it makes use of a micro USB (OTG) port.

The performance of Raspberry Pi 3, with a quad-core Cortex-A53 processor, is 10 times more than that a Raspberry Pi 1.

The processor of Raspberry Pi 2 is quad-core Cortex-A7 CPU running at 900 MHz and 1 GB RAM. It is more powerful than its predecessor. The GPU is same as the previous one. It is 14 times faster than its predeccessor.

The performance of the raspberry pi is similar to that of Pentium II. The graphical performance of the Raspberry Pi is approximately equivalent to that of the Xbox of 2001.

Figure 3. Raspberry Pi

B. CONCEPT

i. Haar Cascade like feature

A Haar-like feature takes rectangular regions close to each other at a specific location in a detection window, sums up the pixel intensities in each region and calculates the difference between these sums. This difference is used differentiate subsections of an image. The main example is liscence plate recognition. The registration number is printed in black letters on a white background. Therefore, a set of two rectangular areas around the number and background are used.

The cascade classifier encloses many steps, where each step has different weak learners. The objects are identified in question by moving a window over the image. Each stage of the classifier names the specific region defined by the current location of the window as either positive or negative – positive means that an object was found. But, negative means that the specified object was not found in the image. If the labeling yields a negative result, then the classification of this specific region is hereby complete and the location of the window is moved to the next location. If the labeling gives a positive result, then the region moves of to the next stage of classification. The classifier yields a final verdict of positive, when all the stages, including the last one, yield a result, saying that the object is found in the image.

A true positive means that the object in question is surely in the image and the classifier labels it as such – a positive result. A false positive means that the labeling process falsely determines, that the object is located in the image, although it is not. A false negative means the classifier is unable to detect the actual object from the image. But, a true negative means that a nonobject was correctly classifier as not being the object in question. In a good classifier, each stage of the cascade has a low false negative rate. However, each step is able to have a relatively high false positive rate, because even if the n-th stage classifies the non-object as actually being the object, then this mistake can be fixed in n+1-th and subsequent stages of the classifier.

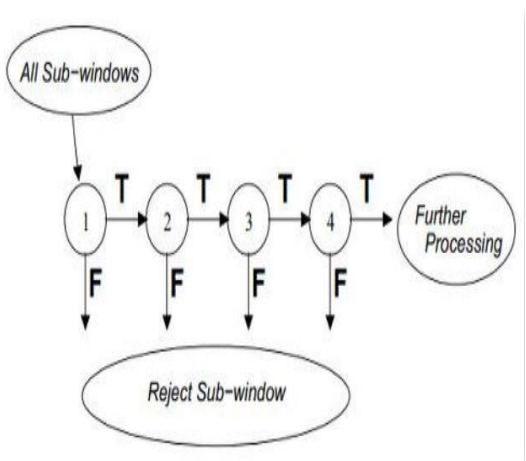

Figure 4. Stages of the cascade classifier

ii. Steps to create Haar-like classifier

- Assembling image database.
- Ordering negative images.
- Crop & mark positive images.
- Creating a vector of positive images.
- Haar-Training
- Creating XML file

iii. The framework of the algorithm

In this section, we will describe of our algorithm in detail. The flow chart is given in Figure 4

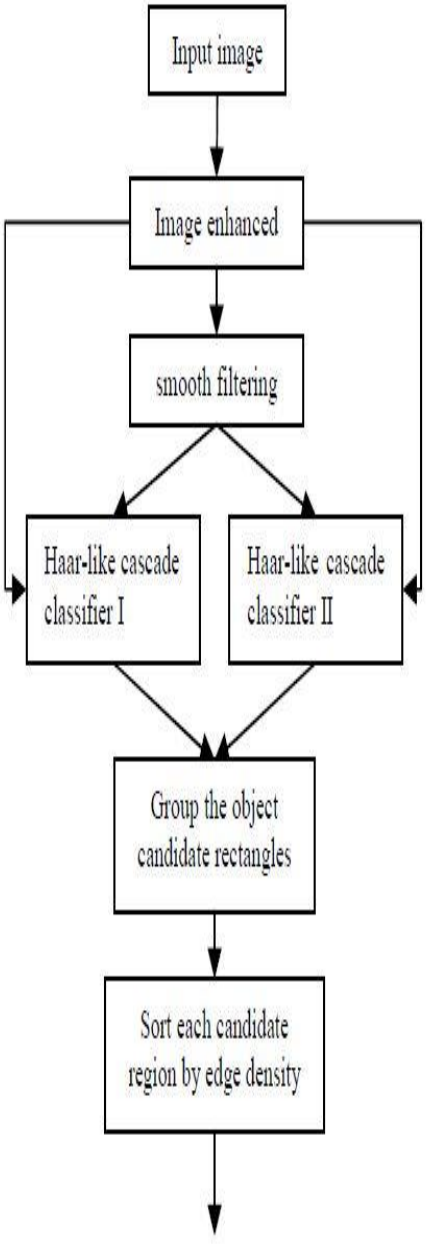

Figure 4. The flow chart of the algorithm

4. EXPERIMENT AND RESULT

The completed system is turned on and the user starts to use the system. To test the object detection the user is to step into the real world environment. When the user starts to walk down on the path a pillar is in front of the user and the object detection module processes the object and gives information to the user through the speaker attached to the system. For testing the hazard button the user turns on the GPS by engaging the mentioned button, this results in finding out the location and is sent to the caretaker of the user. The system is working perfectly.

5. CONCLUSION

The main technologies used in our project for helping the visually impaired are : to find the distance we use ultrasonic transmitter, for object detection we use camera with the help of Raspberry Pi, we also use a GPS and GSM module for transmitting the current location of the user, we also use a remote controller for finding the misplaced walking stick. When the user switches on the walking stick the GSM and GPS module starts to do their job. But they only send the data or the current location if the user wanted to, when he is in need of assistance the user can press the switch and the data will be sent instantly to the caretaker of the particular user. GSM module sends the data in text message format. The image recognition module helps the user by telling the user that a particular object is in their way and the distance is calculated by the ultrasonic sensor. The previous version of the walking stick only had the distance detection from the object, but now the new and improved version has tracking and image recognition which will help the user more efficiently and easy to walk down the streets. Every human life matters, so for making the world a better place for the visually impaired too, we dedicate this project.

6. REFERENCES

[1] Mahdi Rezaei, Hossein Ziaei Nafchi, Sandino Morales, "Global Haar-like Features: A New Extension of Classic Haar Features for Efficient Face Detection in Noisy Images", *6th Pacific-Rim Symposium on Image and Video Technology*, PSIVT 2013.
[2] V. Jones, "Rapid object detection using a boosted cascade of simple features," Computer Vision and Pattern Recognition, 2001.
[3] GPS based Automated Public Transport Fare Collection Systems Based on Distance Travelled by Passenger Using
[4] Chris Gearhart, Alex Herold, Dr. Brian Self, Dr. Lynne Slyvovsky, "Use of Ultrasonic Sensors In The Development of An Electronic Travel Aid" JEEE *Sensors Application Symposium* New Orleans, LA, USA – February 17-19, 2009
[5] Alessio Carullo and Marco Parvis, "An Ultrasonic Sensor For Distance Measurement In Automotive Applications", IEEE *Sensors Journal*, Vol.1, No.2, August 2001.

