SMART CANE

Anjali J Suresh[1], Sruthi A[2], Revathy Prasannan[3], Malavika Bhasy B[4], Soumya Murali[5]

[1,2,3,4,5] Department of Computer Science & Engineering, Sree Buddha College of Engineering, Pattoor, Kerala, India

---***---

Abstract - *Today technology is improving daily in different aspects in order to provide flexible and safe movement for the people. Visually impaired people find themselves challenging to go out independently. Traditionally white cane had become a well known attribute for the blind navigation. The use of white canes has created many issues for the blind. It is possible to extend the support given to people who are visually impaired during their mobility with the latest technology. This paper is about an IoT based Smart Cane for blind. A portable economic user friendly blind stick is introduced with the capabilities of detection of obstacles and tracking objects which are necessary for the blind people. Ultrasonic sensor and RFID technology is used for obstacle detection and object tracking respectively. The distance between the obstacle and blind is determined and is spoken out along with the necessary details that are retrieved from the object tracking.*

Key Words: **RFID, IoT, Ultrasonic sensor.**

1. INTRODUCTION

Blindness has been recognized as an important health problem in India. The traditional and oldest mobility aids for blind people are the walking cane called the white stick and guide dogs. With the rapid increase in the modern technology, both in hardware and software front have brought potential to provide intelligent navigation capabilities. We are decided to modify and enhance the walking cane, since blind are only able to detect objects by touch or by cane. We accomplished this goal by adding ultrasonic sensors at specific positions to the cane that provided information about the environment to the user through audio feedback. The reason why ultrasonic sensor is popular is that the technology is relatively inexpensive, and also ultrasound emitters and detectors are small enough to be carried without the need for complex circuitry. A blind aid system can be provided a new dimension of Real-time assistance and artificial vision along dedicated obstacle detection circuitry.

As the blind can't see the environment around them, it is difficult for them to handle his/her necessary accessories. Normally the blind can't able to know where his/her objects are. And it is difficult for them to identify its positions. Sometimes the blind can identify the objects by touch and feel. But there are several objects such as medicine, can't able to identify in such a way. For such a situation it is necessary to track the objects for blind. The main component of this system is the Radio-Frequency module which is used to find the stick if it is misplaced around. The cane thus provides two functionalities obstacle detection and object tracking.

2. LITERATURE SURVEY

[1] An Electronic Walking Stick for Blind:

The main objective is to develop a simple guidance system for the bind users, using sensors and to determine whether the bind can move safely or not. Using two ultrasonic sensors and infrared sensors implemented on the lower side of the stick for avoiding small obstacles. There is a switch that can be operated with the thumb that allows the blind user to send a general message on a saved mobile number for help. Vibrating sensors along with buzzer is used when it is about to hit any obstacle. The disadvantage is that the actually distance from the obstacle cannot be determined for the blind.

[2] Radio Frequency identification Walking Stick (RFIWS): A Device for the Blind

The device is intended to assist the blind during walking on a side walk using RFID technology. RFID can perform a variety of actions such as sending an alert to the floor personnel, updating the location information of this object in database or completely ignoring it. RFID tag will be placing in the center of the sidewalk with the specific distance of each other and RFID reader attach on walking stick. Vibration and sound will be produced to remind the blind about the distance between him and the border of sidewalk. Characteristic test are conducted to verify the precise place to put the RFID tag on sidewalk. Disadvantage is that the blind people must walk closely to the border of the sidewalk and use the walking stick to find out their current location.

[3] Intelligent Ultrasonic Detection of Walking Stick for the Blind

This device assists the blind to travel through an unfamiliar environment with ease. It consists of a crutch, can detect the obstacles infront with ultrasonic sensors uses an angle sensor and stepper motor, and bracelet is used for obstacles detection. Sensors are connected to the bracelet. Accelerating sensors can detect the blind man's fall, if the blind cannot stand up in time the bracelet would automatically make a voice to passengers by for help. Sensors with ultrasonic waves and determine the distance of obstacles according to the echo. When the distance is less than 3m the stick sent a signal via Bluetooth to the bracelet, the bracelet will vibrate.
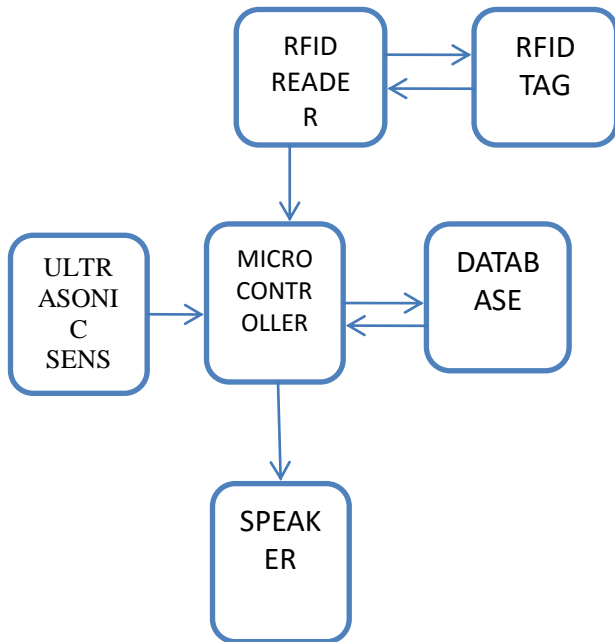
3. SYSTEM ARCHITECTURE

Fig 1: Architecture

In the proposed system, a voice based walking stick is proposed for the visually impaired people.

The system has mainly two functionalities:

a. Obstacle Detection
b. Object Tracking

3.1 Obstacle Detection

The system has the ability to perform obstacle detection using ultrasonic sensor. The module has two eyes like projection in the front which forms the ultrasonic transmitter and receiver. The ultrasonic transmitter transmits an ultrasonic wave at 40,000Hz which travels through the air. When it gets objected by any material, it gets reflected back toward the sensor. This reflected wave is observed by the Ultrasonic receiver module. To calculate the distance towards the obstacle, the following formula can be used.

Distance $L = \frac{1}{2} \ast T \ast C$

Where T is the time between the emission and reception and C is the sonic speed. The circuitry inbuilt on the module will calculate the time taken for the ultrasonic wave to go and return. Thus the value is multiplied with 0.5. Since ultrasonic wave is used, the universal speed of ultrasonic wave at room conditions is 330m/s.

The calculated distance is send to the server and the server will send a speaking output to the cane. The speaker connected to the cane will produce the speech description of the distance.

3.2 Object tracking

Object tracking module is used to track the objects which are necessary for the blind. For this Radio Frequency Identification (RFID) technology is used. RFID belongs to a group of technologies referred to as Automatic Identification and Data Capture(AIDC). AIDC methods automatically identify objects, collect data about them, and enter those data directly into computer systems with little or no human intervention.

RFID method utilizes radio waves to accomplish this. RFID system consists of three components: an RFID tag, an RFID reader, and an antenna. The objects which are necessary for the blind and those which are difficult to identify by touch and feel are provided with an RFID tag. The smart cane has an RFID reader. When the blind moves around the object with the stick in which the RFID reader is placed, the reader sends signals to the tag using an antenna. The tag receives this information and resends this information along with the information in its memory. The reader receives this signal and transmits to the server. The server will compare the already stored tag with the received tag. If both are same the speech output about the description of the object is send to the blind.
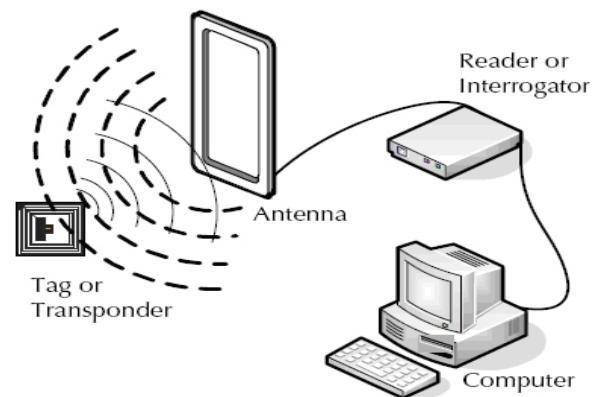

Fig 2: Working of RFID

3.3 SERVER MODULE

Obstacle detection and object tracking are done simultaneously. For obstacle detection, a range of distance is considered. The calculated distance sent from the obstacle detection module is received. In the server, the two distances, distance1 and distance2, are stored and is considered as a range of distance. An alert description about the distance between the blind and the obstacle is also provided to the corresponding range of distance. The distance received at the server is compared with the range of distances. If the range of distance is identified for the received distance, then the corresponding description is retrieved and the speech output of the description is

generated. The Bluetooth speaker, which is placed on the stick, connected to the server will produce the speech output of the alert description. In object tracking, the necessary objects for the blind are tracked. The RFID tags are attached with necessary objects. In the server, the RFID tag and supporting details are stored. The tag information from the RFID reader is received. The received information is then compared with the stored RFID tag information. If the two tags are same, then the corresponding details are retrieved and the speech output of the description is generated. The Bluetooth speaker, which is placed on the stick, connected to the server will produce the speech output of the alert description.

4. ADVANTAGES

1. Low cost

2. Used for both indoor and outdoor navigation.

3. It enables blind to travel through an unfamiliar environment.

4. Blind person's location can be tracked whenever needed which will ensure additional safety.

5. Detects obstacles and alerts the blind person through vibration alert and speech output.

5. CONCLUSION

In our present day there aren't any well developed gadgets that would change the normal life of a blind to a life that those who have vision. We all are well informed about the challenges that blind's faces in their daily life. In order to overcome this, we had developed a Smart Cane. Smart Cane is a system that is designed to act as a mobility aid which uses Ultrasonic sensors and RFID technology for object tracking and obstacle detection. It has an emergency alert system. If we lose the smart cane it can be easily founded by the RF remote installed within the cane. The system is developed using Visual Studio 2013 C# .Net and make use of Sql community server.

REFERENCES:

[1]. Ankit Agarwal, Ultrasonic stick for blinds

[2]. Akhilesh Krishnan Autonomous walking stick for blind using Echolocation and Image Processing.

[3].Anon , An Electronic Walking Stick for Blinds .

[4].Radio Frequency Identification Walking Stick(RFIWS):A Device for Blinds.

[5].Dhambara ,Smart Stick for Blind:Osacle Deecion,Arificial vision and Real -time assistance via GPS.

[6] Kang, S. J., Ho, Y., K. & Moon, I. H., 2001. Development of an Intelligent Guide-Stick for the Blind. Seoul, Korea, IEEE March 2013].

[7] Koley, S. & Mishra, R., 2012. Voice Operated Outdoor Navigation System for Visually Impaired Persons.