Smart Stick for Blind using Raspberry Pi

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***Abstract*— A Smart stick system concept is devised to provide a smart electronic aid for blind people. Blind and visually impaired people find difficulties in detecting obstacles during walking in the street. The system is intended to provide artificial vision and object detection, real time assistance via GPS by making use of Raspberry Pi. The system consists of ultrasonic sensors, GPS module, and the feedback is receive through audio, voice output works through TTS (text to speech). The proposed system detects an object around them and sends feedback in the form of speech, warning messages via earphone and also provides navigation to specific location through GPS. The aim of the overall system is to provide a low cost and efficient navigation and obstacle detection aid for blind which gives a sense of artificial vision by providing information about the environmental scenario of static and dynamic object around them, so that they can walk independently.**

Keywords—Raspberry Pi, Ultrasonic sensor, GPS Module, Earphone.

I. INTRODUCTION

Eye sight plays a major role in collecting most of the information from the real world and that information will be processed by brain, visually impaired people suffer inconveniences in their daily and social life. Blindness or visual impairment is a condition that affects many people around the world. This condition leads to the loss of the valuable sense of vision. Worldwide there are millions of people who are visually impaired, where many of them are blind. The need for assistive devices was and will be continuous. There is a wide range of navigation systems and tools existing for visually impaired individuals. The blind person truly requires an identifying objects.

II. OBJECTIVE

The main objective of our project is to provide a voice based assistance to blind people. Here we have developed an intelligent system that helps blind person to travel independently and works efficiently. Current navigation device for the visually impair focus on travelling from one location to another. Our project focuses on designing a device for blind people that help them to travel independently and also it must be comfortable to use. The proposed device is used for guiding individuals who are blind or partially sighted. The device is used to help blind people to move with the same ease and confidence as a sighted people.

III. LITERATURE SURVEY

A literature survey is a proof essay of sorts. It is a study of relevant literature materials in relation to a topic we have been given. For thorough development of the device Smart Stick for Blind Using Raspberry Pi, we need to go through each and every technical aspect related to it. This chapter provides an introduction to the area of research. A Brief Study and Survey has been Carried out to understand various issues related to the project which involves providing a smart electronic aid for blind people to provide artificial vision and object detection, real time assistance via GPS module by using Raspberry Pi .A survey is made among the Blind people finding difficulties in detecting obstacles during walking in the street .Our project mainly focuses on the visually impaired people who cannot walk independently in unfamiliar environment .The main aim of our project is to develop a system that helps the blind people to move independently. Smart Stick for Blind systems usually consist of three parts to help people travel with a greater degree of psychological comfort and independence: sensing the immediate environment for obstacles and hazards, providing information to move left or right and orientation during travel.

- “Navigation Tool for Visually Challenged using Microcontroller”, Sabarish.S.
- “Smart walking stick - an electronic approach to assist visually disabled persons”, Mohammad Hazzaz Mahmud, Rana Saha, Sayemul Islam
- “Ultrasonic smart cane indicating a safe free path to blind people”, Arun G. Gaikwad 1, H. K. Waghmare2 1ME Embedded system Design, MIT Aurangabad 2 Assistant Professor Department of E&TC, MIT Aurangabad
- “A Multidimensional Walking Aid for Visually Impaired Using Ultrasonic Sensors Network with Voice Guidance”, Olakanmi O. Oladayo

IV. EXISTING SYSTEM

Blind people generally use either the typical white cane or the guide dog to travel. The white cane is a widely used mobility aid that helps blind people to navigate in their surroundings. Although the white stick gives a warning about few meters before the obstacle, for a normal walking speed , the time to react is very short . The idea of designing and manufacturing ultrasonic sensor combines the properties of sound monition and that benefit the blind and vibrating alert feature, which benefit from the experience of deafness. Sensor can detect obstacles within the designed range to avoid the blind person through the issuance of distinctive sound or vibration can be issued by the sense of the deaf by putting his finger on the button at the top of the device vibrate when there is a risk. This system involves more manual work and it does not provide better result. The existing system doesn't provide proper navigation and is not much effective.

V. PROPOSED SYSTEM

The proposed system consists of three main units:

- Ultrasonic Sensor unit.
- GPS Module unit.
- Espeak Text to Speech unit.

"Smart stick for blind using Raspberry Pi" system is easy to understand and maintain. This system uses Raspberry pi, it is a small processing device which works as computer at relatively low cost. Blind and visually impaired people find difficulties in detecting obstacles during walking in the street. The system is intended to provide artificial vision and object detection, real time assistance via GPS by making use of Raspberry Pi. The system consists of ultrasonic sensors, GPS module, and the feedback is received through audio. Voice output works through TTS (text to speech).
The proposed system detects an object around them and sends feedback in the form of speech that is warning messages via earphone and also provides navigation to specific location through GPS. The aim of the overall system is to provide a low cost, efficient navigation and obstacle detection aid for blind which gives a sense of artificial vision by providing information about the environmental scenario of static and dynamic object around them, so that they can walk independently.

A. Ultrasonic Sensor

High frequency sound waves is generated by ultrasonic sensor. It evaluates the echo which is received back by the sensors. The time interval between sending the signal and receiving the echo is calculated by sensor to determine the distance to an object. Ultrasonic is like an infrared where it will reflect on a surface in any shape, but ultrasonic has a better range detection compared to infrared. In robotic and automation industry, ultrasonic has been highly accepted because of its usage. In our Project the Ultrasonic sensor distance measurement Module deals with the distance measurement between the obstacle and the blind person. This module starts the process when the user turns on the device using power supply. Firstly when the device turns on, the ultrasonic sensor will automatically gives the distance measurement of the obstacle infront of the blind, and then the distance measured is stored in the SD card.

FIG 5.1 ULTRASONIC SENSOR

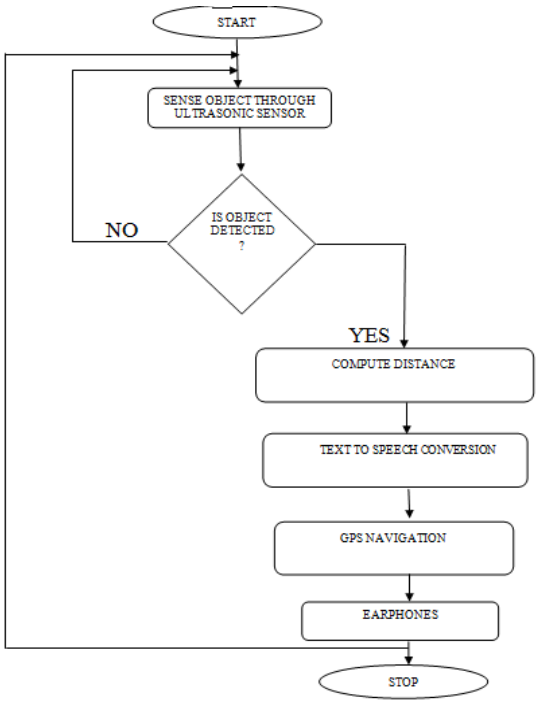

FIG 5.2 PROPOSED FLOW CHART

B. GPS Module

This module deals with the navigation of blind person from particular source to destination. This phase starts by

Obstacle Detection. First the ultrasonic sensor gives voice command about the distance measurement between the obstacle and the blind person, based on that the navigation route instruction will be provided to blind by GPS Module via voice command. The navigation route is provided based on the latitude and longitude values. The latitude and longitude values will be stored so that when that value is matched the blind person gets the voice command to move left or right.

FIG 5.3 GPS MODULE

C. Voice Command Module

This module deals with giving the instructions to the blind user about the obstacles via Earphone. After detecting the Obstacles it gives the instructions about the obstacle and based on that GPS Module Provides route to the Blind.

HARDWARE REQUIREMENTS

The working of the system begins when the power supply is given. The ultrasonic sensor is then used to detect obstacle and provides distance between obstacle and the device. GPS Module provides navigation. When obstacle is detected, the distance and the navigation will be processed using Raspberry Pi device. The processing happens in such a way that if the obstacle is on to the right side, a voice command will be given to take left and vice versa.

VI. RESULTS

To evaluate the performance of the proposed method the experiments were conducted. The results in this paper shows the beginning of our efforts to build a compact travelling aid that allows the visually impaired to negotiate everyday environment. As previously mentioned, the sensor circuits give information about the environment. The circuit that has been designed for the object detection has provided an accuracy of 1 meter. For providing navigation Gps module has been used.

VII. CONCLUSION

The project “Smart Stick for Blind Using Raspberry Pi” is designed to create a system using Ultrasonic sensors, GPS module and providing Voice command through headphone to the blind people. It would help a visually impaired person navigate through a public place independently. The proposed system tries to eliminate the faults in the previous system. It aims to solve the problems faced by the blind people in their daily life. The system also takes measures to ensure their safety. The design Smart Stick for Blind using ultrasonic sensors and GPS with voice output is of great benefit to blind people when it comes to independent mobility. 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 Ultrasonic Sensor and GPS makes a real-time system that monitors position of the user and provides feedback making navigation more safe and secure. We are using Espeak text to speech conversion to provide voice command as output. Blind person can easily navigate from one place to another as we are providing voice message. The prototype of Smart Stick for Blind is able to detect obstacles in front of the user. And, it is therefore capable of guiding a visually impaired person for navigating his environment.

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