Expert System for Visually Blind People Using Raspberry Pi

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ABSTRACT: The ability of science and technology to improve human life is known to us, but it is hard to find advantageous or profitable device for visually impaired people and blind people. The life of blind and impaired people is very difficult as compared to normal person. They cannot visualize by their own eyes. They face many problems in moving from one place to another place. Since they could not survive properly in circumstances of obstacles. As they cannot see, they perpetually get knock by objects in roads like poles, walls, cars, people etc as a result they may severely injured. Visually impairment can limit people's ability to perform everyday tasks and affect their quality of life and capability to interact with surrounding world. Blindness is the most severe form of visual impairment can reduce people's ability to perform daily tasks, move about unaided. Hence we are introducing "Third Eye For Blind people". The system is designed to act like a virtual eye for blind people. The system consist of ultrasonic sensor, water sensor, buzzer, GPS & GSM module, Ear phone. This paper deliberate about the system which will helpful to visually impaired people in order to save them from obstacles. When any object or obstacle comes in a range of an ultrasonic sensor then person alert by the buzzer, camera captures an image and image processing is done in raspberry pi processor. image processing which we are going to use with feature extraction method. GPS and GSM module are used to track the location of blind people in an emergency condition. A water sensor is used to detect the wet surface in the path of blind people.

KEYWORDS: Raspberry pi processor, GPS & GSM module, Ultrasonic Sensor, Water Sensor, camera, buzzer, etc

I. INTRODUCTION

In anterior there were number of system available for blind people who can easily survive but we are trying to introduce new system the people who can properly survive in their surrounding environment. In accordance with World Health Organization (WHO) and International Agency for Prevention of Blind(IAPB) nearly 285 million persons around the world are visually impaired. On other hand the more incredible fact is that out of these 285 million people, 39 million people are completely blind.[1] In Times of India stated as there are largest number of blind people are available in India. That is some are partially blind people, some are visually blind people, some are met with accident or many people are blind with birth and many other reasons.[2] Blind people faces many problems, they are faces many difficulties to walk alone. For this purpose Save Our Soul system is used to overcome this difficulties.[3] Ultrasonic sensor based smart blind stick is proposed to detect the obstacle or object in the path of blind person. The advantage of this system is it is less sensitive to environmental noise.[4] A smart stick has been developed where the hardware consists of AVR microcontroller & Bluetooth module. A Bluetooth module will help person to find the stick which is placed away. [5] Many products are available in the market that is smart belt, smart ring, smart cane but these devices are limited in use & lack of approach due to more cost. For reducing cost we are tried to make a smart blind stick using IR sensor. But IR sensor not works in sunlight. So, instead of IR sensors Ultrasonic Sensors are used.[6] In this system, ultrasonic sensor and infrared sensor are used to detect the obstacle. Microcontroller are used in the system but microcontroller operates single program at a time hence instead of microcontroller Raspberry pi is used to run the multiple programs at a time.[7] Smart stick for blind people which not helps in detecting objects using ultrasonic sensor but also provide a features of tracking them with the help of GPS and GSM module.[8] In this paper we are trying to design a solution for the blind people as "Third Eye For Blind People". The Stick consists of various sensors like ultrasonic sensor, water sensor, camera with GPS-GSM module with Raspberry pi etc.
Where Sensor and camera act as eye and the raspberry pi act as a brain of the system .When the obstacle comes in path of blind people then the ultrasonic sensor detect the obstacle and buzzer is sounded. After detection of an object or obstacle camera captured an image then the image processing is done with the raspberry pi. The captured image is compare with stored image. After identify the image or object the text to speech message is converted and inform the

user through the earphone. If an unknown object or obstacle is comes in the path of blind people i.e. the image which is not stored in database. The image cannot identified hence it will notify the user by sending a message as unknown object through the earphone .The GPS & GSM module are used to track the live location of the blind people and in an emergency situation the message is send to the family or the friends. The water sensor which is connected to the bottom of the stick is used to detect the wet surface in path and notify to the user.

II. METHODOLOGY

In previous many methodologies are used. One of them is microcontroller based methodology. In microcontroller one program is run at a time. So, to overcome this we are used Raspberry Pi processor. In Raspberry Pi multiple programs can run at a time[7]. Also in some system uses IR sensor but IR sensor not works in sunlight. For more accuracy, instead of IR we are using Ultrasonic Sensor[6]. Some system uses image processing means processing digital image by means of digital computer. It is a process of using computer algorithms to get enhanced image either to extract some useful information image processing now regularly used by a wide range of individuals who have access to computers and camera. The GPS & GSM technology is used to track the live location of the blind person and in emergency situation it send the message to their family or friend[8]. For the wet surface detection the water sensor is used which is placed at the bottom of the stick.
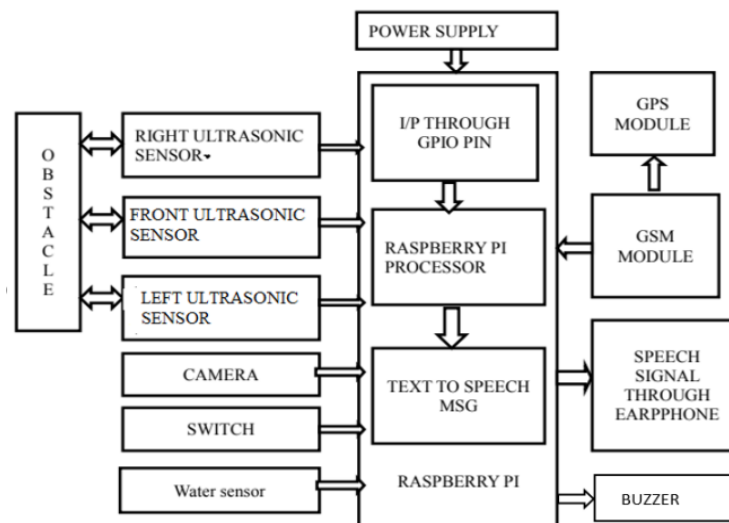

Fig.1. Block diagram of proposed system

Raspberry pi processor is mini single board computer. Processing and communication of data will handle by Raspberry pi processor. Ultrasonic sensors are used to detect the obstacle present in the path of blind people. By emitting sound waves towards the object and get back the reflected sound waves towards receiver decides the actual distance of the object from the blind people. Water sensor is used to detect the presence of water in the path of blind people. It gives an alert in time to avoid chances of soak or slipping. The buzzer provides the alert signal to blind people. GPS and GSM module is used to track the location of blind people and get the notification in an emergency situation. The web camera is used to capture the image and compare the captured image with stored image. Identify the object present in the path of blind people and inform the user through an ear phone.

FLOWCHART

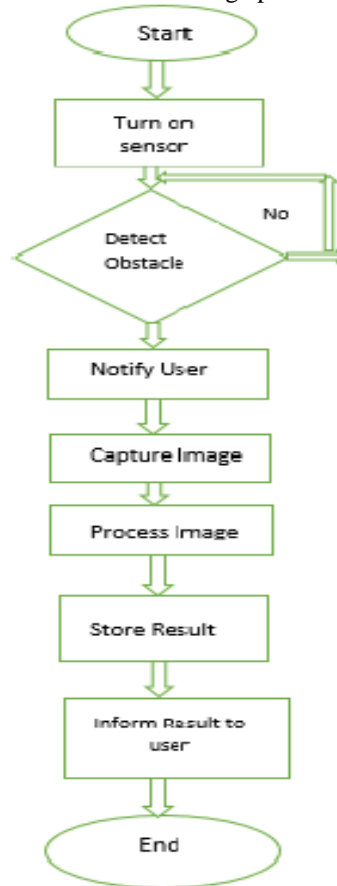The flow of the Ultrasonic sensor and image processing is given as follows:

Start → Turn on sensor → Detect Obstacle (No loops back) → Notify User → Capture Image → Process Image → Store Result → Inform Result to user → End

Fig.2. Flow chart for Obstacle Detection & Image Processing

Following Fig shows the flow of the GPS& GSM Module:

Start → Button Press (No loops back) → GPS Info → GSM Module → Send Notification → End
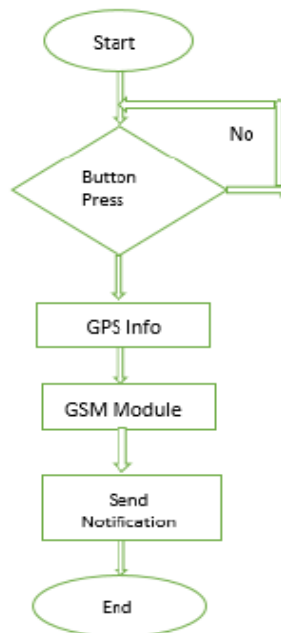
Fig.3. Flow chart of GPS & GSM module
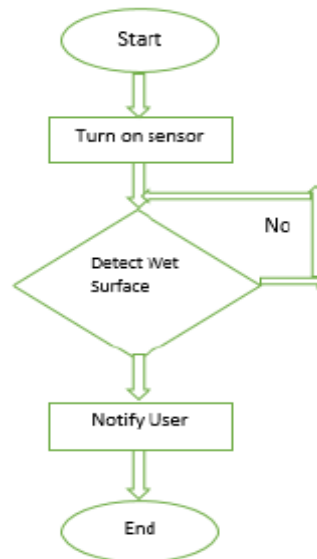
The fig shows the steps of the water sensor:

Fig.4. Flow chart for wet surface detection

III. RESULTS AND DISCUSSIONS

As per the existing system, the system detects the obstacle present in the path of blind people. It also tracks the location of blind person [2]. This system senses the obstacle and detects the presence of water present in the path of blind people. This system also tracks the location of blind person and send an emergency notification to user relatives and friends [4].This system detects the object with the help of ultrasonic sound waves and alert the user with the help of buzzer [6]. The expected outcome of this system would be that the smart stick would be able to alert the blind person about any upcoming hurdle. This would, in turn, help the person to avoid any mishap. Plus, obstacles like a water body (using a water sensor), a manhole or a pole can be successfully avoided by the individual, thus, avoiding any injury or an accident. The main attraction would be the GPS and GSM module-system which helps the recommended people to keep a track on the user of the stick, so that, in case of an emergency the person could get help on time.

IV. CONCLUSION AND FUTURE WORK

With the proposed system, if constructed in a real time it will gives the most precision results. The blind people will able to travel from one place to another place without taking help of other people that means which leads to increase self determination for the blind.

The considered stick has been provided with numerous sensors. Which will guide the user towards the preferred direction while in motion and it will keep him/her alert of any potential danger or inconvenience around. The blind will have the maximum benefits knowing that developed prototype detects the obstacle accurately placed at a distance in front of the user.

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