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Smart Blind Stick using IoT

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ABSTRACT: Visually impaired persons find it more challenging to move out independently. There are millions of visually impaired or blind people in this world who are always in need of helping hands. The blind stick developed, alerts the user about various obstacles through a vocal sound from the headset. The stick can also detect wet and damp surfaces and raise a vibratory alert to the user. To a person who is visually impaired, a mobile phone does not effectively serve the purpose to send a panic message whenever the person ends up at a location unknown to him. A simple button on the stick will do the job of sending a message to the acquaintances of the blind person.

A Smart stick system concept is devised to provide a smart electronic aid for blind people. 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. 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.

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. Worldwide there are millions of people who are visually impaired, where many of them are blind. It is necessary that a smart solution must be proposed for the blind people so that they can use this in their daily life.

For visually impaired people, performing daily activities is a difficult task since vision plays a central role in almost every activity of ours. The visually impaired people have to rely on their memory to find their belongings and may become irritated if someone replaced the object or it falls down occasionally. It is not possible to search an object in an unknown place or surroundings without having the eye sight.

Smart Walking Stick helps the blind people in moving and allowing them to perform their work easily and comfortably. The stick measures the distance between the objects and Smart Walking Stick by using an Ultrasonic sensor. In normal cane or stick, the detection of the obstacle is done by using the sensor.

II. RELATED WORK

Third eye for the blind people: This paper was proposed by M. Narendran, Sarmistha Padhi, Aashita Tiwari [1] in the year 2018. In this paper they proposed a smart wrist band for blind people which was a wearable wrist band which is impacted with ultrasonic sensor for detecting the obstacles on the way of user. But this gadget was made to wear in Hand because of which it does not detect the object nearer to the earth surface.

Smart walking stick for visually impaired person: This paper was proposed by Dada Emmanuel, Gbenga, Arhyel, Ibrahim Shani, Adebimpe Lateef, Adekunle [2] in the year 2016.In this paper they proposed a stick for the blind people using Arduino Atmega 328 which was impacted with ultrasonic sensor for detecting the obstacles. But there was no mechanism for sensing the water in the way of the user.

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The Digitalization of the Walking Stick for the Blind: The other invention by V. Patel et. al [3], includes a wearable glove to ensure the blind can navigate alone safely. The main component of this system is an ultrasonic sensor which is used to scan direction by emitting-reflecting waves.

Voice Based Navigation System for Blind People Using Ultrasonic Sensor: A stick was proposed by Anushree Harsur, Chitra. M et. al[4]. This system will detect an obstacle using HC-SR 04 ultrasonic sensor and guide blind person by providing an audio instructions through 3.5 mm speakers.

III. PROPOSED METHOD

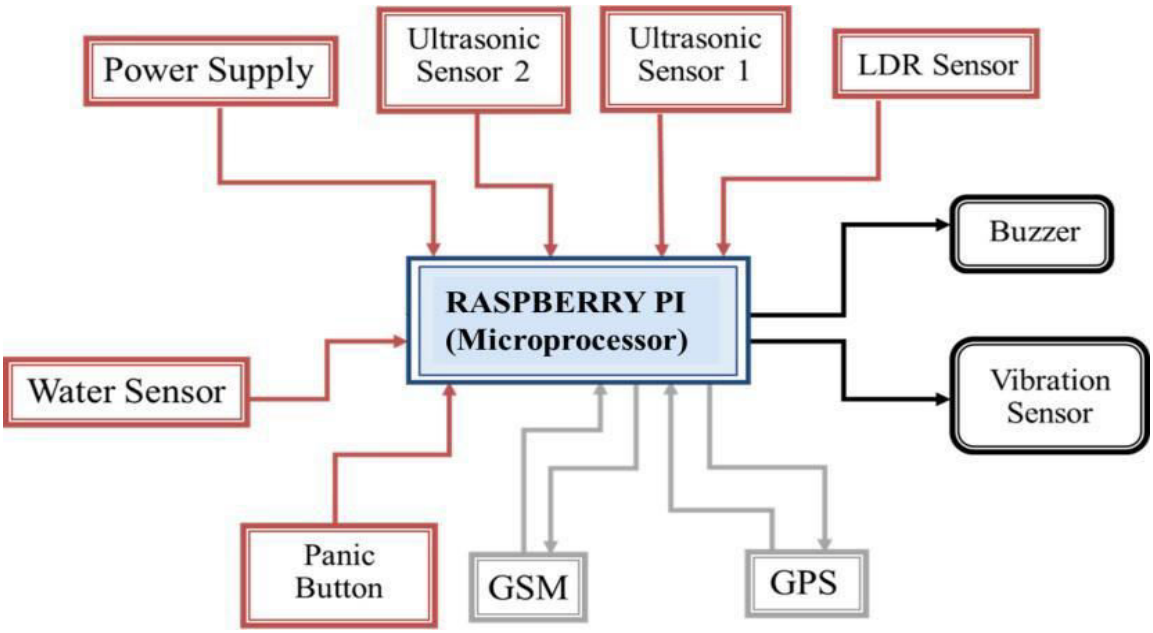

Figure 1: Block Diagram of the proposed system

The block diagram shown in Figure 1 is the design architecture of the project. Thus this system allows for obstacle detection as well as finding stick if misplaced by visually disabled people.

The smart stick also facilitates the blind person to make calls and messages at times of emergency.

Water Detection Unit:

For water detection, water sensors are used. If water is detected then buzzer gets activated and produces beep sound. Flowchart of this unit is shown in Figure 2.

Object Detection Unit

For obstacle detection, ultrasonic sensor has been used, this ultrasonic sensor emits ultrasonic beams to the environment, which are reflected back by the object; the system calculates the distance from the object according to the time difference between the emitted and received beam. The stereo-vision systems use the object tracking. When the ultrasonic sensors detect any objects or obstacle in the range of 50cm it will activate the buzzer and the vibration motor as indicated in Figure 3.

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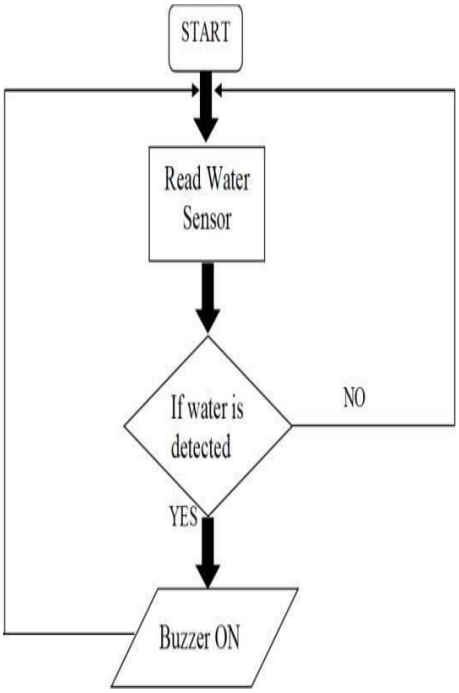

Figure 2: Flow chart of Water Detection Unit

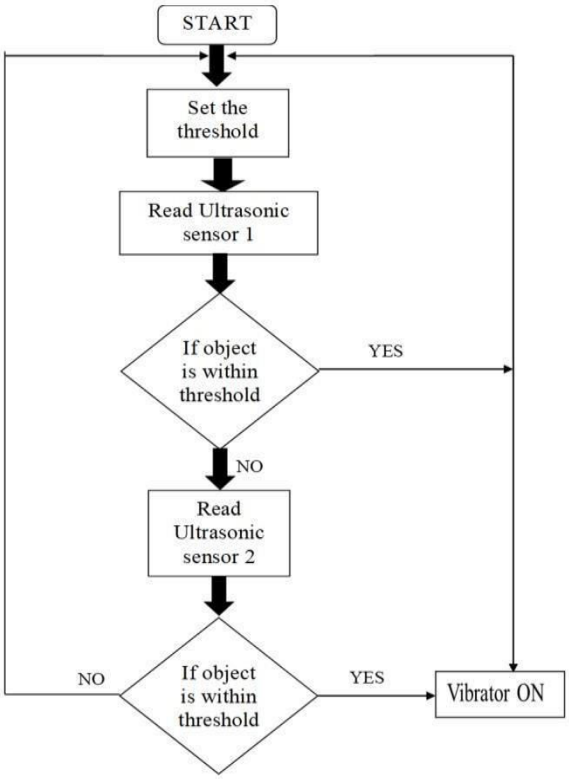

Figure 3: Flow chart of Object Detection Unit

Light Detection Unit:

By receiving luminosity on the component's sensitive surface, LDR produces output day/night.

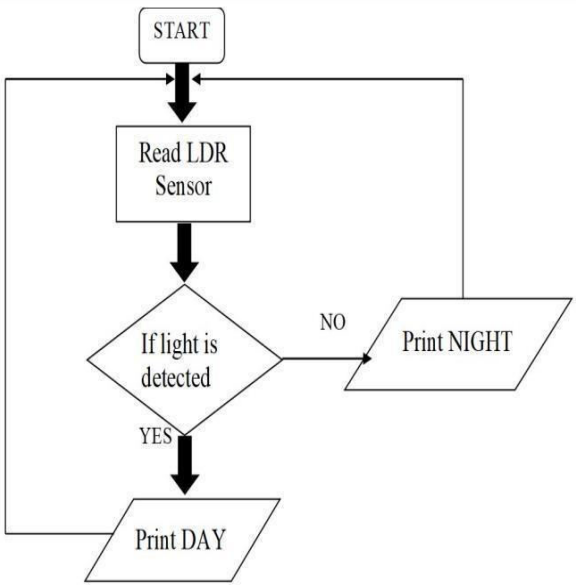

Figure 4: Flow chart of Light Detection Unit

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GPS-GSM Unit:

By using the benefits of GPS module and GSM module, where GPS module helps to trace the blind person using the data collected by it. In case of dangerous circumstances the person whose phone number has been saved is notified that the blind person is at risk, along with the current location of the blind person. The smart stick also facilitates the blind person to make calls and messages at times of emergency.

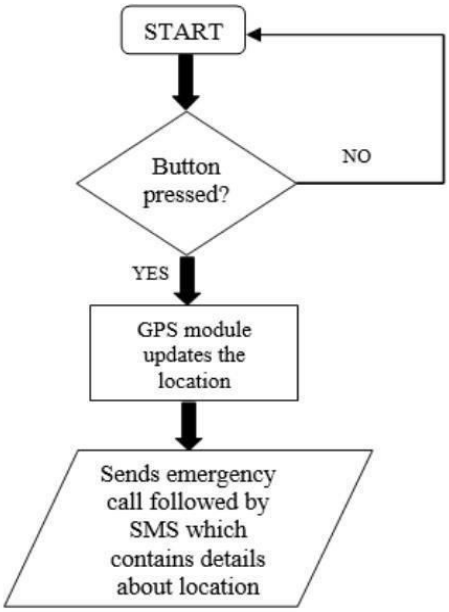

Figure 5: Flow chart of GPS-GSM Unit

Lost Stick Detection Unit

The system has one more advanced feature integrated to help the blind find their stick if they forget where they kept it. In Ubidots platform, when the user/guardian clicks ON, the message which contains the location of the stick will be sent to saved number. Thus this system allows for obstacle detection as well as finding stick if misplaced by visually disabled people.

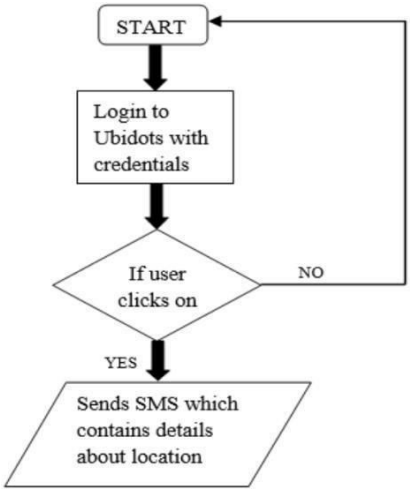

Figure 6: Flow chart of Lost Stick Detection Unit

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IV. CONCLUSION AND FUTURE WORK

The project proposed the design and architecture of a new concept of Smart Blind Stick. The advantage of the system lies in the fact that it can prove to be very low-cost solution to millions of blind people worldwide. The proposed combination of various working units makes a real-time system that monitors position of the user and provides dual feedback making navigation more safe and secure. It can be further improved to have more decision taking capabilities by employing varied types of sensors and thus could be used for different applications. It aims to solve the problems faced by the blind people in their daily life. The system also takes measures to ensure their safety.

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