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# IOT Based Smart Blind Stick

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***Abstract:*** ***People who are blind today must deal with several challenges in their daily lives. Using a blind stick to direct them and a buzzer to inform them with beeps is the new strategy that is presented in this system to assist them. Any object, including impediments, might be easily located with the use of an ultrasonic sensor. They could message a relative in case of any issues. In order to assist people who are blind or visually impaired, the "IoT based blind stick" project is proposed. This proposed system is implemented using Renesas. An IoT project is useful for the blind person and sensors are also connecting to a blind stick. They can use this stick for safe walk and they could move from one place to another place.***
***Keywords: Renesas 64pin, Buzzer, ultrasonic sensors, Water Sensor, Bluetooth***

## I. INTRODUCTION

Blindness is defined as the inability to see because of physiological or neurological conditions that cause visual impairment. Blindness can be temporary or permanent, and it can make someone dependent on other people for support. Visually impaired people find it challenging to travel in unknown locations because they do not receive adequate information about their situation regarding traffic and impediments on the road that can be clearly noticed by people without visual impairment.

People who are visually challenged have trouble interacting with and sensing their surroundings. They don't interact much with their surroundings. Because it can be difficult for visually impaired people to differentiate obstacles that are in their path and because they are unable to go from one location to another, physical movement might be difficult for them. In the past, several systems were created with restrictions and a weak knowledge of nonvisual perception. Researchers have been working on creating an intelligent stick for decades in order to help visually impaired people and warn them about potential hazards as well as provide locational information. Research has been done over the past few decades on new gadgets to create a good and trustworthy system for visually impaired people to identify obstacles and notify them at danger spots.

A walking stick is frequently used for navigating by people who are blind. Simple tactile-force feedback is employed in the basic walking stick to detect static obstructions on the ground, stairs, holes, and uneven surfaces. Although this device is small and light, it cannot include dynamic components because its range is constrained to its own size. Guide dogs are another option that offers blind people a means of transportation.

In order to assist visually challenged people to be more self-reliant and to walk confidently, a Smart Walking Stick is proposed. The Smart Blind Stick is a tool designed to assist blind people in finding solutions to the issues they encounter on a daily basis if they prefer to be self-sufficient and do not wish to ask for aid from others.

The Internet of Things (IoT)-based smart stick for blind people is designed to identify impediments, making it easier for the blind to travel. The usage of auditory signals will maintain user alertness and significantly lower accident rates, and designed with an obstacle discovery module, water recognition, front obstacle detection, pit and flight of stairs localization using various sensors within the range. Through mobile, all detected obstructions are voiced instructions to the user. The visually handicapped can so securely and conveniently overcome their daily mobility challenges by being given a sensation of artificial vision.

## II. LITERATURE SURVEY

A lot of ideas are constantly being proposed in the field of walking aids for visually impaired people. Earlier visually impaired people have to rely on others for help in their day-to-day life. But nowadays, many devices are available to make them self-dependent.

This research aims in the development of a visually challenged person's ultrasonic sensor-based walking stick. A buzzer is used to alert the visually impaired person while an ultrasonic sensor module, model HC-SR04, is utilized to identify obstacles in their route. The PIC microcontroller 16F877A is used to implement the suggested system. This walking stick can help the users navigate safely. Within a range of 5 to 35 cm, it can detect obstacles. This variant can't be extended to identify obstacles at a greater distance. It also lacks the GPS component that would normally provide spoken directions. [1]

 

This paper aids the visually impaired by operating in both indoor and outdoor settings. Ultrasonic sensor, buzzer, GPS and GSM module, vibratory motor, and Arduino as a micro-controller are some of the parts that make up this device. It accomplishes its goal of assisting the visually impaired people by locating impediments using an ultrasonic sensor, using GPS for navigation, and using GSM to transmit messages in an emergency to assist the users in receiving the necessary assistance. The main demerit with this model is that the SMS can provide inaccurate information if the GPS module does not receive a satellite signal. [2]

This research aims to offer a technique that enables visually impaired people to avoid surrounding obstacles without grasping sticks or other heavy objects. The system used RGB data from a micro-controller and a smart phone to calculate the smoothness of the surface in both light and dark conditions. The system achieves the best level of surface smoothness in the day-night and dark conditions, respectively, at 96.341% and 98.683%. It creates and develops a system that consists of inexpensive, wearing, lightweight spectacles for the users so that they can receive assistance with walking and obstacle detection. This model's main drawback is that it can only calculate distances and object smoothness with a limited level of accuracy, which might lead to dangerous situations in some circumstances. [3]

In this study, we suggest a smart stick based on infrared technology that is lightweight, affordable, user-friendly, quick to respond, and low power consuming. Within a two-meter range, a pair of infrared sensors can identify the existence of stairs and other obstacles in the user's route. Though, the experimental results are accurate, and the stick can find every barrier. The avoidance accuracy of this model only ranges from 75% to 90%, which is one of its shortcomings. [4]

The suggested approach alerts the user to identify and avoid every barrier so they can achieve their objective while being accurate in obstacle identification. This innovative prototype aids in energy conservation. This model does not have SOS mechanism to send the alert message in case of emergencies. [5]

This paper, demonstrates a smart blind stick that uses ultrasonic sensors to recognize obstacles and an infrared camera to identify obstacles in front of the user within a 1 m range. The user will receive speech warning messages if the sensor detects any obstacles. The "Arduino Nano" micro-controller is used by this blind stick. The stick contains a feature that allows it to send an SOS message to the caregiver that was programmed into the system along with the caregiver's position and a link to a Google Map. The stick can detect objects up to one meter away and provide an alarm message to the user, causing the visually challenged person to move twice as quickly as usual. This smart stick lacks the developing technology to estimate the speed of impending obstacles. [6]

This research aims to create an image of opportunity, autonomy, and certainty with the help of an IoT stick. In order to do daily tasks swiftly, the proposed smart stick is designed with an obstacle identification module, a worldwide positioning system (GPS), pit and flight of stairs detection, water detection, and a global system for mobile communication (GSM). In order to separate the obstructions that suggest recognizing the obstacles and identifying the obstructions pattern, the impediment identification module makes use of an ultrasonic sensor combined with a water level sensor. The debilitated persons are informed about the barriers using an Arduino ATmega328, which also delivers notifications via buzzer and earphone. Using GPS and GSM modules, the users present location is determined. In the event of a loss, the stick initiatesa warning system. [7]

This paper proposes the addition of sensors, microcontrollers, and buzzers to the existing blind sticks. This study is suggested as a way to improve the subject's ability to move around and better navigate their surroundings. In the event of danger, the microcontroller activates a buzzer once the sensors detect hurdles and impediments from a safe distance. In emergency situations, the model uses a different device to use GPS and GSM to communicate location updates to the subject's family members. [8]

The objective of this model is to develop an accessible, intelligent blind stick that will aid in navigation for the users. For the purpose of detecting obstructions in front of a blind user, the gadget consists of an ultrasonic sensor, an infrared sensor, and a vibration motor with a buzzer.

Going up and down stairs is one of the major obstacles for individuals when they move indoors. By adding a feature that alerts the user when a staircase is present to our blind stick, we hope to address the problem. Additionally, this device contains a built-in GPS module and a GSM module that enable location tracking and display on a smartphone app, a feature that many family members of users find appealing.

This was equipped with ultrasonic and infrared sensors that could detect objects up to 150 cm away from the user. For improving its user experience, the stick's weight may be decreased. [9]

The suggested electronic walking stick in this paper gives the blind person more practical methods of transportation and interfaces with various sensors to detect obstructions in the path. This smart blind stick technology can be utilized to travel on straight roads and through bends while navigating around minor obstructions. The user can also send their contact a distress message along with their current position. The ability to find a lost stick is highly useful for blind people because they are unable to do so on their own. [10]

 

## III. PROPOSED METHODOLOGY

The goal of the proposed system is to design and develop alight weight, easily affordable Smart Walking Stick for the visually impaired that will provide constant assistance and aid them in better understanding their surroundings by frequently sounding different alerts on detection of obstacles, water, lowered and elevated surfaces, and guiding them to a specific location.

As shown in fig 2.1 figure, we designed a block diagram to demonstrate the technique of our project. Several modules are connected to the Renesas microcontroller. The three ultrasonic sensors linked to the Renesas, among which two are used for detecting obstructions and one for detecting potholes. The Water sensor which is also connected to the Renesas detects water, and buzzer provide tactile and audible feedback to the user.

The system also sends emergency messages to the family members if the impaired person faces any problem.

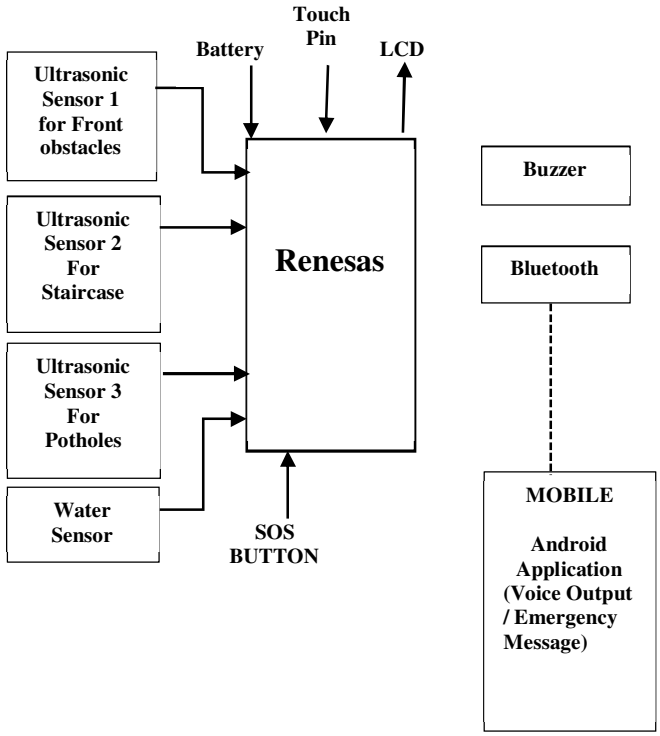


Figure 2.1 Block Diagram of Proposed Methodology

### *A. Ultrasonic Sensor*

Ultrasonic sensors are mainly used in two main processes

#### *1) Hole Detection Process*

The procedure for detecting holes is designed to use an ultrasonic sensor mounted on a stick inclined at an angle of around 90 degrees. placing sensor at a maximum height of certain cm, it can recognize a hole from 30 cm, indicating the user about the presence of potholes before them. A buzzer will provide audible response to the user if a hole is discovered.

#### *2) Obstacle detection Process*

The input comprises of ultrasonic sensor capable of detecting obstructions up to 30cm in front of it. It is connected to Renesas, that assesses whether a barrier is nearby the stick and activates the output if so. The output is a buzzer that provides a tactile response to audio feedback.

There are two systems in this process: one is a knee above impediment detection system, in which an ultrasonic sensor is put on the stick about 90 cm above the ground. The other is a knee-below obstacle detection system, in which an ultrasonic sensor is mounted on a pole about 15 cm well above ground level. It can detect obstructions up to 15 cm height.

 

*B. Water Sensor*

To detect water, the water sensor is connected to the Renesas microcontroller, which is located at the bottom of the stick. Whenever the sensor detects the presence of water, it notifies the user through mobile phone via Bluetooth connected to the Renesas providing the audible feedback.

*C. Touch Pin*

Whenever the impaired person is in emergency, touch pin sends the emergency messages to family members.

## IV. EXPERIMENTAL RESULTS

The sensors, Push button switch and the battery all placed physically as per the Figure 2.1 and the connection is followed as Figure 1. When the stick is powered with battery supply depending on the types of obstacles it gives a particular rhythm through vibrator based on the type of the obstacle detected. The classification of obstacle is done based on the sensor output as given in following tables.

| S .no | Type of obstacle | Buzzer output |
|---|---|---|
| 1 | Wall | One buzzer sound |
| 2 | Up Stairs | Two buzzer sounds |
| 3 | Downstairs and pot holes | Three buzzer sounds |
| 4 | Water | Four buzzer sounds |

| S .no | Type of obstacle | Android output |
|---|---|---|
| 1 | Wall | Obstacle detected |
| 2 | Up Stairs | Elevated surface detected |
| 3 | Downstairs and pot holes | Pothole detected |
| 4 | Water | Water surface detected |

The actuation rhythmic signal is generated from Renesas in pulse format differently for different type of obstacle face by the blind.

The Figure below shows the SMS received at the relative number, when the blind man lost his path, he pushes the push button for asking help by informing his location to his relative.

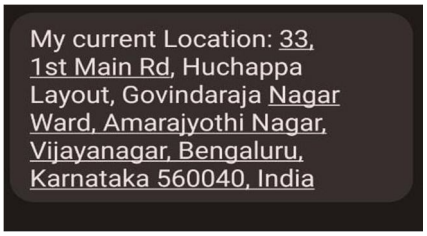


Fig: SMS OUTPUT

## V. CONCLUSION

In this paper design of a smart blind stick based on ultrasonic sensor is proposed and implemented successfully. It can be used as an effective navigation tool for blind persons. On the detection of obstacle in the path of the concerned person the smart blind stick sounds a buzzer to make an alert. The implemented system can detect any obstacle within the range of 5-30cm.This work can be extended to increase the range of obstacle detection and to send this information for further assistance along with integrated Google mapping Assistance feature, which will provide voice directions on detection of obstacles in the path.

 

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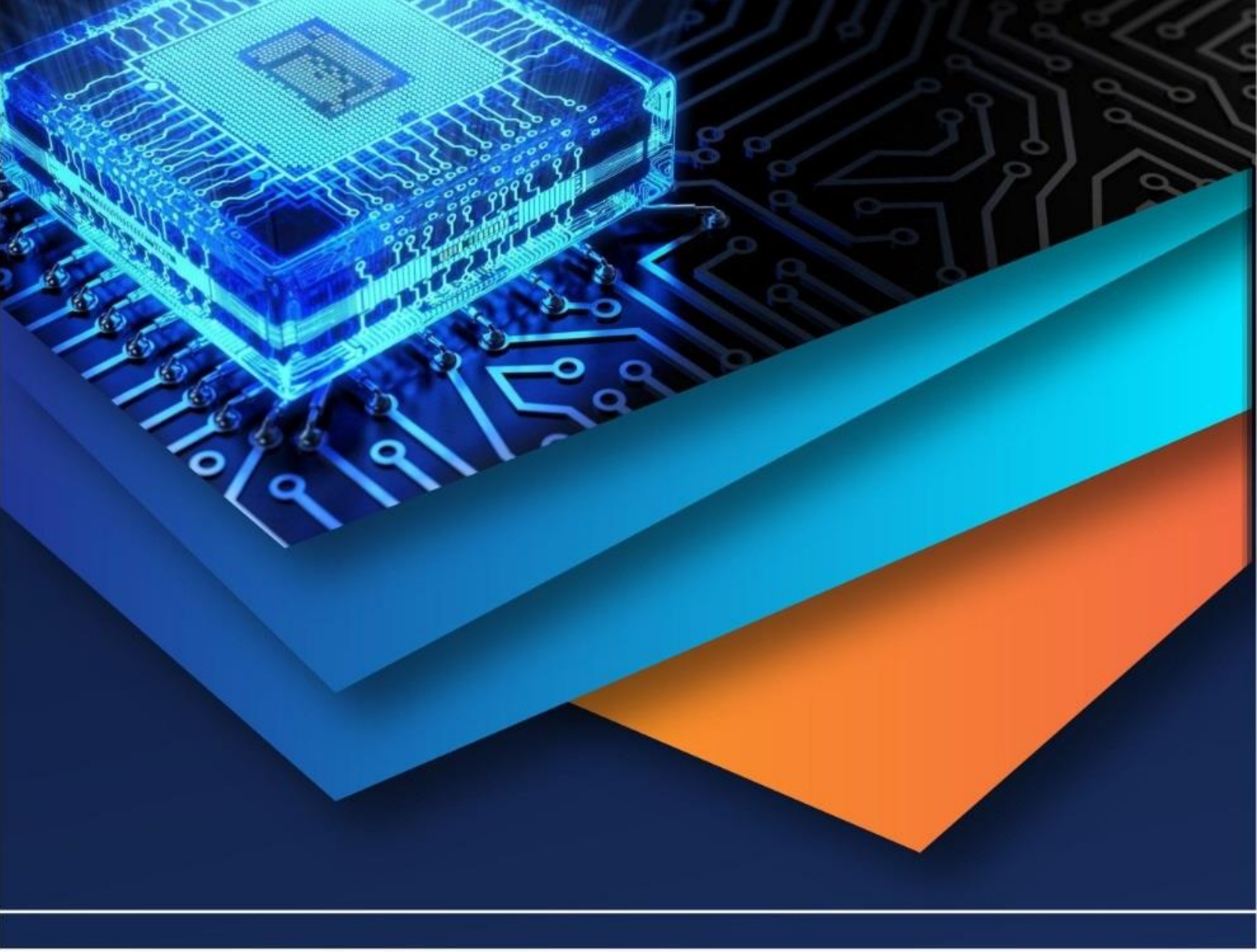

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