MULTISENSOR STRATEGIES TO SUPPORT BLIND PEOPLE: A CLEAR-PATH INDICATOR

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Abstract:

When travelling from one point to another, a blind person finds it difficult to notice the existence of any impediments in their path, and it is also difficult to locate the exact location of the stick if it has been misplaced. As a result, the smart stick is presented as a solution to assist visually impaired persons in their day-to-day activities without the assistance of others. We presented a solution for blind persons in this research by incorporating an ultrasonic sensor into the blind stick. The gadget is utilised to detect impediments within a four-meter range, while the infrared instrument is used to detect nearer problems in front of blind individuals.

INTRODUCTION

People who are blind because they have a significant loss of vision that cannot be repaired with traditional methods, such as refractive surgery or medication, and which limits a person's ability to do some or all duties.

When moving or walking, blind individuals now utilise a white stick as a navigational aid. We create a product that can be used as a blind Smart Stick and is more efficient and useful than the traditional one.

Because humans receive 83 percent of their information from their surroundings through sight, vision is the most crucial element of their physiology. According to World Health Organization (WHO) data from 2011, there are 285 billion individuals worldwide with visual impairment, with 39 billion being blind and 246 having impaired vision.

Blind individuals now utilise a white stick to guide them around as they move.

We create a tool that can be used as a blind stick and is more efficient and useful than the traditional one.

This will aid blind people when walking and will sound an alarm if any obstacles are detected within the chosen range.

A mobile phone does not properly fulfil the aim of sending a panic message to a visually impaired individual who finds himself in an unfamiliar environment.

The button on the stick will be used to send a message to the blind person's acquaintances.

The phone numbers of acquaintances can be changed, added, or deleted using a software programme. The supplier, who has admin authority to update the phone numbers, can also help the user set up the phone numbers. If a stick is misplaced, the user is given a remote with a button that, when pressed, makes a buzzer sound on the stick.

PROBLEM STATEMENT

Existing technologies, like as canes, can assist blind persons in navigating their environment by allowing them to detect obstacles in their route by touching or prodding them. Smart belts, smart rings, smart canes, and other aids, in addition to the previous way, can assist people by detecting obstructions using ultrasonic or laser sensors. To warn them, these technologies emit an audio or vibration in response to the detected obstructions.

Existing systems have the following limitations:

• Exorbitant

• It is ineffective.

• Untrustworthy

RELATED WORK

The Smart Blind Stick is a cutting-edge device that helps visually impaired persons navigate more easily. Using a water sensor, ultrasonic sensor, RF module, and GPS-GSM module installed in it, the smart stick developed by M. P.Agrawal [1] can detect any impediments in the path and send vibrations to alert the user.

K. B. Swain [2] developed a stick guide model that includes GPS and GSM and sends SMS whenever the person requires assistance. It detects impediments with an ultrasonic sensor and detects levels with an infrared sensor. Radhika R [4] developed a model which can detect obstacles within the distance of about 3m with the help of infrared, ultrasonic and water sensors sensors.

Image processing and assistive technologies are two areas in which I work. People with disabilities exist in our culture. Technology advances on a daily basis, but no important advancements are made for the benefit of these people. The world's deaf and dumb population is estimated to be around nine billion individuals. Communication between a deaf-mute and a hearing person has always been difficult.

EXISTING SYSTEM

According to Mazo and Rodriguez, the blind cane is one of the most significant aiding instruments for the visually handicapped.

One of the biggest concerns of the visually impaired, according to Herman, is that most of them have lost their bodily integrity.

They also have little faith in themselves. This statement has been confirmed by Bouvrie, who conducted an experiment dubbed "Project Prakash." It was designed to see if the sight handicapped could use their brain to recognise a series of objects.

OBJECTIVES

• To use an ultrasonic sensor to detect an obstacle.

• Using an accelerometer sensor to detect a fall.

• Checking for emergency situations.

• Both a voice and a buzzer alert are available.

• Notification on Telegram Hardware

Components

1.Ultrasonic sensor:

An ultrasonic sensor is a device that uses ultrasonic waves to measure the distance to an object**.** Transducers are used by ultrasonic sensors to emit and receive ultrasonic pulses that convey information about the proximity of an object.

2. IR Sensor

Infrared sensors are electrical devices that detect specific features of the environment.

3.RF Module

An RF module (short for radio-frequency module) is a (typically) small electrical device

that allows two devices to send and receive radio signals.
An RF transmitter and receiver make up an RF module.

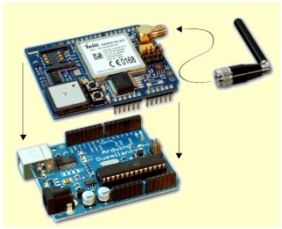
4.Accelerometer Sensor

An accelerometer sensor is a device that monitors a body's or object's acceleration in its immediate rest frame.

5.APR Voice Module

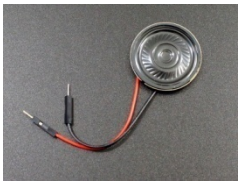
There are two modes of operation for the IC APR 9301: recording and playback.

6. GPS-GSM module



The GPS module receives location data in the form of latitude and longitude from satellites. This data is processed by the microcontroller and sent to the GSM modem.

7. Buzzer and Speaker



A buzzer is a sound-producing gadget that is commonly utilised.

8.Emergency Switch

A push button is an emergency/distress device that can send the user's location in the form of a message to the concerned contacts in the event of an emergency.

9.Power Supply

A power supply is a hardware component that gives electricity to an electrical device. It takes power from an electrical socket and transforms it to DC (direct current), which the computer requires.

10.Aurdino

Arduino is an open-source hardware and software company, initiative, and user community that creates single-board microcontrollers and microcontroller kits for creating digital devices that can sense objects.

Software Requirements

1.Aurdino IDE

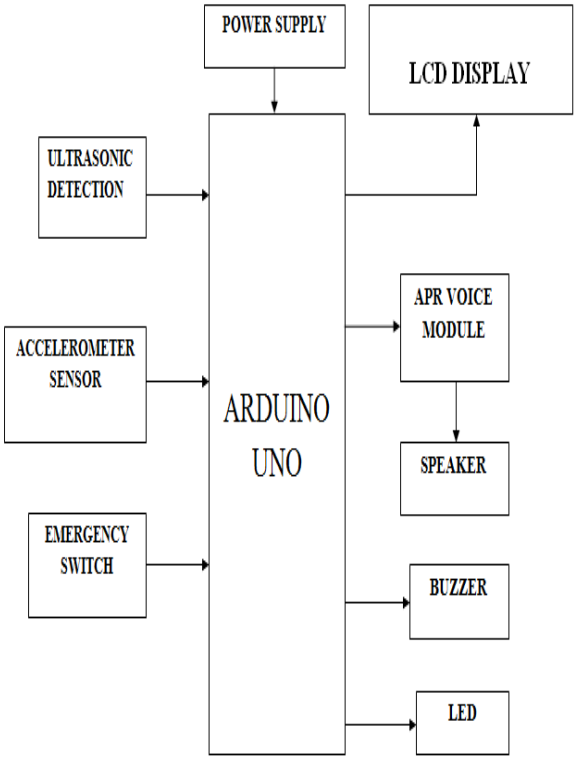
The Arduino software (IDE) includes a text editor for writing code, a message area, a text console, a toolbar with buttons for basic functions, and a set of menus. You can connect to the Arduino hardware to download programs and interact with them.

2.Node MCU

The Node MCU (Node Micro Controller Unit) is an open-source software and hardware development environment based on the ESP8266, a low-cost System-on-a-Chip As a result, it's a great fit for a variety of Internet of Things (IOT) projects.

PROPOSED SYSTEM

The following units make up the suggested model, which monitor the situation and take appropriate action.



1.An ultrasonic sensor detects the obstructions using sound waves. It emits a sound wave of a certain frequency and waits for it to return. The elapsed time between these two events can be used to calculate distance. An ultrasonic sensor is used in the suggested device, which has a theoretical measurement distance of up to 3m.

2.An IR LED and a Photodiode are used to create and detect infrared radiation in an IR sensor. The photodiode receives the reflected IR waves that are transmitted by the LED. An IR sensor with a theoretical detection distance of 3m is employed in this project. A radio frequency module is used to track down a missing stick.

3. Serial data can be transmitted using the RF transmitter.

4.By retrieving the blind person's GPS coordinates, the GPS module is utilised to track their current location. The GSM module is utilised to convey the blind person's coordinates to the appropriate contacts.

5.When an obstruction is spotted, a speaker is utilised to inform the blind individual. It's got a voice recorder built in, so you can get unique audio alarms for different types of difficulties.

6.A push button serves as an emergency/distress signal to the user, and when hit, it can send a message with the user's position to the appropriate contacts in the event of an emergency.

7.The controller is powered by a 12 V rechargeable Li-ion battery, which then feeds the required power to all of the sensors and modules connected to it.

8. An Arduino Uno microcontroller is used to communicate with various sensors, switches, and modules. It functions as a decision-making controller by receiving diverse signals from various sensors and suitably triggering output sensors.

Result

Because it was created for blind users, the newly designed stick complies with human ergonomics. The blind stick prototype is tested for various obstacle heights as well as the front hole. Two ultrasonic sensors are utilised in this study to identify varying heights of barriers, whether they are high or low, and an IR sensor is used to detect potholes. The GPS and GSM modules are both operational and can send and receive messages as well as provide accurate location information.

Conclusion

This smart blind stick, on the other hand, can help a blind person move around autonomously. This proposed concept aims to improve the lives of vision impaired people by allowing them to move around. This proposed concept for the building and design of a smart blind stick can assist visually impaired users in navigating across various terrains and obstacles. In the event of an emergency or trouble, the stick can also notify the user's caretakers of their whereabouts.

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