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Smart Blind Stick

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Abstract

Blindness is the lack Smart of vision caused due to physiological or neurological factors resulting in visual disability. Blindness can be temporary or permanent, and partial or complete blindness causing a person to become dependent on others for help. Even disabled people want to be independent in today's world and do not want to seek help from others. Smart Blind Stick is an innovative device, which is an initiative to help blind people to resolve the problems faced by them in their daily life. Smart Blind Stick is a system device that incorporates several features, namely- obstacle detection, navigation, panic button, and moisture detector. The main objective of the device is to help blind people to walk with complete relief and self-dependency. The blind stick is integrated with three ultrasonic sensors, panic switch, navigation switch, Bluetooth and soil moisture detector, and Arduino UNO. The Smart Blind Stick automatically detects the obstacle in front of the person by use of sensors present in the systems; it also incorporates moisture detection at its bottom in order to detect the moisture of the soil or ground so that the person will be aware if it is feasible to walk on that particular ground.

Keywords: *Smart blind stick, Arduino UNO, ultrasonic sensor, infrared sensor, soil moisture detector, buzzer, microphone, GPS, android app*

I. Introduction

Blindness is a very common disability among people throughout the globe. About 90% of the world's population, which are visually impaired, live in developing countries. They need help to walk and do their essential work of daily life. Smart Blind Stick is fully automated and manually operated, easy to maintain, cheap, and comfortable to use the device. It is an innovative device designed for visually disabled people for refined navigation and advanced obstacle detection. In this device, we propose an advanced blind stick that visually challenges people to navigate with relief using advanced technology. The blind stick is integrated with three ultrasonic sensors, panic switch, navigation switch, Bluetooth and soil moisture detector, and Arduino UNO. The three ultrasonic sensors are used to detect obstacles ahead using ultrasonic waves. On sensing obstacles, the sensor passes this data to the person through the microphone device. A smart stick implements the navigation process with Global Positioning System (GPS) for the blind, which will detect the obstacle and hurdle in the path and determine the position and location through GPS coordinates. The technologies used for the device include embedded C language for programming and coding, Atmega328 microcontroller is used which is a low power CMOS microcontroller, GSM (Global System for Mobile Communication) for voice communication, Bluetooth to connect a microphone with the device, and GPS (Global Positioning System) to interface with device for navigation. It is not an effortless task for a blind person to use this device with complete accuracy as it requires necessary training to help the user understand the information and react to them in real-time.

II. Comparative Technologies

Smart Blind Stick has been developed several times previously with attempts to help blind people effectively and efficiently.

A. Smart blind walking stick using PIC16F676

The blind stick is an innovative device designed for blind people for better navigation. RF module is integrated with ultrasonic sensors in the device. The device uses ultrasonic sensors to detect obstacles present using ultrasonic waves. On sensing the obstacles, the sensor passes this data to the microcontroller PIC16F676, which then processes the data and calculates the object's closeness. [4] If the obstacle is not that close, the device does nothing. If the obstacle is closed, the microcontroller sends a signal to rotate the motor, which finally is connected to the stick. It also detects and sounds a buzzer if it is lost and alerts the blind. The system also has the feature to help the blind find their stick if they forget where they kept it. For this purpose, a wireless RF-based remote is used. Pressing the remote button sounds like a buzzer through which a blind person can find the stick. Thus this system incorporates the feature for obstacle detection as well as finds the stick. The device system consists of sensors such as ultrasonic sensors, the feedback system, which has a motor interface, microcontroller, control buttons, and

power circuitry, which is battery-based. The system can be designed to take off a detachable and portable device, which can be unconditionally mounted on any stick.

B. Smart Microcontroller Based Blind Guidance System

The system consists of three sensors: front IR sensor, right IR sensor, and left IR sensor. All signals are inputs for ADC on a PIC microcontroller 16F877A which can detect any switch triggered and generate vibrations and sound. [5] PIC runs the program in its memory when it is turned on as it does not have an operating system. PIC microcontroller is a compact computer on a single integrated circuit that stores a set of instructions which consists of a processor core, memory, and programmable input/output peripherals. Three IR sensors are used to attain particular details relative to the obstacle categorization. The IR sensors are the main electronic components that act as the new eyes for the blind. IR sensors will scan the area in their range of the IR beam. Any obstacle that lies in the IR beam's scanning range will be reflected and detected back by the receiver unit in the sensor.

III. Proposed System and Flow of System

IC 7805

The circuit may have fluctuations resulting in not providing fixed voltage outputs as per the requirement. A voltage regulator IC maintains the output voltage at a constant value as required. IC 7805 provides +5 volts regulated power supply, which is needed for our device.

Atmega328

The Atmega328 is a low-power CMOS 8-bit micro-controller. It is based on enhanced RISC architecture. It is used in the Arduino UNO board.

Ultrasonic sensors

The ultrasonic sensor is a non-contact distance measurement device that works on the basic principle of emitting ultrasonic waves, reflected by the object, calculating the distance based on time and speed. In this device, we are using three ultrasonic sensors present on the front, left, and right sides of the device. The supply voltage given is 5 volts at Global Current Consumption 15 mA. The **Ultrasonic** Frequency 40k Hz Maximal Range 200m Minimal Range 0.1 m.

Panic Switch

It is a button fitted on the blind stick device for emergency purposes, connected with an android app via Bluetooth communication.

Navigation Switch

This switch is being used to guide the blind person to reach their destination, with the help of an android app connected via Bluetooth to start with its journey.

Soil Moisture Detector

Used to detect the moisture in the soil and gives voice command accordingly. It is used to measure the soil's volumetric water content by using the properties of the soil, which are electrical resistance, dielectric constant, and proxy for the moisture content the interaction with neutrons.

Arduino Uno

The main hardware tool we are using is Arduino Uno, a microcontroller board based on ATmega328. Arduino UNO comprises 14 digital input/output pins, 6 Analogue inputs, a USB connector for the power supply, and a reset button. It contains everything needed to support the microcontroller. It can be easily connected to a computer with a USB cable or battery to get started.

Its features are:-

Arduino boards are relatively inexpensive compared to other microcontroller platforms ranging from 8-bit microcontrollers to IoT applications.

1. The Arduino Software (IDE) is easy to use with a simple programming environment.
2. Arduino Software (IDE) runs on Windows, Mac OSX, and Linux operating systems.
3. Arduino software is published as open-source tools, available for contribution by programmers worldwide.

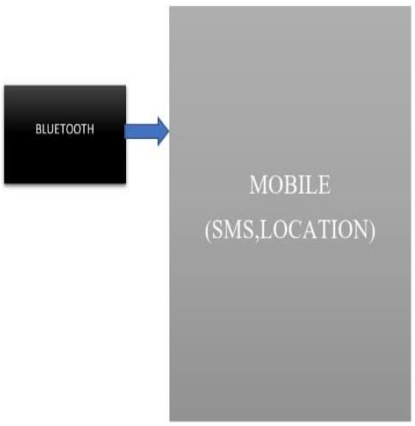
Android Device

Android Device will support the application for navigation in this project by using Google Maps, which is interfaced with the device. Android Device works on Android Operating System, a modified version of Linux Kernel and other open-source software.

Bluetooth

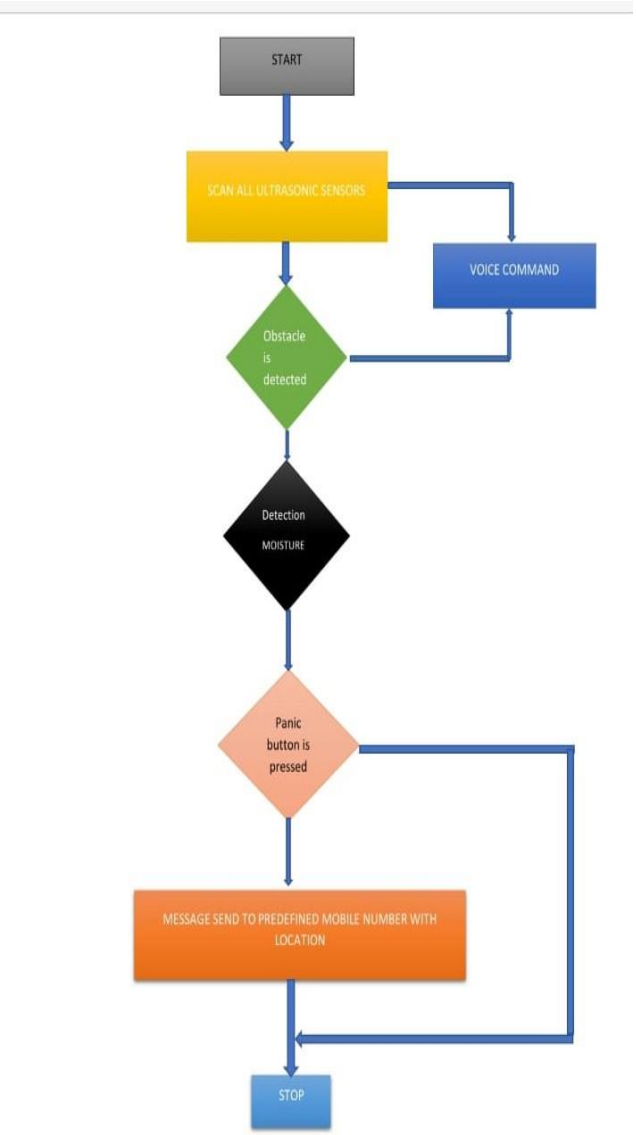
Bluetooth is used to form a network between personal computers. It is a wireless technology standard used for forming a personal area network. The IEEE standard defined for Bluetooth is IEEE 802.15. The network formed works in a defined range and is used for exchanging data over short distances using short wavelengths. For the SmartBlind stick, we use Bluetooth to interface the android device with the smart stick.

Block diagram of Smart Blind Stick (Transmitter)



Block diagram of Smart Blind Stick (Receiver)

III. FLOWCHART OF THE METHODOLOGY



IV. Scope

The Smart Blind stick is an innovative device designed for blind people for better navigation to travel wherever they want. The device works on the principle of the same time global positioning system (GPS), which is linked with the voice stick for navigation so that person is aware of the current position and distance from the destination, which will be informed to users through voice instructions given.

A variety of future scope is available that can be used with Smart Blind Stick -

1. Linking to Aadhar Card s so that the government can help the physically disabled better.

2. GSM attached can help in the future of any immediate casualty help.

3. GPS can have to find the shortest path and longest path according to Google/Bing Map based on real-time coordination.

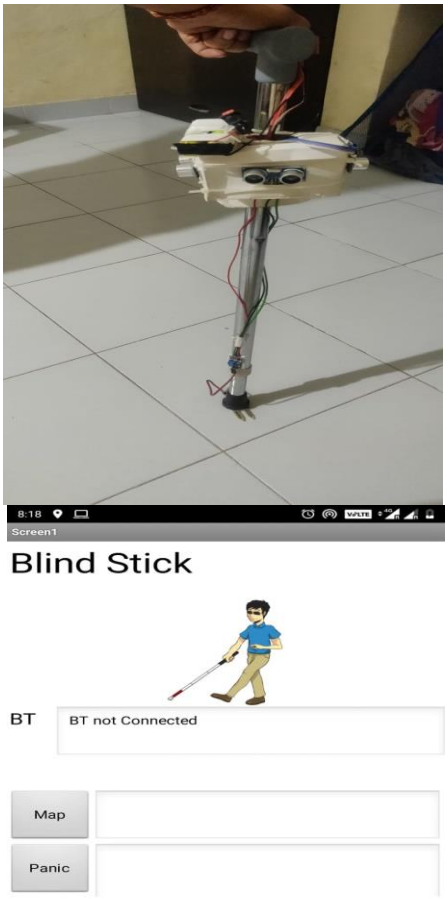
4. Video recording once alarm gets triggered.

5. Connecting to more devices.

6. Provision to have direct help from police when in crisis.

V. Advantages

1. This gadget will help all the blind people in the world make them easier to walk everywhere they want. Furthermore, the navigation system helps them with voice command.
2. It will detect the obstacle coming in the way of blind people.
3. The most important feature will be the panic button on the gadget; whenever the blind person is stuck or in an emergency, his location will be sent to the predefined person.
4. The gadget will be portable and can be used in other blind sticks also.
5. Moreover, the moisture detector easily detects the soil moisture and will give the command to the blind person.



VI. Disadvantages

1. There is a requirement of prior training of the blind person in order to use the device.
2. The device cannot recognize objects.
3. The device cannot differentiate between person or object; it will simply sense it is an obstacle.
4. Does not protect from obstacles at face level or from above the head.

RESULT

The smart blind stick is given to a physically impaired person with prior training.

1. The physically impaired person is taught the positions of the buttons present in the smart blind stick.
2. The owner should have an Android phone so that the installed application can be used.
3. As the person is blind thus only wired earphones can be used.
4. On switching on the application, the mobile will be connected with the smart blind stick to Android through Bluetooth.
5. For navigation, the person can press the navigation button, and it will help them reach their destination and detect the obstacles present at left, right, and front using ultrasonic sensors.
6. Whenever there is obstacle detection, there is a warning given to the blind person by voice command.
7. The blind stick also incorporates a moisture detector feature to detect mud and wet soil in the path.
8. The panic switch is also present in order to call in emergencies. The call will be dialed to the provided number.

CONCLUSION

The Blind Walking Stick has been finally made into a prototype that can be used to guide the blind. It aims to solve the problems faced by blind people in their daily life. The system also takes the measure to ensure their safety. This project will help all the blind people in the world and make it easier for them to walk. It was done to help the blind move ahead very well. It helps to facilitate the movement ensuring safety.

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