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Smart Blind Stick for Visually Impaired People

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Abstract— Technology has contributed more than anything to help mankind live a life of luxury and convenience, however there is no cost-effective device for blind people. Blind peoples have to face many challenges in their life, one of them is finding their way on the streets. On the streets, there are so many vehicles and obstacles that may block their way and also may injure them. Smart blind stick helps the blind people for navigation by detecting the obstacle in the path. If any obstacle comes in front of blind people then he /she will get an indication alarm by the buzzer which will be produce after the detection of obstacle by the sensor. Here IR sensor used to detect the small objects and Ultrasonic sensor will detect the obstacle in the path. It is much more efficient than normal stick. If blind stick will comes in contact of water then the water sensor will detect the water. Designing a cost effective and efficient blind stick is the main objective of the paper.

Keywords— Ultrasonic sensor HCSR0-4 , Arduino ,Rate of mobility

I. INTRODUCTION

The biggest problem for a visually impaired person, especially the one with complete loss of vision, is to navigate around places and because of this they are not able to interact with the world. The transportability of blind people completely depends on their family and friends and limits their freedom. Most of the time blind person falls in potholes which are filled with water and get injured. These are the some example of problems that blind people face in their life and smart blind stick is the best solution to overcome these problems. Smart blind stick is specially designed to detect obstacles or object which may help the visually impaired person to navigate independently.

The smart blind stick measures the distance between the objects and blind people by using an ultrasonic sensor. The proposed system contains the ultrasonic sensor HCSRO-4, water sensor, IR sensor, LED, buzzer and GPS module. Whenever any obstacle come in path of blind people then the buzzer start beeping and alert the blind person. In case the stick is lost around him/her a RF transmitter is induced in the stick along with arduino and ultrasonic sensor and the blind person carries an RF transmitter when he press the button the stick starts beeping so he can find the stick. This automated stick is light in weight and portable.

Table 1: Summary of previous research work of Smart Blind Stick for Visually Impaired People

Authors	Title	Methodology	Findings
M. Narendran Sarmistha Padhi Aashita Tiwari. Dept of Computer Science and technology SRM Tamil Nadu	Third eye for the blind people using Arduino and ultrasonic sensor (2018)	Voice module, LDR Sensor	Smart wrist band detects obstacles for blind people.
Shubham Bele, Swapnil Ghule, Akshay Gunjal	Smart Blind Stick (2020)	Android, GSM Module.	Smart blind stick uses ultrasonic sensors and GPS for user convenience..
Chinmayi A B, Lakshmi H, Dr. Rajashekarappa, Shivaranjini	Smart Blind Stick (2019)	Arduino Nano V3, Arduino IDE	Smart blind stick allows users to navigate their surroundings.
Akhil, Ramdas Akshara, Raju Athira , Shrinivasan Padmanaban Kamalesh Kumar , Mathialagan Thamotharan and Sobana singh Devapaul Shobha Christila.	Smart Blind Walking Stick with Integrated Sensor	LM358 Op-Amp , Arduino Uno R3	A stick for blind people using Arduino ATmega328p microcontroller with IR, water and other sensors to detect obstacles.
Vaishnavi Lingawar, Madhunika Nilakhe , Mrunali Kamble, Prof. M.P Shinde	Ultrasonic smart glasses for Visually impaired people (2023)	ESP8266 d1 mini, OLED 0.91" 128x32 px	Smart glasses for blind people using ultrasonic sensor.

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II. PROPOSED SYSTEM

This device consists of a bodily sensor connected to a microcontroller. The code has been written with an Arduino sketch, and the microcontroller is interfaced with the ultrasonic sensor. The Arduino board has 14 digital outputs and inputs, 6 of which are PMW outputs, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a strength jack, and an ICSP reset button. When contact is made, two wire probes feel the presence of water by means of the precise resistance of water. The machine has the function of detecting the rear limits located during the movement in and out of navigation. A smart stick is usually an embedded device that combines the effort of the sensory nerves to detect the boundaries ahead of time, rather than the blind from top to top within a distance of 400 cm per head. Inaudible sensors and water sensors capture real-time statistics and send them to a small controller. The water gadget sees water below, and the battery is powered by circuits. This proposed system is helpful for visually impaired people with the help of varied components to detect obstacles.

III. IMPLEMENTATION

The paper includes a simple electronic system that includes the following components: Walking Stick, Arduino (UNO R3), Ultrasonic Sensor (HC-SR04), IR Sensor (A215/450), Water Sensor, Switch, Voltage regulator, Power supply, Buzzer

A. Arduino

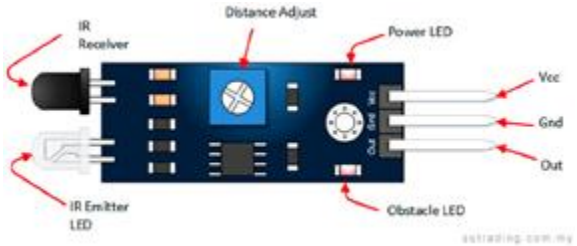
Arduino (UNO R3) is an open-source hardware and software company that designs and builds single-board microcontrollers and microcontroller kits to create digital units and interactive sensors. It features DIP, removable and AT-mega328 microcontrollers, and can be downloaded using the Arduino laptop system. It has great support from the Arduino community, making it an easier way to start working on embedded electronics.

B. Ultrasonic Sensor (HC-SR04)

The ultrasonic sensor is used for proximity sensor purposes, and in this it is used as an object detection system. It covers a range of 2 cm to 400 cm, but the environment must be free from water vapour. The distance between the sensor and the object will be sensed and the information will be given to the microcontroller for an alarm to be turned on. The sensor module is a four-pin module with pins Vcc, Trigger, Echo and Ground.

C. IR Sensor (A215/450)

The IR sensor module consists of an IR Transmitter and Receiver, OPamp, Variable Resistor (Trimmer pot), and LED outlet. The IR LED emits light in a wide infrared frequency, with an optical illuminating angle of 20–60 degrees and range of approximately a few inches to several feet. The Photodiode Receiver acts as an IR receiver as it operates when light falls on it. A photodiode is a semiconductor with a P-N junction, which operates in Reverse Bias, which means it initiates current in reverse direction when light drops in it, and the current flow value is equal to the amount of Light. This feature makes it useful for IR detection.



D. LM358 Op-Amp

The LM358 is an Operational Amplifier (Op-Amp) used as a voltage comparator for IR sensors. It compares the threshold voltage set using pre-set (pin2) and photodiode's resistor voltage (pin3), and when the Opamp output is high, the LED at the Opamp output terminal turns ON (Indicating Detection of object).

E. Water Sensor

The water sensor brick is designed for water detection, which can be used to detect rainfall, water level, and leak liquate. It is made up of three parts: an electronic brick connector, 1 M resistor, and several rows of bare wires. The sensor works by having a series of exposed trackers connected to the ground and connected between ground-based tracking sensors. The resistor pulls the value of the sensor trace up until the drop of water sensor traces to the bottom track. This circuit works with Arduino digital I/O pins or analog pins to detect the amount of water-generated connections between the ground track and the sensors. The sensor can judge the water level through a series of interlocking strings to measure a drop of water/size. It has low power consumption and high sensitivity, which are major features of this module. It is

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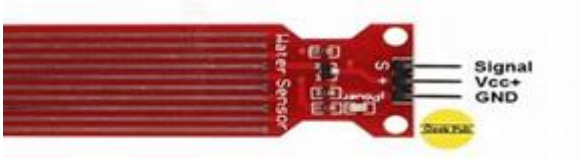
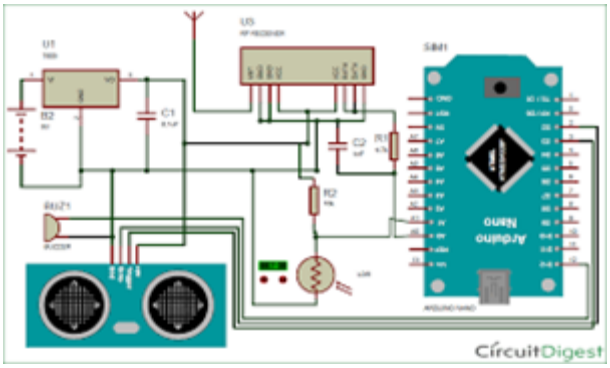
compatible with Arduino UNO, Arduino mega2560, Arduino ADK, etc.



F. Buzzer

The buzzer is a small but effective component for adding audio features to a system. It is small and compact with 2 pins, making it easy to use on bread board, Perf Board and even PCBs. There are two types of buzzers commonly found: a simple buzzer that makes a continuous beep sound and a ready-made buzzer that produces a "Beep. Beep. Beep." sound due to the internal oscillating circuit located inside it. This buzzer can be operated by simply powering it using a DC power supply ranging from 4 V to 9 V. It is usually associated with a switch on the "ON" or "OFF" of the bus when needed and requires an interval.



The Circuit Diagram

IV. CONCLUSION

This study aims to design and use a smart walking stick for visually impaired people. It is practical and affordable, and leads to good results in finding obstacles in the user's path over a distance of 3 m. It provides a low cost, reliable, portable, low power consumption and a robust navigation solution with short clear response time. Other features of the system can be enhanced by connecting wireless components between the components, increasing the range of the ultrasonic sensor and the use of the speed detection technology. The device built into this function can only detect obstacles and moisture, so a better device can be built using ultrasonic sensors, Arduino Uno and other tools that use audio commands to alert the user of what is in his or her way. In the future, some changes to improve system performance will be added, such as Global Positioning System for GPS User Location, GSM modules to communicate the location with a relative or caregiver, and a wide variety of handles for flexible management.

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