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Smart Blind Stick Using Ultrasonic Sensor

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ABSTRACT –

This article's principal goal is to help blind people who have no human needs. Notably, those who are blind carry a hand that sticks by them whenever they need assistance. When they use this stick, there is occasionally no guarantee that the blind persons will be safe or succeed in getting to their objectives. With the use of the stick, the person may not feel any deterrents that may be in their path. Notably, those who are blind carry a hand that sticks by them whenever they need assistance. In any case, there is no guarantee that those who are blind will be safeguarded when they use this stick. Even though there might be a barrier in their path, the person using the stick for support doesn't feel it. Therefore, if the impediment is large enough or harmful, the people may get hurt. In order to help the blind and give them a clear way, a blind stick is devised and produced in this study. An ultrasonic sensor that is fixed to the user's stick makes up the system. The ultrasonic sensor and Arduino Mega mounted to the stick attempt to identify any obstacles in the user's path as they move the stick ahead. The output of the receiver triggers when the sensor detects an obstruction, and the microcontroller will be able to detect this change because the output of the receiver serves as inputs to the microcontroller. This stick detects the object in front of the person and responds to the customer by vibrating or by asking a question. The person is thereafter able to stroll without fear. The optimum solution to a visually impaired person's problems will be provided by this device.

Technical Keywords : Electronic travel aids, a smart stick for the blind, an Arduino Mega, and an ultrasonic sensor

I. INTRODUCTION -

Blindness is a highly widespread disability among people all over the world. Around 90% of people who are blind or visually impaired reside in developing nations. They require assistance to walk and carry out their everyday tasks. The Smart Blind Stick is a fully automatic as well as manually operated, low-cost, simple-to-maintain device. It is a cutting-edge tool made for visually impaired persons that allows for precise navigation and cutting-edge obstacle detection. With this device, we offer an enhanced blind stick that makes it easier for those with visual impairments to navigate utilising cutting-edge technology. Three ultrasonic sensors, a panic button, a navigation switch, Bluetooth, a soil moisture indicator, and an Arduino UNO are all built within the blind stick. Utilizing ultrasonic waves, the three ultrasonic sensors are utilised to find impending obstructions.

II. Objective –

The major goal of this project is to create a system that is less expensive but still has good functionality for those who are blind. This device can assist persons who are blind in avoiding barriers like people and animals who use the same corridor as them. It can also give them information about the distance to obstacles in front of them. The goal of this project is to help those who are blind or visually impaired make their way around a hallway more easily rather than having to use a walking stick to manually detect every obstruction and waste time trying to discover the precise direction they want to go.

III. Literature Review –

[1] "The third eye for the blind utilising Arduino and ultrasonic sensor," M. Narendran, Sarmistha Padhi, and Aashita Tiwari. National Journal of Multidisciplinary Research and Development ISSN: 2455-9040 Volume 3; Issue 1; January 2018; Page No. 752-756 Department of Computer Science & Engineering, SRM Institute of Science & Technology Ramapuram, Chennai, Tamil Nadu, India. For the blinds, this was wearable technology. The fact that this device will be reasonably priced is one of its key features. Wearable electronics include the Arduino Pro Mini 328-MHz 15/16 MHz board. This was furnished with a module of ultrasonic sensors. With the help of the sensor, visually impaired people may navigate their surroundings and identify nearby items. The sensor will vibrate or beep to alert the user when it locates any object.

[2] Smart walking stick for the blind by Sathya, S. Nithyaroopa, P. Betty, G. Santoshni, S. Sabharinath, and M. J. Ahana. Kumara Guru College of Technology Coimbatore, Department of Computer Science and Engineering. Volume 118, Number 20, Pages 4531–4536, Coimbatore International Journal of Pure and Applied Mathematics. The ultrasonic sensor, water sensor, speech playback board, raspberry pi, and speaker are all parts of the proposed system. With the aid of a camera, the suggested method locates obstacles that are visible both indoors and outdoors. Using an ultrasonic sensor, the Stick calculates the separation between the items and its smart walking stick. In order to give the user vision, we also need to think about and process

the image in advance. Image sensors (a camera walking stick with a USB camera, an RF module, a rain sensor, an ultrasonic sensor, a Raspberry Pi, and a headphone attached to it) are used to detect the image. The system's main controller is the raspberry pi. Using image processing, the photos sent from the camera are compared to the images saved in the dataset. Segmenting based on morphology is employed in image processing.

[3] "Smart walking stick for visually challenged individuals," by Jayakumar, S.Magesh, K. Prasanth, P. Umamaheswari, and R. Senthilkumar. Erode Sengunthar Engineering College, Dept. of EEE. IJARBEST, Vol. 3, Special Issue. 24, March 2017. International Journal of Advanced Research in Basic Engineering Sciences and Technology. Different sensors are employed, including light, humidity, temperature, and object sensors (ultrasonic sensors). Blind persons are given status by using speakers and volume controls. Blind people's routes are tracked using GPS, and GSM-based alert systems are utilised to notify neighbours of emergencies. The DSPIC30F2010 controller, ARM Processor, and DSPIC3OF 2010 are used in the implementation of this project.

[4] Adebimpe Lateef, Dada Emmanuel, Gbenga, Arhyel, Ibrahim Shani, and Adekunle. "Smart walking stick for blind persons utilising Arduino and ultrasonic sensor." University of Maiduguri, Borno State, Nigeria Department of Computer Engineering Vol. 4, No. 3, March 2016, of the International Journal of Innovative Research in Electrical, Electronics, Instrumentation, and Control Engineering This paper describes a smart walking stick for visually impaired individuals that uses Arduino and ultrasonic sensors. The device was created, programmed in C, and evaluated for accuracy by a person who is blind. Within around 2 metres of the user, our device can identify obstructions. Mobility aid, individual with visual impairment, alert, ultrasonic sensor, and Arduino atmega328 microcontroller.

[5] Ultrasonic and voice-based smart sticks were developed by D. Sekar, S. Shivakumar, P. Thiyagarajan, R. Premkumar, and Vivekkumar. Engineering college in SriEshwar. Vol. 4, Issue 3, March 2016, International Journal Of Innovative Research In Electrical, Electronics, Instrumentation, And Control Engineering In order to decide the best route to take, GPS technology is combined with pre-programmed places in this study. The user can select a location from a list of locations that are recorded in the memory, and the stick will be guided in the right direction. In this system, a battery, a PIC controller, a temperature sensor, a humidity sensor, a GPS receiver, a vibrator, a voice synthesiser, a speaker, or headphones are used. The following components are used in this system: an ultrasonic sensor, temperature and humidity sensors, a GPS receiver, a vibrator, a voice synthesiser, a speaker or headphone, a PIC controller, and a battery.

IV. Proposed System –

Here, we suggest an enhanced blind stick that enables people with vision impairments to navigate with ease utilising cutting-edge technology. Along with having integrated light and water sensors, the blind stick also has an ultrasonic sensor. In the initial step of our suggested project, ultrasonic sensors use ultrasonic waves to find impending obstructions. We'll attempt to integrate a GPS system into our Blind Stick Project in the future. Additionally, we'll aim to make the stick foldable for carrying purposes.

V. Methodology –

Atmega328 - A low-power, 8-bit CMOS micro controller is the Atmega328. Its foundation is an improved RISC architecture. The Arduino UNO board uses it.

Ultrasonic sensors - The fundamental idea of an ultrasonic sensor is to generate ultrasonic waves, which are then reflected back by the object being measured to determine the distance based on time and speed. Three ultrasonic sensors are used in this device, and they are located on the front, left, and right sides of it. 5 volts are provided as the supply voltage, with a 15 mA global current consumption. The maximum range of the ultrasonic signal at 40k Hz is 200m. Minimum Range: 0.1 metres.

Soil Moisture Detector - used to offer voice commands in accordance with the amount of soil moisture detected. By utilising the soil's electrical resistance, dielectric constant, and interaction with neutrons as a proxy for the moisture content, it is utilised to determine the volumetric water content of the soil.

Arduino Uno - Our primary piece of hardware is Arduino Uno, a microcontroller board built on the ATmega328. The 14 digital input/output pins, 6 analogue inputs, a USB connector for power, and a reset button make up the Arduino UNO. Everything required to support the microcontroller is included. To get started, it is simply connected to a computer via a USB connection or battery.

Its features are : Compared to other microcontroller platforms, such as 8-bit microcontrollers and Internet of Things applications, Arduino boards are comparatively cheap.

1. The Arduino Software (IDE) has a straightforward programming environment and is simple to use.

2. The Arduino Software (IDE) is compatible with Windows, Mac OS X, and Linux.

3. Arduino software is released as open source resources that allow programmers from all over the world to contribute.

Bluetooth - Bluetooth is used to connect personal computers together in networks. A personal area network can be created using this wireless technology standard. IEEE 802.15, which is the Bluetooth-specific IEEE standard. The network that is created is used for data exchange over short wavelengths and within a specific operating range. In order to connect the Android mobile to the Smart Blind Stick, Bluetooth is used.

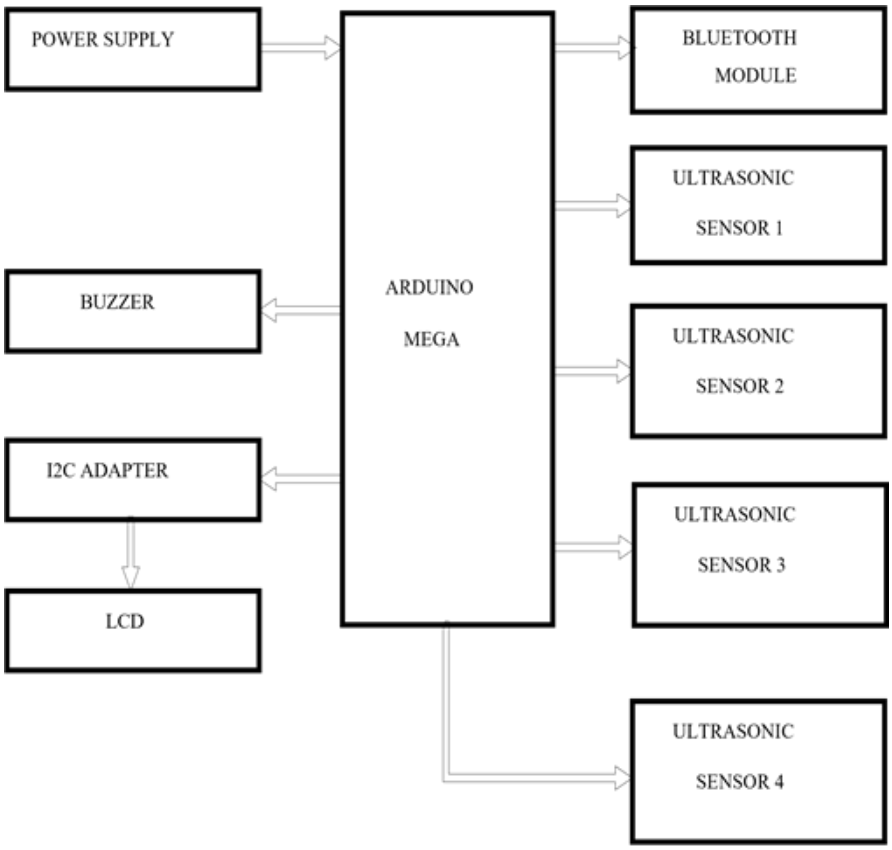
IR sensor - Because it is situated on the lower side of the stick, it is easy to find tiny obstructions like pits, stairs, or stones. A voice instruction will be sent by the Arduino after the IR sensor detects any minor impediments on the ground International Journal of Engineering Science and Computing, March 2018 16250 http://ijesc.org/ and sends a signal to it. Additionally, it will enable the buzzer so that it can alert a blind person to the existence of obstacles on the ground.

Water sensor - In order to protect against slippery wet surfaces that could cause injury, a water sensor is positioned at the bottom or base of the stick. The Arduino controller is triggered by an electrical signal produced when the water sensor makes contact with a moist surface. A buzzer is turned on to alarm against a wet floor, and a voice command is given for moist surfaces.

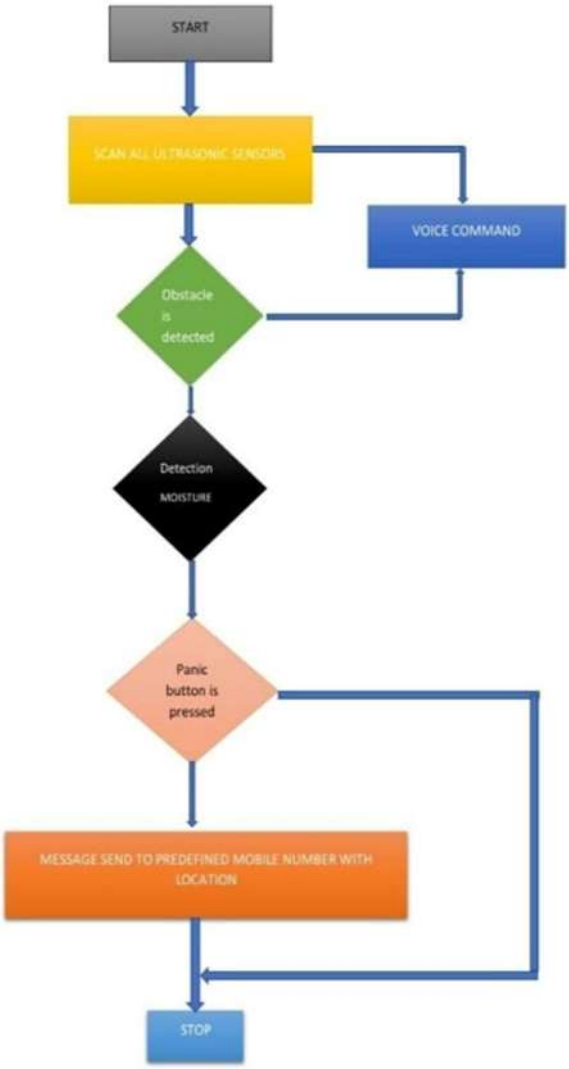
Buzzer - A transducer is a device that transforms mechanical energy from electrical energy. The lower part of the 20 Hz to 20 kHz audible frequency range is where buzzers are located. It is done by transforming an audible electric oscillating signal into mechanical energy in the form of audio waves. In this study, a buzzer is utilised to alert the blind individual to obstacles by producing sound that is proportionate to the distance from the obstacle.

GPS and GSM System - The microcontroller processes the message with the saved keyword when a GSM modem receives a message. In order to answer to the sender, it will then obtain the stick's location from the GPS modem and send it to the GSM modem. When the stick's user presses the emergency button, the microcontroller receives the location information from the GPS modem and transmits it to the GSM modem, which sends SMS messages to all the microcontroller's registered phone numbers. The stick's location will be updated by the GPS and will be automatically saved in the EEPROM memory of the microcontroller. The microcontroller will track the last location from the EPROM and transfer it to the GSM modem, which will send an SMS message containing the person's location to the specified number, if the microcontroller receives the word "codeword" (it is set) from the GSMmodem. In addition, if the emergency button is pressed immediately, the microcontroller will transfer the most recent position stored in the EEPROM to the GSM modem for transmission to all saved phone numbers.

Block Diagram of the Smart Blind Stick



Flowchart of the Smart Blind Stick



VI. ADVANTAGES

1. This device will work to make it easy for blind individuals throughout the world to move wherever they wish and the navigation system will assist them with voice commands.

2. It will be able to identify obstacles that blind individuals would encounter.

3. The panic button on the device will be the most crucial function; once a blind person is stuck or in an emergency, his or her position will be relayed to a predefined person.

4. The device will be portable and work with other blind sticks as well.

5. The moisture detector will also give the blind person instructions after quickly detecting soil moisture.

VII. DISADVANTAGES

1. The blind individual must have received prior instruction before using the equipment.

2. The gadget is unable to recognise items.

3. The device will only recognise it as an obstruction because it is unable to distinguish between people and objects.

4. Does not offer protection from threats coming from above or below the head.

VIII. Conclusion

Finally, a version of the Blind Walking Stick that can be used to guide the blind has been created. It aims to address the problems faced by those who are blind on a daily basis. The framework also takes the necessary steps to ensure their protection. Every visually impaired person on the earth will benefit from this project, which will make it easier for them to walk anywhere they need to go. It was done to help the blind go forward fairly well. It is used to help people with disabilities who are unable to work on the development and to increase security.

IX. REFERENCE

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