SMART NAVIGATION ASSISTANCE FOR VIUALLY IMPAIRED USERS

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ABSTRACT:

The smart walking stick helps blind people to perform navigation and to do their work easily and comfortably. In normal stick, the detection of the obstacle is not done and normal stick is not efficient for visually impaired persons. Because the blind person does not know what type of things or what type of the objects come in front of him or her. Visually impaired persons have difficulty to interact and feel their environment. They have little contact with surroundings. Physical movement is a challenge for visually impaired persons, because it can become tricky to distinguish obstacles appearing in front of them, and they are not able to move from one place to another. God gifted sense of vision to the human being is an important aspect of our life. But there are some unfortunate people who lack the ability of visualizing things. The visually impaired have to face many challenges in their daily life. The problem gets worse when they travel to an unfamiliar location. The old systems are not work properly in outdoor applications. In this project, we propose a navigation device for the visually impaired which is focused on providing voice output for obstacle prevention and navigation using the ultrasonic sensor. We also use the IoT module, voice ice, mike and speaker. Using this system we alert the blind person's relatives.

Index Terms: Area-efficient, Low power, CSLA, Binary to excess one converter, Multiplexer

I.INTRODUCTION

There are approximately 85% of information human get being from environment. And there are 330 million people are visual impaired in the world. The smart phones allow those people to listen to voice mails. Another example is the laser or ultrasonic technology. Thus, the distance to the obstacle is calculated according to the time variance between the two signals. This GPS technology used to identify the position and location for the blind person. Ultrasonic sensors are much more efficient than other obstacle detection sensors. There are other several systems related to the aid mobility of visually impaired are existing. Also the author uses GPS location information to provide directions to blind people within a campus environment. A smart cane was aimed to guide the blind people by using of onboard sensors for obstacle avoidance. The system is based on an ultrasonic sensor in which it detect obstacles and command.

II.MATERIALS AND METHODS:

1.EXISTING METHOD

This project is to give the alarm for blind people using ultra sonic technology.This project is very useful in blind people to indicate the alarm for avoiding accident. In this project microcontroller AT89C2051 is used to as oscillator to generate the 40KHZ frequency signal. Then the generated frequency signal is given to ultrasonic transmitter. The ultrasonic transmitter is constructed with two inverted buffer is connected in parallel. Depending on the frequency the buffer on and off time

is varied. Through this way 40KHZ ultrasonic wave is generated and transmitted. The ultrasonic wave is hit the nearest object and reflected from the object. The ultrasonic receiver is used to receive the reflected wave.

Depends upon the distance of the object the received wave strength is varied. The received signal is given to amplifier unit. The amplifier unit is constructed with the operational amplifier which acts as power amplifier. The received signal wave is in the form of AC wave form so the amplified signal is given to signal conditioning unit. The signal conditioning unit consists of precision rectifier and comparator. The precision rectifier is also constructed with operational amplifier in which the negative signals are rectified. Then the rectified signal is given to comparator. The comparator is used to generate the square pulse. The square pulse is given to driver circuit. The driver circuit is constructed with transistor which acts as switch to turn ON and turn OFF the alarm. The ultrasonic transmitter & receiver are fixed in front of the walking stick. The transmitter transmits the ray towards receiver. According to the distance the transmitting pulse has been changed. From this, the microcontroller monitors the distance between the object and the stick. So if he walks near the wall or any object. The alarm makes the sound for to indicate.

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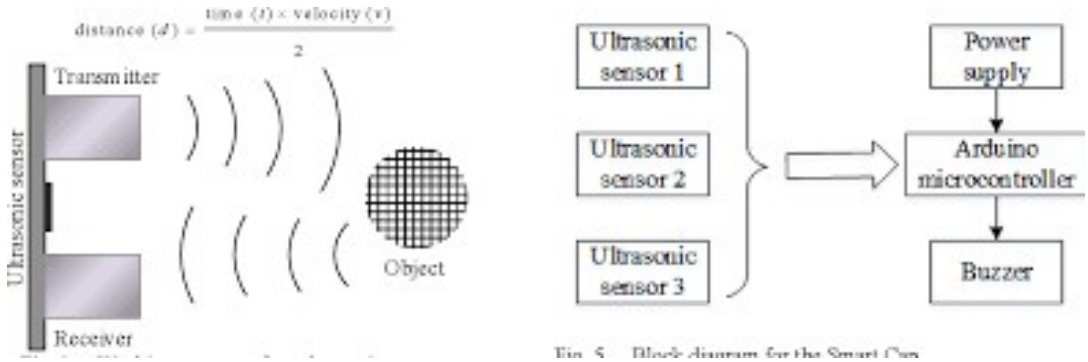


Figure 1: Block diagram of Ultrasonic Sensor based Smart Cap as Electronic Travel Aid for Blind People

Traditional methods for assisting visually impaired individuals include the simple yet effective white cane and guide dogs trained for navigation. However, technological advancements have led to the development of sensory-based smart sticks. These include ultrasonic sensor-based canes like the Smart Cane, infrared sensor-based canes like Eye cane and laser sensor-based canes like Drishti, which detect obstacles via high-frequency sound waves, infrared radiation, or laser beams.

GPS-enabled smart sticks, such as Trekker Breeze and Smart Guide, provide audio feedback and vibration guidance to enhance navigation. Artificial intelligence (AI)-powered smart sticks, like We Walk and Drishti, integrate ultrasonic sensors, GPS, and voice assistants for advanced obstacle detection and navigation.

Wearable devices, including smart glasses like OrCam and smart vests like Wearable X, offer object recognition and haptic feedback for navigation. Mobile apps, such as TapTapSee and Nearby Explorer, provide object recognition and GPS navigation assistance.

Electronic Travel Aids (ETAs) and Tactile Graphics Display (TGD) technology also aid visually impaired individuals. ETAs are handheld devices with sensors and audio feedback, while TGD raises Braille dots electronically. These smart sticks and assistive technologies offer numerous benefits, including enhanced mobility, increased independence, improved safety, better navigation,

and increased confidence. Despite challenges such as cost, user acceptance, sensor accuracy, power consumption, and integration with existing infrastructure, continued innovation aims to address these limitations.

2.PROPOSED SYSTEM

The ultrasonic sensor produces a beam of ultrasonic waves of frequency of about 40 kHz which reflects back from the objects it strikes with. The ultrasonic sensor measures the time between emission and detection of the ultrasonic waves which acts as the time of flight. This calculated time is used by the Arduino Uno micro controller to calculate the distance of the object by using the speed of sound in air using formulae (velocity x time)/2.

Now when the Arduino records the distance of the objects it first checks the precalibrated threshold distance and then checks whether the device is connected with voice ic. If the device is not connected to mobile then it triggers the voice output once threshold distance is reached. If the device is connected with IoT module then it will send the notification to the android device via Wi-Fi which with the help of the app will convert the location notification. The device continuously receives the GPS coordinates from the mobile which are very accurate and uploads them to the cloud which can be easily accessed by the family members of the person in case of any kind of emergency.

3.METHODOLOGY

The design of the Ultrasonic Walking Stick for the Blind system involves the incorporation of the following steps-

1. Three ultrasonic sensors are incorporated- to sense objects on the right, left and in front respectively.
2. The PIC microcontroller has to be programmed in order to calculate the distance of any object from the sensor.
3. The programming of the microcontroller is done in C language.
4. On detection of an obstacle, a buzzer is sounded.

4.COMPONENTS

The system includes the following key components:

a) Ceramic Capacitor

A ceramic capacitor is a fixed value capacitor where the ceramic material acts as the dielectric. It is constructed of two or more alternating layers of ceramic and a metal acting as the electrodes. The composition of the ceramic material defines the electrical behavior and therefore applications.

b) Electrolytic Capacitor:

An electrolytic capacitor is a polarized capacitor whose anode or positive plate is made of a metal that forms an insulating oxide layer through anodization. This oxide layer acts as the dielectric of the capacitor. A solid, liquid or gel electrolyte covers the surface of this oxide layer, serving as cathode or negative plate of the capacitor.

c) LED:

Light Emitting Diode is a widely used for standard source of light in electrical equipment. It has a wide range of applications ranging from your mobile phone to large advertising billboards

d) Resistor:

A resistor is a passive two terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow , adjust signal levels to divide voltages, bias active elements.

5.SYSTEM REQUIREMENT

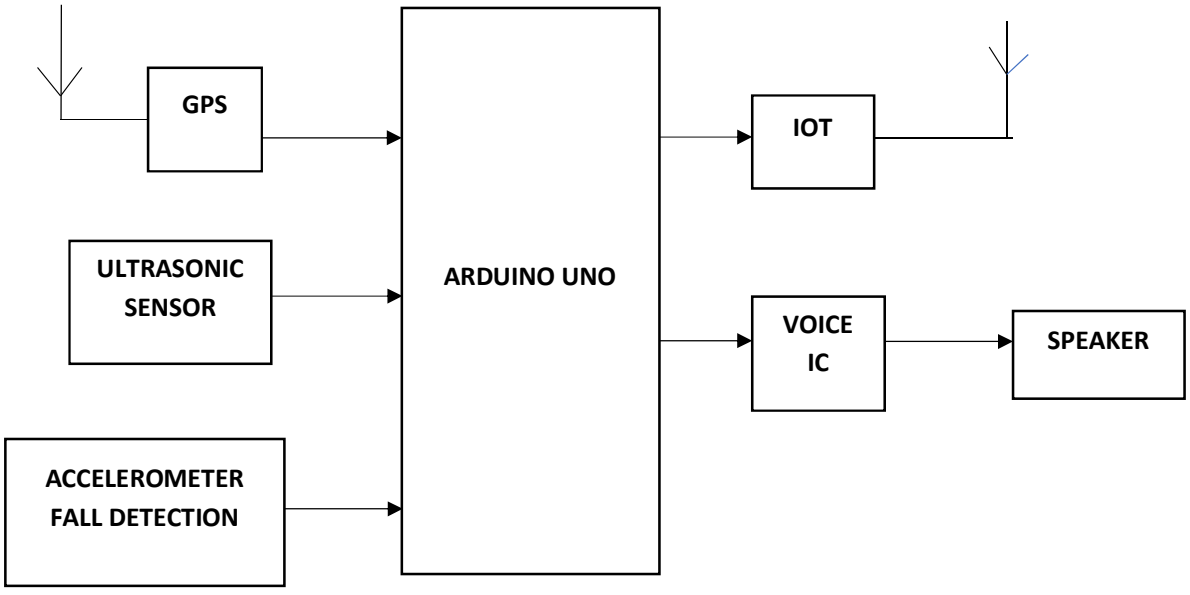
HARDWARE REQUIREMENT:

- Arduino Uno microcontroller
- Lcd Display
- Ultrasonic Sensor
- Accelerometer Sensor
- Voice IC-Speaker (Or) Head Phone
- IOT(Wi-Fi)
- GPS

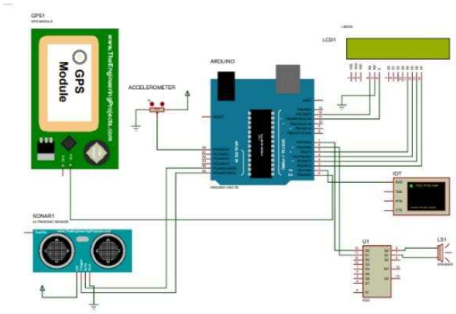
SOFTWARE REQUIREMENT:

- Arduino IDE-----(Controller Side)
- Embedded C

6. BLOCK DIAGRAM



III.SIMULATION



IV.CONCLUSION

The proposed device helps visually impaired peoples to move freely and reduce their dependence upon others. The proposed device is very compact and easy to use as it uses minimum hardware components and makes maximum use of features of mobile devices which reduces its size and overall cost. Also, the device helps the family members to easily trace the location with help of GPS data uploaded to the cloud which is highly precise and accurate as it is obtained from mobile GPS.

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