A Smart Stick for Blind People

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Abstract: *The life of blind and visually impaired people is very different. They face many problems in moving from one place to another. Since they cannot see, they often get hit by objects in roads like poles, walls, cars, people etc. as a result they may severely injured. It may leads to face humiliation and lose confidence in themselves. There are chances that they can get lost. In such cases, it is very difficult for their family members to find them. Even though they are provided with stick, in which they can identify the object by tapping it. It is not much helpful for them in order to avoid obstacles, the Smart Stick for Blind people in which visually impaired person can be able to detect the object from a further distance and they could avoid it using ultra sonic sensors, and if they are lost, using GPRS and GSM modules their family members can track them easily.*

Keyword: Blind Stick, Arduino, GPS, GSM, Earphone, Ultrasonic Sensor.

1. INTRODUCTION

Blind people find it difficult to move in this world as they get Distracted by the obstacles, they may even get lost. So in the Proposed system the above mentioned cases are taken into Consideration and implementation is provided. In order to help the blind people for detecting object. The proposed system make use of ultrasonic sensors to track the person. The system makes use of GPS and GSM modules to find the location. Visually impaired persons have difficulty to interact and feel their environment. They have little contact with surrounding. Physical movement is a challenge for visually impaired persons, because it can become tricky to distinguish where he is, and how to get where he wants to go from one place to another. To navigate unknown places he will bring a sighted family member or his friend for support. Over half of the legally blind people in the world are unemployed. Because limited o types of jobs they can do. They have a less percentage of employment. They are relying on their families for mobility and financial support. Their mobility opposes them from interacting with other people and other social activities. In the past different systems are designed with limitations without a solid understanding of the non-visual perception. Some of the systems are only for indoor navigations, and has no hurdle detection and determining location feature in outdoor environment.

Researchers have spent the decades to develop an intelligent and smart stick to assist and alert visually impaired persons from obstacles and give information about their location over the last decades, research has been conducted for new devices to design a good and reliable system for visually impaired persons to detect obstacles and warn them at danger places. The main objective of this project is to reduce the cost and to provide a better solution for the visually impaired.

2. LITERATUR SURVEY

2.1 Existing system

 1) S.Gangwar (2011) designed a smart stick for blind which can give early warning of an obstacle using Infrared (IR) sensors. After identifying the obstacles, the stick alerts the visually impaired people using vibration signals. However the smart stick focused only for obstacle detection but it is not assisting for emergency purposes needed by the blind. And also the IR sensors are not really efficient enough because it can detect only the nearest obstacle in short distance.

2) S.Chew (2012) proposed the smart white cane, called Blind spot that combines GPS technology, social networking and ultrasonic sensors to help visually impaired people to navigate public spaces.The GPS detects the location of the obstacle and alerts the blind to avoid them hitting the obstacles using ultrasonic sensors. But GPS did not show the efficiency in tracing the location of the obstacles since ultra-sonic tells the distance of the obstacle.

2.2 Proposed System

We have many reasons to design smart stick for blind people; firstly, the blind person to feel free, isn't surrounded by wires as in belt and its content. Secondly, is easy to use because it is familiar and affordable. Thirdly, to be able to detect obstacles that exist on the ground (this is not available in glasses), which he walks indoor and outdoor is faced by obstacles such as stairs, puddles and sidewalks. The smart stick, as shown in Fig. 1, Is basically an embedded system integrating the following: pair of ultrasonic sensor to detect obstacles in front of the blind from ground level height to head level height in the range of 400 cm a head. Ultrasonic

sensors collect real time data and send it to 18F46K80 microcontroller. After processing this data, the microcontroller actives the motor to vibrate and invokes the right speech warning message stored in ISD 1932 through an earphone. If any obstacle come than the danger sound comes from earphone the blind person come to know something front of him. Using earphone and he get alert. As well as, we will have track of the route he traveled with the help of GPS. If they are in any kind of problem of feeling stuck/ lost, they only need to press the button in their Smart Blind Stick and with the help of GPS and GSM their Family member come to known their location. Via sms to register mobile number with here current location .Through which they can be found him easily.

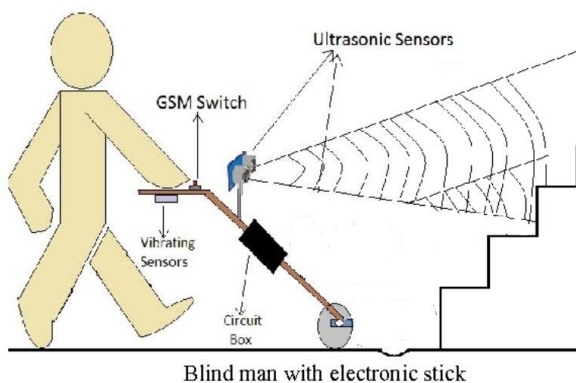**Fig -1**: Proposed Design/ Architecture

3. SYSTEM DESIGN

The ultrasonic sensor received the signal come back form the obstacle. And send it to the Arduino. Where Arduino run the instruction based on signal. If obstacle is present then the Arduino send the alert SMS, though earphone. With the help of sound come through earphone, a blind person come to know something is front of him. Ones the emergency button is press by the person. Then her real Time location will send to their family member with the help of GPS and GSM. Where GPS send the location to Arduino. And Arduino Connect with GSM. And the GSM send their location to register Number in Arduino instruction.

The proposed system provides improvements to the existing system design. It tries to make the existing system more efficient, convenient and user- friendly.

The implementation of the proposed design of the stick requires following hardware components:

1. Microcontroller

2. Ultrasonic sensor

3. Battery

4. Jumper wire

5. Earphone

6. Arduino Uno Microcontroller Board

7. Stick

8. GPS & GSM

Fig -2: System Design

3.1Microcontroller

The Arduino Uno R3 is a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs). Programs can be loaded onto it from the easy-to-use Arduino computer program. The Arduino has an extensive support community, which it a very easy way to get started working with embedded electronics. The R3 is the third, and latest, revision of the Arduino Uno

- Arduino Uno R3 Microcontroller
- Arduino can control the environment by receiving input signals (Digital/Analog) and can effects its surroundings by controlling lights, relays and other devices.
- The microcontroller on the board is programmed using.

3.2 Ultrasonic transducers

Generating, detecting & processing ultrasonic signals Ultrasonic is the production of sound waves above the frequency of human hearing and can be used in a variety of applications such as, sonic rulers, proximity detectors, movement detectors, liquid level measurement. Ultrasonic Ranging Module HC - SR04. F Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. Ultrasonic sensor send sound waves which get reflected form obstacle and come back to him and send this signal to microcontroller for further processing.

3.3 ALARM

The person get informed through a vibrator and sound comes through the earphone.

1) CONNECTION

Ultrasonic VCC to Arduino 5v.
Ultrasonic GND to Arduino GND.
Ultrasonic TRIG to Arduino D12.
Ultrasonic ECHO to Arduino D11.
Vibrator motor pin 1 to Arduino D7.
Vibrator motor pin 2 to Arduino GND

3.4 GPS Module

GPS stands for **Global Positioning System** and used to detect the Latitude and Longitude of any location on the Earth, with exact UTC time (Universal Time Coordinated). This device receives the coordinates from the satellite for each and every second, with time and date GPS offers great accuracy and also provides other data besides position coordinates which we can use later on.

3.5 GSM Module

GSM is a mobile communication modem; it stands for *Global System for Mobile Communication (GSM). It was created to describe the protocols for second-generation (2G) digital cellular networks used by mobile phones and is now the default global standard for mobile communications. We will use this in order to send the coordinates that we can receive from the GPS Module to the third party whom will receive the message.

4. FUTURE SCOPE

The future scope of the existing smart stick, guides the visually impaired person in his navigation independently in an efficient manner ensuring the person's safety.

A) The programmable wheels would steer the stick away from the obstacles and also leading the blind person towards the destination.

B)Internet of Things is a trending concept which can increase the benefits of the smart stick by allowing one stick to communicate with another smart stick (or mobile , PCs) nearby to utilize the functionality of the other stick when one stick's functionality breaks down.

C) In order to run this integrated set of hardware we can use solar panels as an alternative to the battery. The use of solar panel occurs to be more advantageous as it uses sunlight, the easily available renewable resource of energy, to get recharged.

5. CONCLUSION

With the proposed architecture, if constructed with at most accuracy, the blind people will able to move from one place to another without others help, which leads to increase autonomy for the blind. The developed smart stick that is incorporated with multiple sensors will help in walking and keep alarming the person if any sign of danger or inconvenience is detected .The developed prototype gives good results in detecting obstacles placed at distance in front of the user; it will be real boon for the blind.

6. REFERENCES

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