Advanced Blind Walking Stick Using Atmega 328 Microcontroller

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Abstract-In this paper we have implemented the stick for blind person which is useful for navigation and obstacles such as fire, water i.e, slippery area detection. In this project, we have also used GSM and GPS systems for finding the location and sending message to the relatives of blind people. The ultrasonic sensor is used for detection of obstacles which is coming in front of blind person which is using this stick, the fire sensor is a combination of ICLM35 and LDR for detection of the fire and water sensor is used for detection of slippery area using two probes.GSM and GPS are used for the location detection and sending the message to the number which is already saves in programming. Thus, this is the overall contents of paper.

Keywords–ATmega328,	ultrasonic	sensor,	water	sensor,	LDR,	LM35,	GSM,	GPS
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1. INTRODUCTION

In day to day life for navigation to the human being, eye plays an important role. According to the world health organization (WHO) there are 39 billion peoples are blind by birth. For the working in their life they suffer from many problems and difficulties. Like a sighted, the blind also wants to travel inside or outside without any help. They may go for office, colleges, market, etc. for that purpose they used guided dogs. Due to this they waste a lots of time for training the dogs, but there will not the confirmation of safe navigation.

To provide a solution for their navigation we introduced a electronic cane. As the technology is developed day by day, the new inventions are done to provide the comfort for navigation securely. These devices are providing all facilities as shown below so, they are independently navigated.

Paper is providing the solution of such many problems which they are suffer while travelling indoor as well as outdoor. It consists of four sensors with GSM and GPS technology [1]. The sensors are used to detect the obstacle, fire and water spoilage in the path of blind one. For that purpose we used ultrasonic sensor, LDR and LM35 as a fire sensor, two probes as water sensor.

2. LITERATURE REVIEW

The central Michigan University (CMU) in 2009 introduced a blind stick. This blind stick gives the general information about the surrounded area. This stick is consisting of a RFID chip. This RFID chips are inserted street in the front of shops and many such places where they navigates. While travelling, the RFID will read the related information and provide the guidance to them.

In the 2011, the smart stick is developed by the S. Gangwar. He used the ultrasonic sensor for the detection of obstacles coming in path of blind by sending vibration signal to alert the blind.

S. chew (2012) introduces the smart white cane for helping the blind. He uses the GPS technology for navigation of blind people in public area and also uses the ultrasonic sensor for obstacle detection.

Alejandro R. Garcia Ramirez and Renato Fonseca Livramento da Silvaetal (2012) introduce an assistive technology device called the electronic long cane which can be used inside in the generalized stick used by blind normally. It works in such a way when an obstacle is detected; the cane vibrates. However, this system only detects obstacle above the waistline.

3. ARCHITECTURE



Fig 1. Architecture of Advanced Blind Walking Stick

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ULTRASONIC ENSOR **A**4 27 GSM Tx BUZZER 43 26 A2 25 LM35 FIRE A1 SENSOR LDR 24 A0 23 ATmega 328 WATER ND 22 SENSOR SWITCH 21 'CC CRYSTAL OSCILLATOR 20 19 MEMORY SCK CARD MISO GPS 18 12 MODULE MOSI 11 17 10 Digital input/output 16 Analog Digital

4. INTERFACING DIAGRAM



The figure above shows the interfacing of the advanced blind walking stick which shows the A0, A1, A2, A3, A4, A5 pins which are the analog pins and remaining pins are digital pins respectively.

4.1. Microcontroller

In our paper, we are using ATmega328 microcontroller. It belongs to Atmel's AVR series microcontroller family. The acronym AVR has been stand for advanced virtual RISC, Atmel says that the name AVR is not an acronym and does not stand for anything in particular.



Fig 3. Microcontroller Atmega328

4.2. Ultrasonic Sensor



Fig 4. Ultrasonic Sensor

To analog pin A4 and A5, ultrasonic sensor is interfaced to the pin number 27 and 28 of microcontroller. The ultrasonic sensor is used to detect the obstacle in the path of blind person. This sensor is continuously transmitting the signal in all the possible direction. The signal is transmitted through the echo pin of sensor. The system then measures the time for the echo to return to the sensor and computes the distance to the target using the speed of sound in the medium [5].

4.3. Fire Sensor

To the pin number 24 and 25 of microcontroller the fire sensor is connected. The fire sensor is nothing but the combination of IC LM35 and light dependent resistor (LDR). The IC LM35 is the temperature sensor IC and LDR is used for light sensing. When the light is incident on the circuit, the resistor changes and it is sensed by the resistor. If the output of LM35 and the output of LDR is sensed at the same instant of time then microcontroller can sense the fire and it can sends alert signal to the user or to the blind person using the stick through headphone.



Fig 5. Fire Sensor (combination of LDR & LM35)

4.4. Water Sensor



Fig 6. Water Sensor

To the A0 analog pin, the water sensor is connected. The pin number 23 of microcontroller is used for interfacing the flood sensor (water sensor).

For detecting the spoilage of water on the ground is detected by the water or flood sensor [2]. The water sensor consists of two probes which are coming outside from the stick at bottom side of stick. When the water is spoiled at the ground space then two probes of water sensors comes in contact with the water. By using this phenomenon, if the water is detected by the stick then the microcontroller can sends the alert signal to the user or blind person by using the headphone.

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4.5. Memory Module



Fig 7. Memory card module

The memory card module is interfaced to the 17, 18 and 19 pin number of microcontroller. The memory card is inserted into the memory module for storing the information.



Fig 8. Memory card

1 GB memory card is used for storing the voice massages. These voice massages are providing the direction for navigation of user or blind person.

4.6. GSM and GPS

To the pin number of 2, 3 and 11 of microcontroller GSM and GPS is interfaced. We are using GPS and GSM module for detecting and sending the location along with the longitude and latitude to the numbers which are already saved and those are useful for blind persons [1].GPS and GSM modules are interfaced with the At mega 328 microcontroller according to its output the controller does the action and sends SMS alert to the relatives of the blind person.

5. ADVANTAGES

- To detect place with the stick.
- To detect obstacles with the stick.
- To ensure safe walking of the blind.
- To help the blind to reach his destination safely and securely.
- To create a cheap and comfortable mobility aid for the blind.

6. EXPERIMENTAL RESULTS



Fig 9. Photograph of circuitry for advanced blind walking stick

7. APPLICATIONS

• The stick which we have developed is useful for the visually impaired person and blind person.



Fig 10. Blind person navigation using the stick

8. CONCLUSION

In this paper, we have implemented various approaches and devices that help for the navigation of blinds. The use of ultrasonic sensor, GPS and GSM help us to overcome the drawbacks by providing better accuracy.

The main objective is to assist blind or visually impaired people to safely move among obstacles and other hurdles faced by them in their daily life. Using this guiding system, the blind people can travel in the unknown areas independently. Also less training time period is required to use this smart system. The solution developed here is a low cost and user friendly navigational aid for the visually impaired and blind person.

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