



CSE 3104: Peripheral and Interfacing Laboratory

Project Title: Smart Walking Stick for Visually Impaired People

Submitted To

Dr. Md. Sheikh Sadi

Professor,

S. M. Taslim Uddin Raju

Lecturer,

Department of Computer Science and Engineering
Khulna University of Engineering & Technology

Submitted By

Shupta Das Roll: 1707001

Antika Noor Roll: 1707017

Faria Sultana Roll: 1707023

Department of Computer Science and Engineering
Khulna University of Engineering & Technology

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Objectives:

The objectives of our project are described below:

- To make a Smart Walking Stick for visually impaired people.
- To make such a walking-stick which is cheap and affordable.
- To ensure the safety of visually impaired people.
- To enable them navigate better and with less chance of getting injured or hurt.

Introduction:

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, they are not able to move from one place to another with ease.

Our project aims to make a Smart walking stick which is specially designed to detect obstacles that may come across a visually impaired person and help them to navigate care-free. The audio messages (sound from the buzzer) will keep the user alert and considerably reduce accidents. This system presents a concept to provide a smart electronic aid for blind people. Our proposed system contains an ultrasonic sensor, a buzzer, and Arduino Uno. Our project measures the distance between the objects and the smart walking stick by using a sonar sensor. An ultrasonic sound wave is sent from the sensor and the time for the echo of that sound to come back to the sensor is measured. Then the distance of the object from which the echo came back is calculated using $d = (v*t)/2$ formula. The proposed system detects obstacles in this way and if any obstacle comes closer to 50 cm of the stick, then the buzzer is sounded to alert the person using the stick to inform them of the coming obstacle.

The smart walking stick is a simple and purely mechanical device to detect the obstacles on the ground. This device is light in weight and portable. Moreover, it is very cheap and affordable as it uses only two sensors and a microcontroller which are very easy to come by. It provides the best travel aid for a visually impaired person. The blind person can move from one place to another independently without the others help. The main aim of the system is to provide an efficient

navigation aid for a visually impaired person that gives a sense of vision by providing the information about their surroundings and objects around them.

Table 1: Apparatus Ratings:

Serial No.	Name	Ratings
1	Arduino UNO	Microcontroller: ATmega328P Operating Voltage: 5V Input Voltage: 7-12V Analog Input Pins: 6 (A0-A5) Digital I/O Pins: 14 DC Current on I/O Pins: 40 mA Flash Memory: 32KB Frequency: 16 MHz
2	HC-SR04 ultrasonic sensor	Power Supply: +5V DC Ranging Distance: 2cm – 400cm Trigger Input Pulse Width: 10us pulse Working Current: 15mA
3	Buzzer	Operating voltage: 5V
4	Battery	Capacity: 9V, 720 mAh
5	Connecting Wire	Capacity: 5A
6	Breadboard	-

Project Details:

Smart walking stick for visually impaired people is made very simply with a few apparatuses (Table 1). The functionalities are given below:

- Ultrasonic sensor works by emitting sound waves at a frequency from ‘TRIG’ pin too high for humans to hear. The ‘ECHO’ pin waits for the sound to be reflected back from an obstacle.

- The time is used to measure the distance from the sensor. $s = (v \cdot t) / 2$ equation is used. Here, v is the speed of sound ($0.034 \text{ cm}/\mu\text{s}$).
- A distance is set below 50cm. If the calculated distance is below 50cm then the buzzer pin is set HIGH for some milliseconds.
- So, the buzzer will let the user know about the obstacle.

Connection:

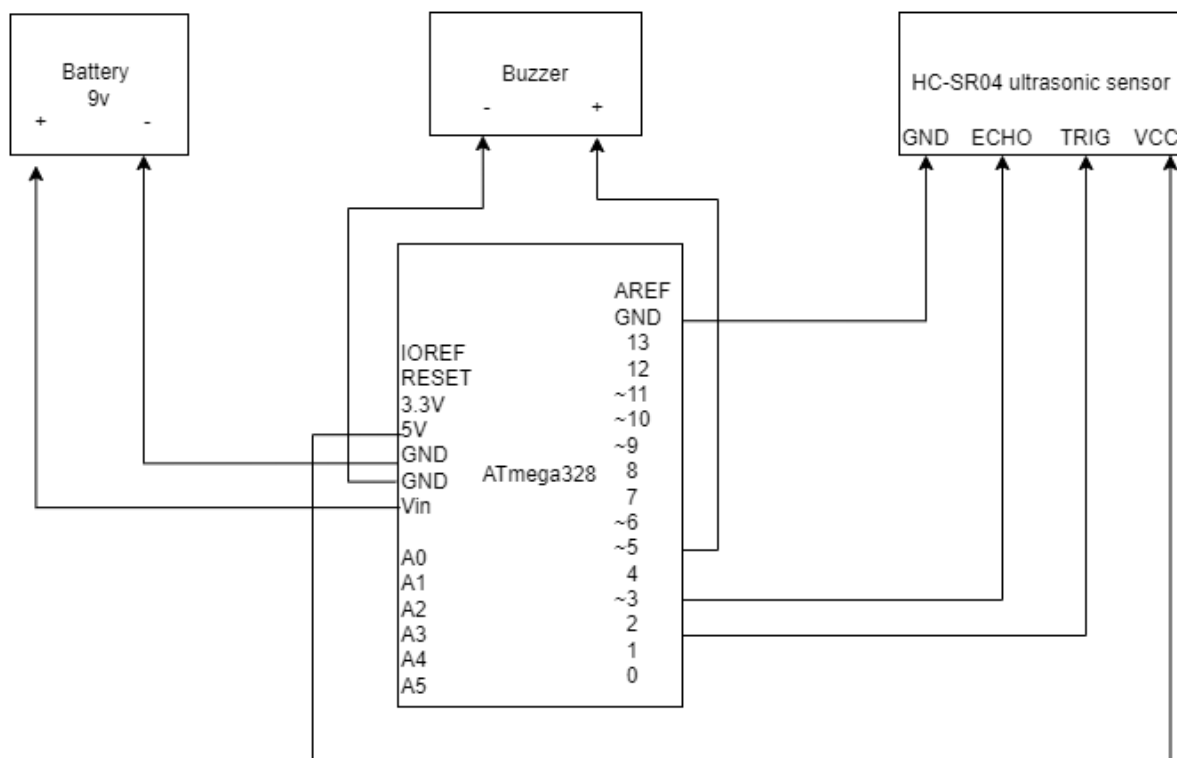


Figure1: Hardware connection of the system.

Discussion:

In this project, we designed a smart walking stick for visually impaired people using Arduino and Ultrasonic Sensor HC-SR04. The blind people are totally dependent on others as they can't walk alone. This is why we created the smart walking stick, a device that allows blind persons to walk freely with ease. The priorities set in our system includes the following:

1. Portable
2. Efficient
3. Low Cost
4. Futuristic
5. Low power consumption

The solution still has many disadvantages. Such as: They can't detect obstructions that are hidden but very dangerous for the blind such as downward stairs, holes etc. Usually, the feedback information comes out as either vibration or sound signals. Thus, these systems communicate their recommendations to the user through sound or frequency vibration. To overcome some of these disadvantages:-

-To facilitate the transmission of information we integrated a buzzer with the stick to alert the obstruction.

-We achieved very fast response time in average distance.

In the future, further modifications to enhance the performance of the system will be added. These include: A global positioning method to find the position of the user using the GPS, and GSM modules to communicate the location to a relative or care giver, incorporating a digital locking and unlocking technology for personalized doors. Also, wireless connectivity between system components can improve other features of the system, such as improving the range of the ultrasonic sensor and incorporating a technique for determining the speed of approaching objects. Visually handicapped and blind individuals in all developing countries were at the forefront of our minds as we developed such a solution.

Conclusion:

There are currently thousands of blind people all around the world. People with poor vision to those who have completely lost their vision are among them. They have a tough time crossing the road or getting to their desired location without the assistance of another person. The standard stick is incapable of detecting impending obstructions. It is outdated. Hence there is a need to update it using today's technology. The aim of this study which is the design and implementation of a smart walking stick for the blind has been fully achieved. The Smart Stick acts as a basic platform for the coming generation of more aiding devices to help the visually impaired to navigate safely both indoor and outdoor. Though the system is hard-wired with sensors and other components, it's light in weight and offers a robust solution for navigation with obvious short response time.

References:

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- 2.<https://techatronic.com/smart-blind-stick-using-arduino-and-ultrasonic-sensor/>
- 3.<https://circuitdigest.com/microcontroller-projects/arduino-smart-blind-stick>