A Smart Stick Assisting the Blind People and Compensates What They Lost

Mariam Omar Issa

Omarmariam126@gmail.com

Abstract

The number of blind people in the world According to a study published in 2017 in the Community Eye Health Journal, the number of blind people increased by 31 million in 1990 to 36 million in 2015, and according to another statistic published in 2020 in ARVO, the number of blind people increased in 2020 to 49.1 million people, most of whom confirmed That there are some challenges and difficulties they face in society, foremost of which is the issue of moving independently, and the urgent need for their presence. In addition to some difficulties related to not rehabilitating and equipping public buildings and facilities for the blind to use so that he can move freely and on his own without the help of others. The main objective of this project is a modern low-cost walking stick that uses an ultrasound sensor to detect obstacles in front of the blind barrier while walking. In the event of any obstacles, this sensor alerts the blind to avoid them, and the alarm is in the form of a bell. Where the stick relies on the (LIDAR) technology that determines light and range, as this technology uses laser beams to detect objects and determine the distance between them. Proteus computer simulation software was used to test system performance

Keywords: Arduino Uno, Arduino IDE, Ultrasonic Sensor, GPS, GSM, LM35.

Introduction

There are millions blind people in this world who always need help from others ,that a person does not live dependent on others is the important methodology in achieving goals, dreams and goals the blind and visually impaired dream of walking and navigating the roads or using the stairs independently without danger. . For many years normal walking the stick has become a well-known feature of mobility for the blind, and subsequent efforts have been made to improve this stick by adding a remote sensor, to provide a more efficient and convenient means of life. . This paper proposes the design and develops a portable stick for the blind for convenient use in public and private spaces Places.

Literature Review

The smart walking stick is very useful for visually impaired people for their safety and freedom from other people Jismi Johnson et al., (2013) introduces a smart walking cane that helps blind people move around and allow them to move to perform their work easily and comfortably. A smart walking stick helps blind people recognize objects, it produces a sound that detects the obstacle by means of a camera. the stick uses the distance between objects and the smart walking stick by ultrasonic sensor when objects

or obstacles come within the range of the ultrasonic sensor, and the pictures will be taken using the camera .

Ramarithenam et al (2013) the proposed system consists of hardware and software. in this system, the Braille touch screen allows easy to use connection with systems. the components are GPS receiver ,a path detector used to find the shortest path to the destination. The navigation process of the system will start as soon as the user gives the destination as a voice command. the system is provided with an emergency button that will trigger an SMS which will send the user's current location (GPS coordinates)

Methodology

Arduino UNO used as the controller, the input and output units are interfaced with the Arduino controller. the ultrasonic sensor is interfaced with Arduino as the input and the output for the ultrasonic sensor are in the form of sound through buzzer, the GPS and GSM are interfaced with Arduino controller through transmitter and receiver methodology, the function of the GPS to locate and the purpose of GSM is to share the location to the particular mobile number, the heartbeat sensor and temperature sensor are also interfaced to check the health conditions by pressing the emergency button in the walking stick the location, the water sensor also interfaced with Arduino controller so if there is any water in front of the stick there is a buzzer sound to alert the blind person , the WIFI module are interfaced with the Arduino controller used for the internet connection, Also for locating the location they used GPS and RF receiver and transmitter that are mainly used to find the walking stick

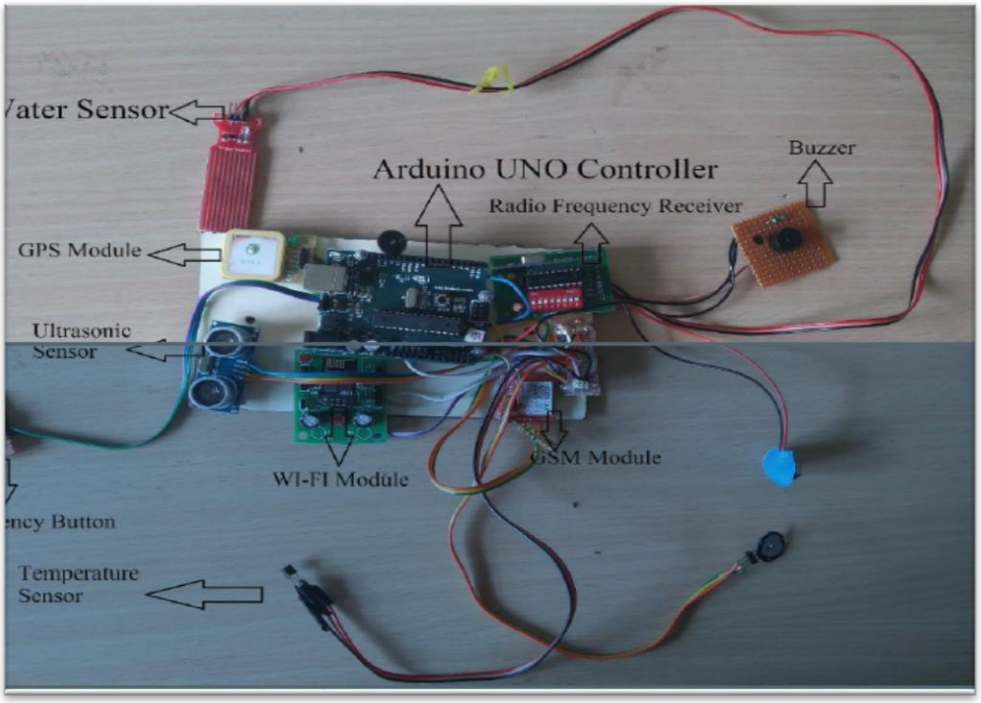

Fig 1. physical equipment for smart stick

physical equipment for smart stick

1-Water Sensor

When the wires touch the water, the electric circuit starts In short, this cuts off the microcontroller, and activates the engine vibrates and turns on a warning message that says: "**Attention There is water”**.

The water sensor output is like yes or no. If there is water the information will be yes otherwise the result is no. In hardware if there is water it will give an alert through buzzer otherwise there is no alert as shown in Figure 2

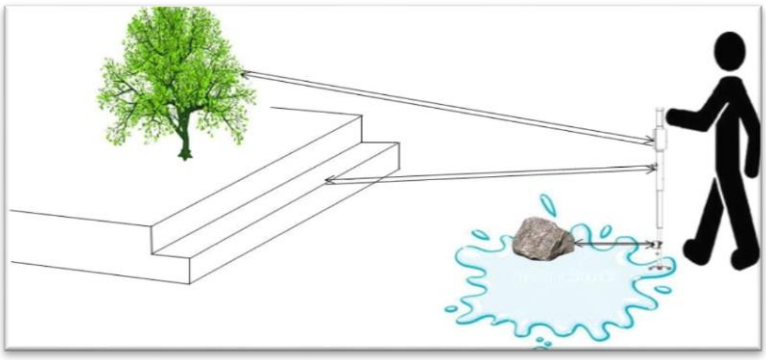

Fig 2. Water sensor

2-vibration motor

Vibration motor is used to inform the user about Obstacle detected by ultrasonic sensors shown in figure 3.

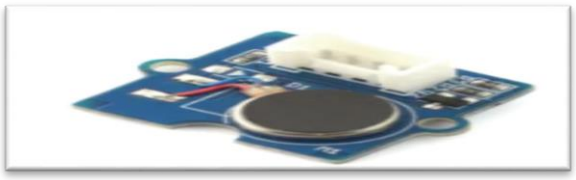

Fig 3. Vibration motor

3- Buzzer

A buzzer is in the lower portion Buzzer is used in smart stick to alert the blind person by generating sound proportional to distance from the obstacle of the audible frequency range of 20 Hz to 20 kHz shown in figure 4.

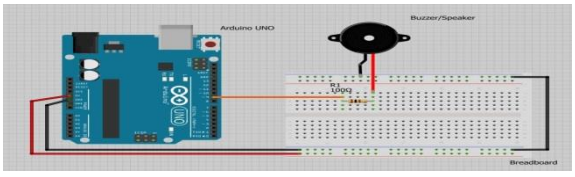

Fig 4. Buzzer

4-Ultrasonic Sensor

Sensors calculate the distance using the time taken for the reception of the echo signal sending the signals and receiving back the echo signals to determine the distance of an object as shown in figure 5.

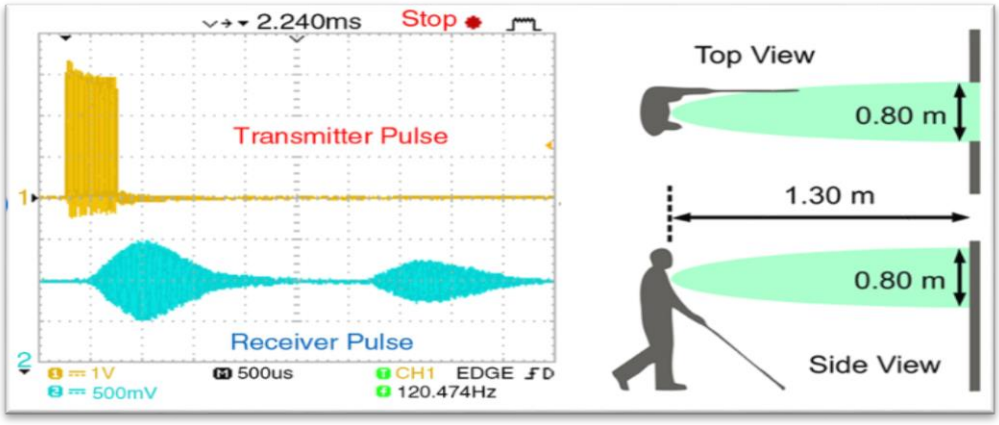

Fig 5. Ultrasonic sensor

5- GSM/GPS Module

When GSM modem receives a message the microcontroller will process the message with the keyword saved in it .then it will get the location of the stick from the GPS modem and the In an emergency the user press the emergency button the microcontroller access the location from the GPS modem and transmit the location to the GSM modem which will send an SMS message to all saved numbers in the microcontroller , The GSM/GPS Module is shown in figure 6.

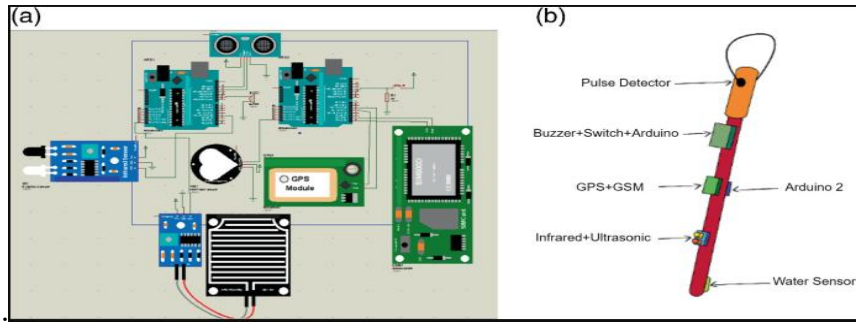

Fig 6 . GSM/GPS Module

Simulation

In this simulation, Arduino board, GSM, WIFI, heartbeat sensor, temperature sensor, water sensor, and ultrasonic sensors are present, and the simulation shows that the interfacing of the GPS modem, GSM modem, WIFI, Heartbeat sensor as shown in figure 7, ultrasonic sensor and temperature sensor is successfully done. Temperature sensor is connected to the Arduino pin (PC1) and this sensor is used to the sense the temperature of the body, the sensor will sense and the output is displayed in the virtual terminal. The water sensor is connected to the Arduino pin (PC0) and this sensor is used to sense the water. If there is any water content present in the water sensor it will give the input signal to the Arduino controller and through Arduino board we can get the output via buzzer or vibration motor. GSM have both transmitter and receiver. Transmitter pin is connected to the Arduino pin (PD5) and the receiver pin is connected to the Arduino pin (PD6). Through GSM the guardian will get the message through mobile phone. The message through is the location of the blind person. Heart beat sensor is connected to the Arduino pin (PC3) and this sensor is used to sense the heartbeat rate of that particular person and it will upload to the cloud for the future analysis. Ultrasonic sensor is connected to the Arduino pin (PD3 and PD4) and this sensor is used to find the obstacles. If there are any obstacles in front of that blind people, the sensor will sense and send signals to the Arduino controller and the output through buzzer or vibration motor the person can find the obstacles**.**

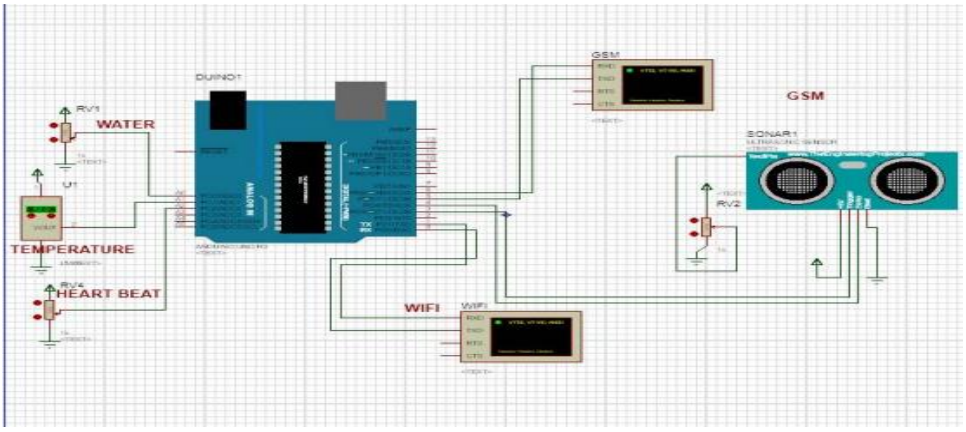

Fig 7. Simulation Circuit of the smart stick using Arduino

Result and Discussion

The output was obtained using Proteus software. In this temperature level, water level, distance between ultrasound Sensors, obstacles and heart rate are displayed. In this it displays the temperature value in degrees Celsius. The water sensor came out like yes or no. if there was the information will be yes, otherwise the result will be no. In appliances if there is water, an alarm will be issued through it Bell otherwise there is no alert. The ultrasonic sensor displays the distance between the ultrasonic sensor and

obstacle. The heart rate sensor displays a person's heart rate for a period of fixed time as shown in figure 8..

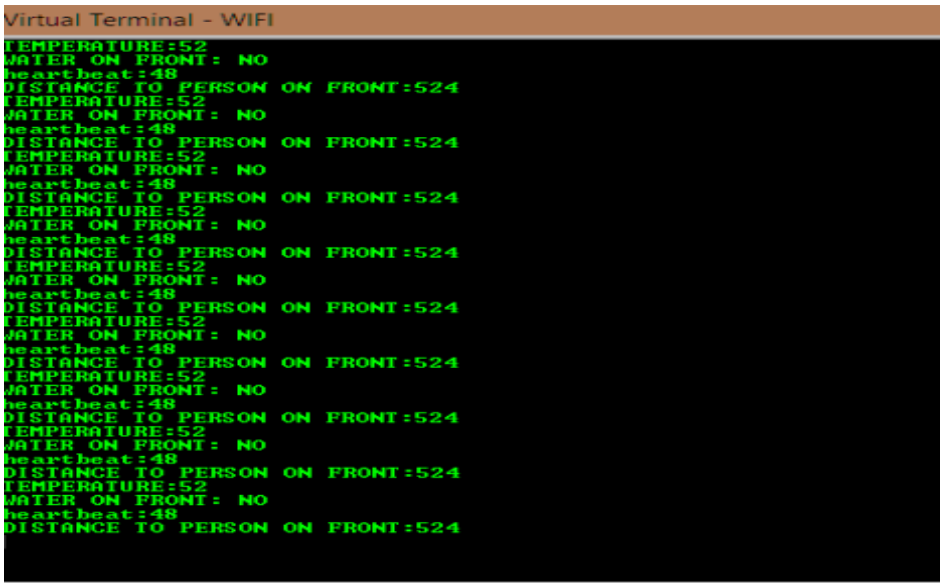

Fig 8. Results Obtained in Proteus

Conclusion

The system was simulated by using Protests software. The simulation results are:

- ✓ This system having the delay while detecting the obstacles between 2 to 4 second.
- ✓ The delay for the GPS to get the location for the stick is around 30 seconds to 0ne minute.
- ✓ GPS system cannot be used for indoor because of the GPS signal will be too week.
- ✓ The vibration motor only will activate if the distance is less than 50cm from the obstacle.

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