CSE360 Lab Project Proposal

Topic: Cane for the visually impaired

Section: 11

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Introduction:

According to the most recent data census provided by the National Eye Institute, the number of people with visual impairment in the United States is calculated to double by 2050, which is estimated to be more than 8 million people. Despite this drastic increase in blindness, there still seems to be no permanent cure for the visually impaired. In this fast moving world, a constant guide or human figure support for the blind seems difficult to attain due to people's being busy in their day to day activities. Considering this, we aim on interfacing a smart cane which will easen the movement and functionality of the blind, thereby reducing the pressure of a human aid. This cane will help the visually impaired to attain normality and function on his own to a certain extent which will eventually increase productivity in that individual. The aim of designing this cane is in such a way that minimal cost is incurred since losing the blind stick is a common issue among the weak sighted. The blind cane that we aim at designing interfaces for by collecting data about the dangers in the surrounding environment and alerting the blind user by producing sounds from the buzzer. The Adafruit AHT20 takes the surrounding temperature and humidity as an input, and if the temperature and humidity are above a certain threshold, it signals the user of the presence of a hot body or high water content within that area. Thus, the blind become aware and do not take that particular path. Using the GY-NE06MV2, the family of the blind individual can keep track of his whereabouts as this is a satellite based navigation system. Accordingly, the A6 GPRS GSM Module will serve as a messenger and notify his location to a family member through SMS. The HC-SR04 is used to sense obstacles around the blind user, and if an obstacle is detected, warning signals in the form of sound through the buzzer are sent out to the user. And from this notification, the blind person is alerted and moves along a different route.

Application Area:

Due to the cane being user friendly and robust in nature, it can be made to be used in a wide range of applications, which includes almost all the fields of the daily lives of visually impared people. It can function well both indoors and outdoors, and if implemented properly, it can be marketed as a potential cutting edge technology for the blind.

Technology and tools:

Arduino This is our microcontroller. After the calibration circuit completes converting the analogue data to digital from the sensor, this Arduino processes the data and performs tasks that were programmed.

Ultrasonic Distance Sensor (HC-SR04) This is the ultrasonic distance sensor HC-SR04. This inexpensive sensor has non-contact measurement capabilities from 2 cm to 400 cm with a maximum range accuracy of 3 mm. Each HC-SR04 module consists of an ultrasonic transmitter, a receiver, and a control circuit.

The Adafruit AHT20 is a humidity and temperature sensor. It is used to measure the humidity and temperature, but in our case, we are going to use it to detect any water source in front of the visually impaired person.

A6 GPRS GSM Module: It is going to be used to send the location of the stick carrier to their emergency contacts as an SMS.

GY-NE06MV2: A GPS sensor that uses a satellite-based navigation system with a network of 24 satellites in orbit around the earth to provide position, velocity, and timing information. In this case, the coordinates of the user's current location are sent to the user's emergency contacts when the switch is pressed or periodically.

Buzzer: This will alert the user if there is an object or obstacle or water source in front of them.

Switch: It is used to send the coordinates of the current location to the saved user.

Programming Language:
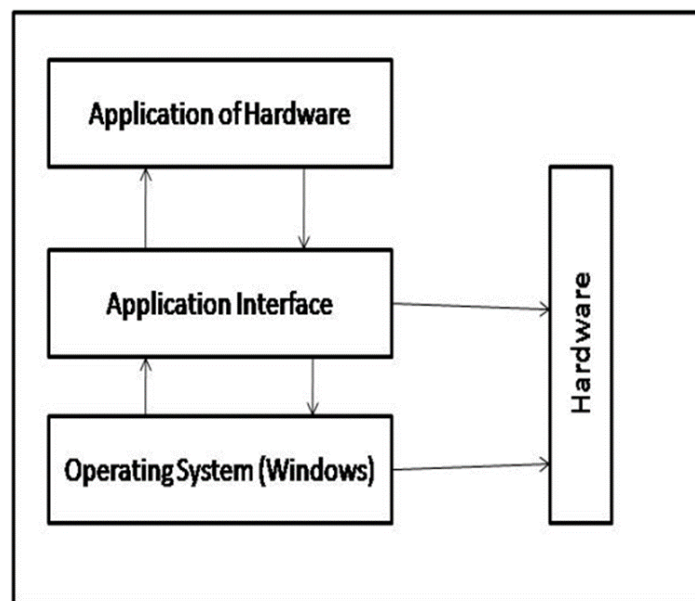
The programming software for this is known as Arduino-IDE. This is an open source programming platform using the Arduino Mega Board. It is very easy to write code and upload it to the I/O board. To configure software, we have to use the Arduino IDE named arduino.exe . The whole system is implemented using the C programming language and is written on the Arduino platform. Then it can be uploaded to the microcontroller using the Arduino IDE software.

Working Mechanism:

The HC-SR04 ultrasonic distance sensor is made up of two ultrasonic transducers. One operates as a transmitter, converting the electrical signal into ultrasonic sound pulses at 40 KHz. The other serves as a receiver, listening for sent pulses. When the receiver receives these pulses, it generates an output pulse whose width is proportionate to the distance between the receiver and the subject in front of it. According to the pulse width, distance is measured and further instructions are played out by the MPU based on the distance.

The Adafruit AHT20 is a humidity and temperature sensor. This sensor has an average precision of +-2% relative humidity and +-0.3 °C. There is just one I2C address, so it is not a choice when several humidity sensors are required, and as our device requires only one sensor, it will be efficient.

The A6 GPRS GSM module It is used to send text messages or make calls. In our case, it is going to be used to send text messages with the current location.

GY-NE06MV2 With the NEO-6M GPS module, we can give our Arduino project the capacity to sense places everywhere on the planet. This module can track 22 satellites and identify a location's precise coordinates. Anyone who is interested in entering the realm of GPS will find that it makes an excellent starting point. They consume little power, making them appropriate for use in devices that are powered by batteries. They are inexpensive, they are simple to interface with, and they are widely used in DIY projects.

Connections with ICs:
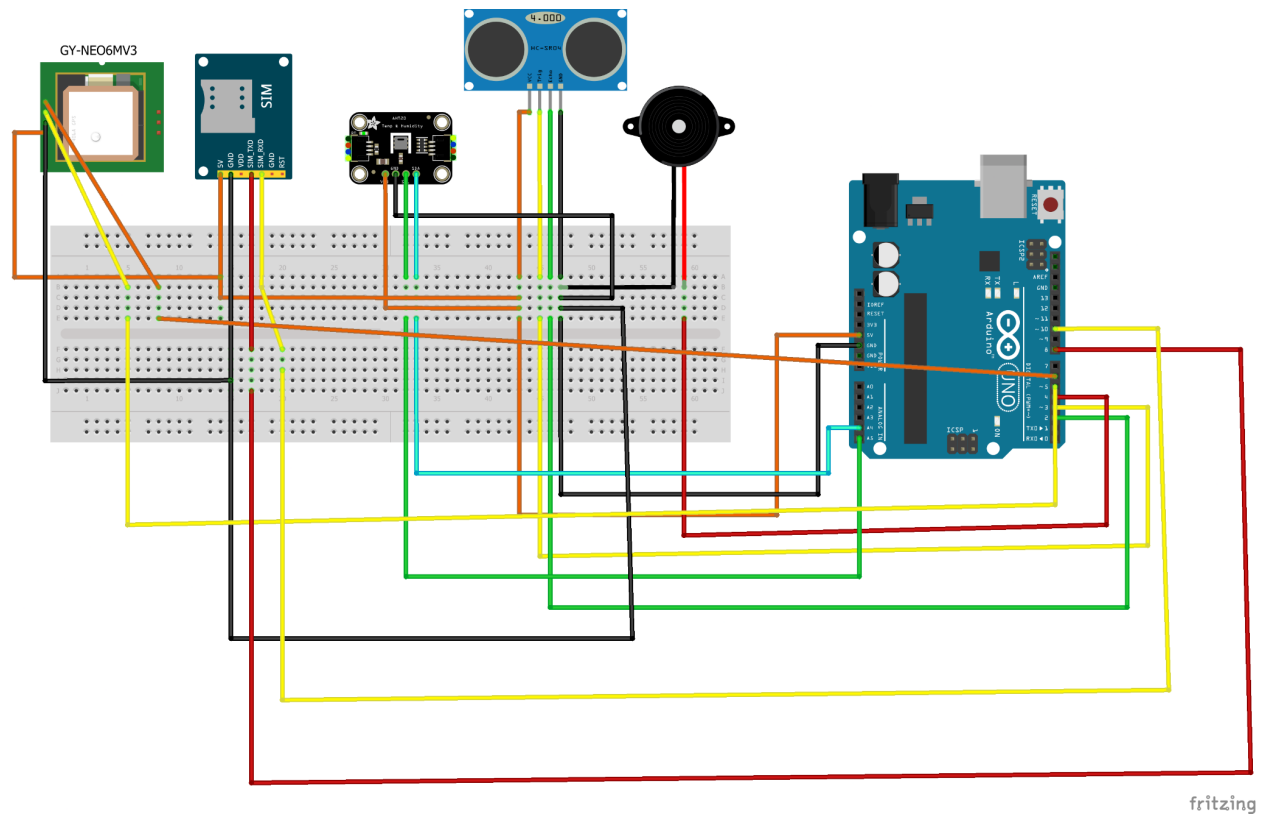
Data flow from sensors through ICs to I/O devices:
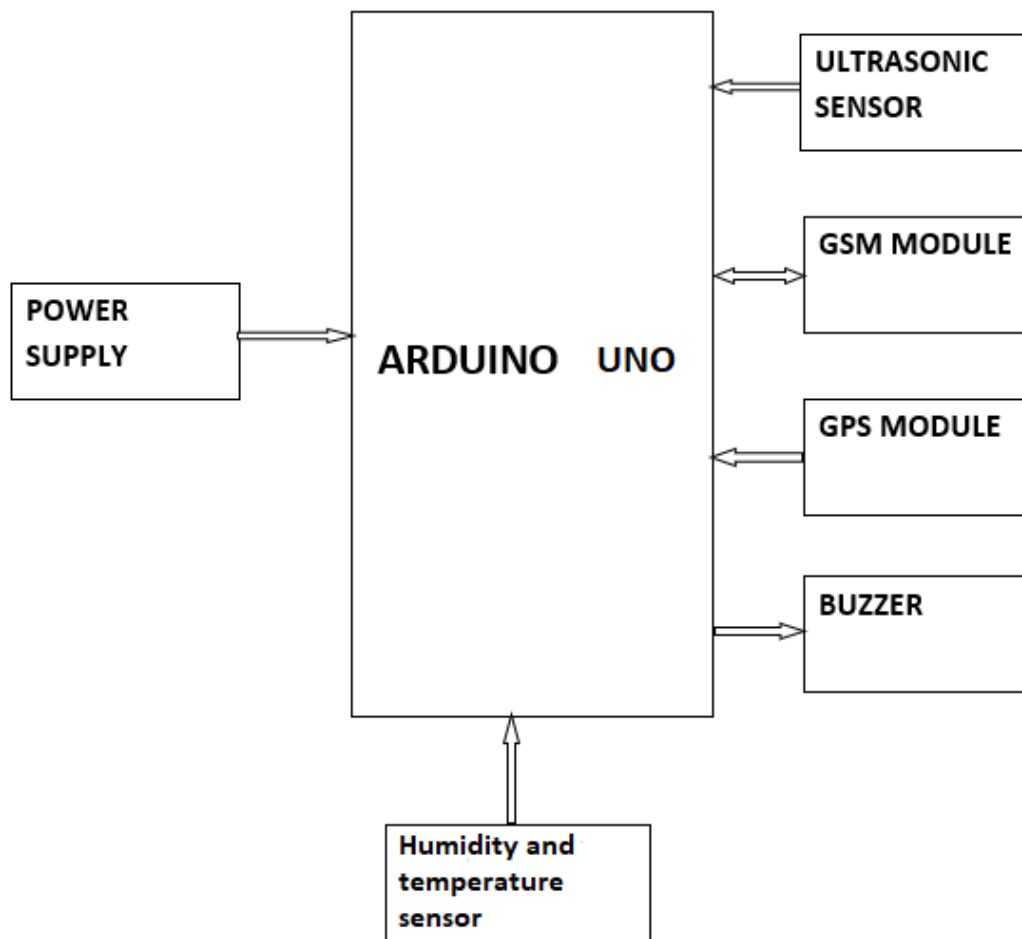
The HC-SR04

The Trig (trigger) pin is used to trigger ultrasonic sound pulses. By setting this pin to HIGH for 10μs, the sensor initiates an ultrasonic burst. The echo pin goes high when the ultrasonic burst is transmitted and remains high until the sensor receives an echo, after which it goes low. By measuring the time the echo pin stays high, the distance can be calculated. If the distance is below or above a certain threshold, the MPU sends appropriate pulses to the buzzer as output.

Adafruit AHT20

VIN is the power pin. It gives the board the same amount of power as the logic level of your microcontroller in order to power it. For instance, if your microcontroller is a 5V micro like Arduino, give it 5V. Moreover, we have a GND pin, which is the common ground for power and logic. The SCL pin, also known as the I2C clock pin, is connected to the I2C clock line on your microcontroller. The logic level is the same as VIN, and There is a pullup resistor of 10 kilo ohms already attached to it. Finally, SDA - I2C data pin, connect to your microcontroller's I2C data line. The logic level is equivalent to the VIN level. In addition, it already has a 10,000 pullup on it.

The A6 GPRS GSM module

The SIM_txd pin is used for serial communication (acts as a transmitter). The SIM_rxd pin is used for serial communication (acts as a receiver).

GY-NE06MV2

The GND pin is the ground pin and needs to be connected to the GND pin on the Arduino. The TxD pin is used for serial communication (transmitter). The RxD pin is used for serial communication (receiver). Finally, VCC supplies power to the module. You can connect it directly to the 5V pin on the Arduino.

Estimated Cost Analysis:

Costing is always an important factor for any project. The price of electronics is not stable for a developing country like Bangladesh, because Bangladesh never produces electronics parts. We have to import them from other countries. So, keeping that in mind, the project is estimated at minimal cost for cost-effective uses.

Component	Quantity	Price Per Quantity	Price
Arduino Uno	1	1200	1200
Adafruit AHT20	1	700	700
Sonar Sensor(The HC-SR04)	1	90	90
Breadboard	1	100	100
Buzzer	1	20	20
9V Battery	2	45	90
A6 GPRS GSM Module	1	900	900
GY-NE06MV2	1	900	900
Switch	1	20	20
Miscellaneous	1	180	180
Total			4200

Responsibilities of Each Member:

Name	Responsibility
MD. AZHARUL ISLAM	Basic Interfacing Setting up Connections
FATIHA ISHRAR CHOWDHURY	Humidity sensor modeling and final implementation
MD. ISA SAYEK HUDA	GSM & GPS sensor modeling. Initial Test Run
MOHAMMAD RAKIBUL HASAN MAHIN	Sonar sensor modeling, and final implementation

Gantt Chart:

Duration	Tasks
Week 1	Basic Interfacing Setting up Connections
Week 2	Humidity sensor modeling.
Week 3	GSM & GPS sensor modeling. Initial Test Run
Week 4	Sonar sensor modeling & Final Implementation

Conclusion:

The project will be successfully designed and tested for effective use. It will be upgraded by properly integrating all the features of all the hardware components used and software. Every module's specifications and uses are described in detail. Using advanced microcontrollers and other technology, the project will be implemented. We conclude that by implementing this cane, a huge population of the disadvantaged vision will be benefitted.

Reference:

Varma, R et al, "Visual impairment and blindness in adults in the United States: Demographic and Geographic Variations from 2015 to 2050," JAMA Ophthalmology, DOI:10.1001/jamaophthalmol.2016.1284.

SMART BLIND STICK USING ARDUINO ,GSM MODULE ,GSM MODULE,ULTRASONIC SENSOR AND RAIN SENSOR. URL:
https://electronicsworkshops.com/2020/06/14/smart-blind-stick-using-gsm-module-gsm-module ultrasonic-sensor-and-rain-sensor/?fbclid=IwAR3fFTOeMcTvEy1CcWEwUb1UR1l_fSj0uFbU0 9UmRBOOpgIWMEVg9EdnYlY

In-Depth: Send & Receive SMS & Call with A6 GSM Module & Arduino. URL: https://lastminuteengineers.com/a6-gsm-gprs-module-arduino-tutorial/#:~:text =A6%20GSM%2FGPRS%20module%20is,TCP%2FIP%2C%20and%20more!