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VIRTUAL EYE FOR THE VISUALLY CHALLENGED

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Abstract - *The advancement was incorporated with the help of Node MCU (microcontroller) in the walking stick that allows visually challenged people to navigate with no one's help using the voice commands from the mobile application. The output will be sent from the voice module via Bluetooth module to the paired device i.e. mobile phone. It is intended in a way that it provides overall mission over artificial intelligence and object detection. Thus the proposed method has successfully proved to be more efficient in providing accurate output as commands and being more user-friendly.*

***Key Words*: sensors, commands, output, stick, bluetooth**

1. INTRODUCTION

Vision plays a vital role in every one's life from feeling the real world to making the own necessities made possible. It can either achieved by natural vision or by replacement to the human eye. The stick is incorporated with Ultrasonic sensor, Rain sensor, LDR whose outputs are dumped into Node MCU(microcontroller) in the form of analog outputs which are parameterized into voice commands using voice module with necessary program and finally to a paired mobile application. Ultrasonic sensor detects the obstacle; Rain sensor senses the region ahead of the person; LDR output is an analog value where the output voice commands pursues the parameterized value for the output command.

This system replaces the hustle in making the idea into system, removing the hurdles of the idea into practical system. This is a model that has itself with many of the separately considered parameters in a single stick.

2. EXISTING SYSTEM

Several proposals are available for the smart stick models. Most of these proposals are ideas that may or may not be made into the working model.

2.1 BLIND STICK NAVIGATOR TOOL

This is a prototype model which is designed using five different sensors with microcontroller interface are used which are connected to a buzzer and vibrator. ATMEGA 16 is the main controller used here. The sensors used here are fire sensor, ultrasonic sensor, IR, LDR, water sensor which are used as input source and the output will be in the form of buzzer and vibrator. This blind assist tool that provide obstacles notification and GPS location to the guardian or authority via SMS. The major drawback of this prototype is the buzzer sound which will create nuisance to the people around the visually challenged people who uses this device.

2.2SMART BLIND STICK

Arduino Nano is used to control all the sensors in this model. The complete board is powered by a 9V battery which is regulated to +5V using a 7805 Voltage regulator. The Ultrasonic sensor is powered by 5V and the trigger and Echo pin is connected to Arduino nano pin 3 and 2. The LDR is connected with a resistor of value 10K to form a Potential divider and the difference in voltage is read by Arduino ADC pin A1. The ADC pin A0 is used to read the signal from RF receiver. The output of the board is given by the Buzzer which is connected to pin 12.have used a small hack to make this RF remote control circuit to work. Normally while using this 433 MHz module requires an Encoder and Decoder or two MCU to work. But, in our application we just need the receiver to detect if the transmitter is sending some signals. So the Data pin of the transmitter is connected to Ground or Vcc of the supply. The data pin of the receiver is passed through an RC filter and then given to the Arduino. The distance is measured from any obstacle. There will be no alarm if the measured distance is more than 50cm. But, if it is less than 50cm the alarm will start by beeping the buzzer. As the object gets closer to the buzzer the beeping interval will also decrease. The closer the object is the faster the buzzer will beep. This can be done by creating a delay that is proportional to the distance measured. Now, whenever the button is pressed the Receiver output some constant ADC value repeatedly. This repetition cannot be observed when the button is not pressed. So Arduino program is written to check for repeated values to detect if the button is pressed. That is how a Blind person can track his stick. When the button is pressed on the remote the buzzer will give a long beep, the output is purely a buzzer sound, if the ultrasonic sensor is closer to the object and the Buzzer keep on beeping and this beeping frequency increases as the stick goes closer to object. If the LDR is covered in dark or if there is too much light the buzzer will beep. If everything is normal the buzzer will not beep. If the buzzer is always beeping, it means the alarm is being false triggered. Then the serial monitor must be opened and checked.

3. PROPOSED SYSTEM

The proposal is developed using three sensors namely,

- ultrasonic sensor,
- rain sensor,
- LDR

which are programmed to work in Node MCU microcontroller on Arduino IDE that is dumped into the microcontroller and the output will be based on the target the stick encounters, while the necessary voice command to alert the user will under Bluetooth communication to the paired android mobile.

Power Supply=> Sensors => Node MCU =>Bluetooth module => Android application => Voice commands

The output is in the form of voice commands only from the paired android mobile, that avoids disturbance to the one around the user. The commands can be modified by re-programming.

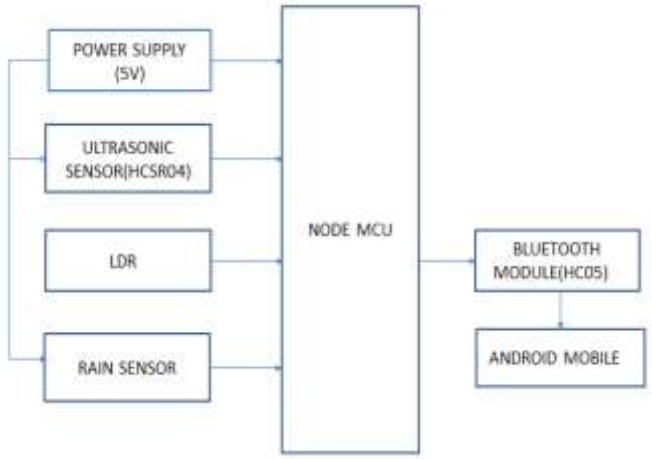

Fig -1: Block diagram

3.1COMPONENTS

Node MCU, is an open source IoT platform which includes firmware which runs on the ESP8266 Wifi SoC and from Expressif systems and the hardware based on ESP-12 module that supports Wifi and bluetooth. Ultrasonic sensor generates high frequency sound waves and evaluate the echo which is received back by the sensor, the time taken to transmit the signal and to retrieve back by the sensor is used in calculating the distance between them. Rain sensor which is otherwise a rain switch gets activated when rain drops fall on the surface of the panel. LDR, otherwise called photo-resistor is a light controlled variable resistor whose resistance decreases with increasing incident light intensity. Bluetooth module in other words is a communication bridge between voice module and paired mobile. They are selected on the basis of lesser distance coverage in order to minimize the ambiguity with distance obstacles.

3.2COMMUNICATION

The output from the microcontroller is communicated to the android mobile phone via Bluetooth communication.

3.3SOFTWARE

Software program is compiled in Arduino IDE which is a user friendly programming environment.

Fig -2: Arduino IDE program compilation

4. HARDWARE DESCRIPTION

On the basis of range to be considered, the components were selected and on the other hand to ignore ambiguity.

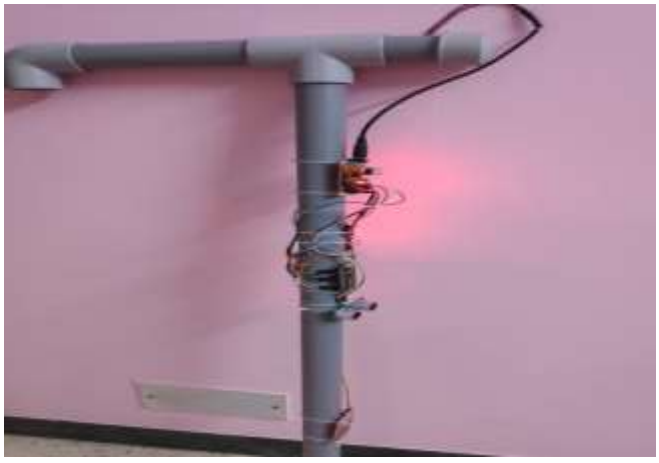

Fig 3-:Hardware prototype

4.1NODE MCU

It has 12 GPIO pins from which the three sensors namely ultrasonic sensor, rain sensor and LDR utilize the inputs and outputs based on the hardware connection that encounters with the code. Firstly, the program to be performed by the system has been dumped into it. Then, the inputs of the sensors are soldered with connecting wires while necessary power supply of 5v is given.

4.2. ULTRASONIC SENSOR

The ultrasonic sensor transmits sound waves and the sound waves travel through the medium with specific velocity at an angle of 35 degree. The sound waves from the sensor once when hit the obstacle reaches back to the receiving terminal. Based on their transmission and receiving intervals, the distance is calculated. The short burst of ultrasonic sound reflects the sound back to the sensor, then the command "obstacle detected" is delivered to the user.

4.3. RAIN SENSOR

The rain sensor senses the water that completes the circuits in the printed leads on its sensor boards'. Here, the leads on the surface of the panel acts as a variable resistor that varies from 100k ohms when wet to 2M ohms when dry. In short, the wetter the board the more current will be conducted. Hence, the program is programmed in a way to indicate wet condition, i.e the presence of water and its output will be delivered as "water here" as output.

4.4.LDR

LDR or Light Dependent Resistor is made up of a high resistance semiconductor. In the dark, it can have a resistance as high as several mega-ohms, while in the light it can have a resistance as low as few hundred ohms. The incident light on the LDR when exceeding certain frequency, the photons absorbed by the semiconductor gives bound electrons enough energy to jump into the conduction band, where the resulting free electrons and their hole partners conduct electricity, lowers electricity. This is considered as output of the LDR, which is fed as output to the Bluetooth module.

4.5. BLUETOOTH MODULE

The Bluetooth module HC-05 works with serial data. This means that the microcontroller sends information and the Bluetooth module receives it via serial and vice versa. By default, the HC-05 module operates at a baud rate of 9600. The module works on 5V supply and the signal pins operate on 3.3V, hence a regulator is present in the module itself.

4.6 MOBILE APPLICATION

The Bluetooth module communicates with the paired device and thereby it provides the necessary voice commands to the visually challenged. The command is provided both as voice command and text so that it would be better for a second party user who guides the user. The mobile app designed especially for this is SMART MIRROR using JAVA programming.

Fig -4:Smart mirror: Android application

5. WORKING

The ultrasonic sensor and the rain sensor requires 5v supply from the power supply while LDR is activated from the minimum supply from the microcontroller. Node MCU is dumped with program to be processed using Arduino IDE and checked for Bluetooth transmission. The hardware connections are checked for any short circuits. If no error or problem is found, the circuit is placed on the upper surface of the walking stick with necessary insulations. When power supply is provided, the hardware circuit gets activated and the program in the microcontroller is enabled. As a result, the stick begins to sense the obstacle with the help of ultrasonic sensor, the presence of water ahead the path is sensed by rain sensor, while the condition whether light or darkness is sensed using LDR and all these parameters once found is delivered as voice commands through the paired android mobile application via Bluetooth communication. The 5v power supply battery can be replaced or recharged once when the charge is found to be drained.

6. RESULTS

The outputs are verified and inspected for a continuous usage of our 3 days till when the charge gets drained. This being user friendly in the way it is designed proves better mode of usage avoiding hardships from existing ones. The designed prototype model can able to detect the obstacle in the straight path, right angle path and the curved path when moved the stick. At least 1m width is required for the proper management of the stick so that the circuit connections avoid shorting. The ultrasonic sensor enables wide range obstacle information. Major drawback of sensors is their non-linear response i.e. a big change in output voltage does not always indicate a big change in range. Apart from these

user is guided for clear path by considering various environmental factors such as rain or presence of water, obstacle, darkness in the region. With the help of this stick, user can improve more than 25-40% travel speed, that reduces collision between them, and it provides increased safety as compared to unaided equipments. All the concepts of the proposed system were checked for their output and proper functioning. Using this technology we can help the visually challenged people navigate safely and freely without any accidents.

Fig -5: Output screen on app

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