Electronic Blind Stick

Prof. Swapnil B. Wani [1] (Faculty of CSE- IOT), Mr. Ramiz Abrar Ahmed Shaikh[2],
Mr. Amol A. Nagaokar[3] , Mr. Daksh Vasant Meshram[4].

1. *Faculty of CSE-IOT of SIES Graduate School of Technology, Nerul, New Mumbai, Maharashtra*
2. *Department CSE-IOT of SIES Graduate School of Technology, Nerul, New Mumbai, Maharashtra*
3. *Department CSE-IOT of SIES Graduate School of Technology, Nerul, New Mumbai, Maharashtra*
4. *Department CSE-IOT of SIES Graduate School of Technology, Nerul, New Mumbai, Maharashtra*

***Abstract*— Blind stick is an innovative stick designed for visually disabled people for improved navigation. We here propose an advanced blind stick that allows visually challenged people to navigate with ease using advanced technology. The blind stick is integrated with ultrasonic sensor along with light and water sensing. Our proposed project first uses ultrasonic sensors to detect obstacles ahead using ultrasonic waves. On sensing obstacles the sensor passes this data to the microcontroller. The microcontroller then processes this data and calculates if the obstacle is close enough. If the obstacle is not that close the circuit does nothing. If the obstacle is close the microcontroller sends a signal to sound a buzzer. Wireless RF based remote is used for this purpose. Pressing the remote button sounds a buzzer on the stick which helps the blind person to find their stick. Thus this system allows for obstacle detection as well as finding stick if misplaced by visually disabled people.**

Keywords*— *Arduino IDE, Arduino Nano, Sensors

I. INTRODUCTION

The proposed electronic guidance system for the blind and visually impaired individuals aims to address existing limitations in current mobility aids. Traditional methods rely on sonar input, such as infrared or ultrasonic signals, similar to radar systems. These systems detect obstacles based on distance, providing limited information about the objects encountered. However, the presented work introduces a novel approach using an embedded vision system comprising three ultrasonic sensors and a PIC microcontroller (Arduino Nano). The key innovation lies in the system's ability to amalgamate reflective signals from the sensors to not only measure distance but also determine two crucial characteristics of obstacles: material and shape. This additional information enhances spatial awareness and memory for the user, surpassing the capabilities of existing devices. Moreover, the system incorporates GPS technology to track the user's location and transmit it via SMS, offering an additional layer of assistance and safety [1]. In essence, this modern blind stick represents a simple, efficient, and configurable electronic guidance system that empowers visually impaired individuals to navigate both indoor and outdoor environments independently and safely. By providing detailed information about obstacles, including their material and shape, and incorporating GPS for location tracking, the system significantly improves the user's mobility and spatial understanding.

ARDUINO NANO

The Arduino Nano is a small, complete, and breadboard- friendly board based on the ATmega328 (Arduino Nano 3.x). It has more or less the same functionality of the Arduino, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one.

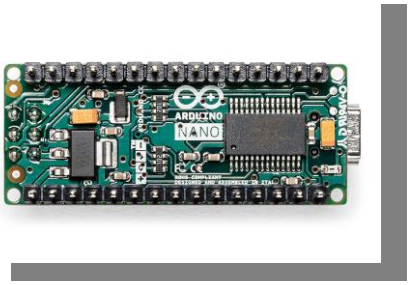

Figure 1: Arduino Nano

ULTRASONIC SENSOR

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. Ultrasonic sensors can measure the distance to a wide range of objects regardless of shape, color or surface texture. They are also able to measure an approaching or receding object. Ultrasonic sensors can measure the distance to a wide range of objects regardless of shape, color or surface texture. They are also able to measure an approaching or receding object[2].

Figure 2: Ultrasonic Sensor

GPS SENSOR

The NEO-6M GPS module is a well-performing complete GPS receiver with a built-in 25 x 25 x 4mm ceramic antenna, which provides a strong satellite search capability. With the power and signal indicators, you can monitor the status of the module. It can track up to 22 satellites over 50 channels and achieve the industry's highest level of tracking sensitivity i.e. -161 dB, while consuming only 45 mA current. Unlike other GPS modules, it can perform 5 location updates in a second with 2.5m horizontal position accuracy.

Figure 3: GPS Sensor with patch antenna

INFRARED SENSOR

An infrared sensor (IR sensor) is a radiation-sensitive optoelectronic component with a spectral sensitivity in the infrared wavelength range 780 nm … 50 µm. IR sensors are now widely used in motion detectors, which are used in building services to switch on lamps or in alarm systems to detect unwelcome guests. In a defined angle range, the sensor elements detect the heat radiation (infrared radiation) that changes over time and space due to the movement of people.

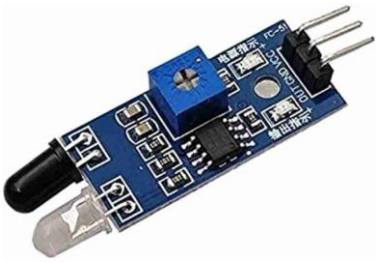

Figure 4: Infrared Sensor

WATER SENSOR

This water level sensor module has a series of parallel exposed traces to measure droplets/water volume in order to determine the water level. Very Easy to monitor water level as the output to analog signal is directly

proportional to the water level. The working principle of the water level sensor is that when the sensor is put into a certain depth in the liquid to be calculated, the pressure on the sensor's front surface is converted into the water level height.

Figure 5: Water Sensor

BUZZER

In simplest terms, a piezo buzzer is a type of electronic device that's used to produce a tone, alarm or sound. It's lightweight with a simple construction, and it's typically a low-cost product. A piezo buzzer works by applying an alternating voltage to the piezoelectric ceramic material. The introduction of such an input signal

causes the piezo ceramic to vibrate rapidly, resulting in the generation of sound waves.

Figure 6: Buzzer

Hardware interfacing

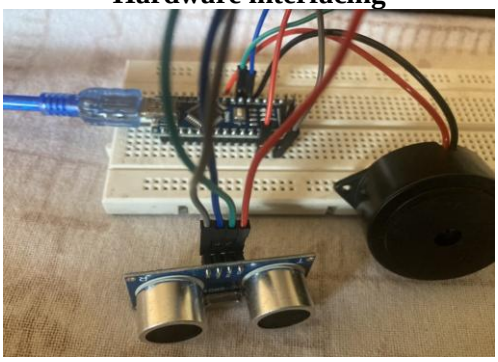

Figure 7: Interfacing Arduino with Ultrasonic Sensor

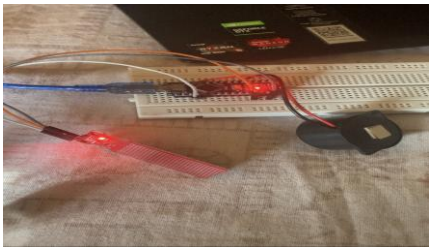

Figure 8: Interfacing Arduino with Water Sensor

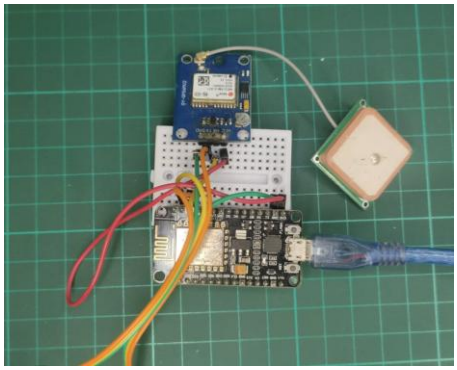

Figure 9: Interfacing ESP-8266 with NEO-6M GPS Module

CONCLUSION

In the end of our project, we can conclude that our project can reduce the number of risk and injuries for the visually impaired person when walking at public. Nowadays, even at young age experience the visually impairment. This thing cannot be taken as lightly as they know how much risk it could be. If the number of risk and injuries increasing rapidly, the kid or the person will lose their spirit to walk independently. The Modern Blind 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. It is effective and affordable. It leads to good results in detecting the obstacles on the path of the user in a range of two meters. Though the system is hard-wired with sensors and other components, it's light in weight. Further aspects of this system can be improved via wireless connectivity between the system components, thus, increasing the range of the ultrasonic sensor and implementing a technology for determining the speed of approaching obstacles. In conclusion, an electronic blind stick can be a highly effective tool for individuals who are blind or visually impaired. It can provide them with greater mobility, safety, and independence in their daily lives. By incorporating advanced technologies such as sensors, GPS, and voice guidance systems, electronic blind sticks can help users navigate their environment with greater ease and accuracy. Additionally, the compact and portable design of electronic blind sticks makes them highly convenient for travel and use in a variety of settings. Overall, electronic blind sticks have the potential to greatly enhance the quality of life for individuals with visual impairments.

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