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Obstacle Detection For Blind People

Mrs. S. Divya[1] , Jayapreethi. S[2]

[1] Assistant Professor, Department of Computer Science

[2] Department of Computer Science, Sri Krishna Adithya College of Arts and Science, Kovaipudur, Coimbatore, Tamil Nadu, India

preethit194@gmail.com

ABSTRACT—

Obstacle detection is a critical challenge for visually impaired individuals, significantly affecting their mobility and independence. This paper presents a comprehensive review of current technologies and methodologies designed to assist blind people in detecting and navigating around obstacles. We explore various sensor-based systems, including ultrasonic sensor along with emergency techniques in machine learning and computer vision. By evaluating the effectiveness, affordability, and user-friendliness of these technologies, to identify the most promising approaches for real- world applications. Our findings highlight the potential of integrated systems combining multiple sensors and artificial intelligence to provide accurate and real-time obstacle

detection. The study also discusses the importance of user-centered design and accessibility considerations in developing assistive technologies for the blind. Through this analysis, we seek to contribute to the ongoing efforts to enhance the autonomy and quality of life for visually impaired individuals. This paper presents a comprehensive review of current technologies and methodologies designed to assist blind people in detecting and navigating around obstacles, focusing on wearable solutions integrated into smart glasses. The proposed system is an advanced wearable glass equipped with a multi-sensor. A system is proposed for obstacle detection and alert system. A white cane is developed which can communicate with the blind person through buzzer beep and vibration signals. Ultrasonic

sensors are majorly used for detecting the barriers. Thus, the obstacles are detected by these ultrasonic sensors and the person is alerted either by the vibrational signals or the buzzer alarm.

Blind people are dependent on others to get assistance during travelling. There are many obstacles along the path. To avoid these obstacles traditionally followed methods such as blind man,,s stick or white cane is used. By these methods, the detection of obstacles is effective.

Introduction :

Visually impaired people are the people who are not able to identify smallest detail with healthy eyes. Such people are in need of aiding devices for blindness related disabilities. As described 10% of blind have no usable eyesight at all to help them move around independently and safely. The electronic Helping devices are designed to solve such issue. In this work, most of the problems that may face the blind people are solved like the barriers or people in front of him at a certain distance because they may cause a collision. In addition, holes or stairs in the way of the blind that will cause him to fall are another problem.

Walking in an urban environment is so easy for most of us that we pay almost no attention to this activity, but a blind person needs much concentration to travel without the help of a guide, even on a well- known route. A person deprived of visual stimuli must base his\her spatial orientation on such methods as feeling the surface properties with feet, estimating the distance to potential obstacles from the echo of their own footsteps, recognizing subtle smells or sound characterics of particular places, or counting steps to the point of changing the direction of movement, if there are no other clues. A momentary distraction of attention, unexpected obstacle, unnoticed important signal or mistake while counting steps may result a loss of orientation and force a blind person to seek help from other people. Since the running of daily life of blind people is very difficult. This project helps them to run their life as usual. They can make this project as a gadget or a device in their hands which detects the obstacle. This project is more efficient than the existing system with cheaper and accurate one. Here we are using Arduino UNO board to perform this operation. To make the life to be as a normal one for the blind peoples this may be very helpful project for them. By making this as a gadget or a device in their hand they can easily judge an object by their own by knowing the buzzer sound. The system uses ultrasonic sensor as a wide range of field to detect an object with its higher detection range.

Proposed System :

The proposed system deals with the cheaper and effective obstacle detection with a wide range of coverage. The device includes the following Major components:

- Arduino UNO
- Ultrasonic sensor

- Potentiometer
- Buzzer
- Vibration motor

ARDUINO UNO:

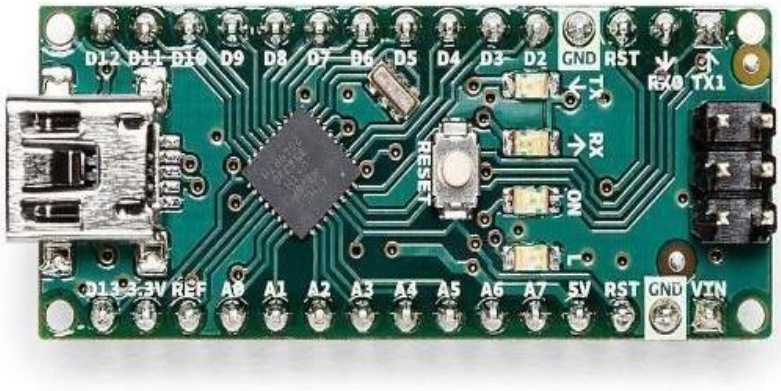


Figure1:Aduino Uno

The Arduino is an open source hardware and software that can make a user to do effective operation in it. The Arduino is a microcontroller. These microcontroller devices help in sensing and controlling the objects in the real-time situations and environment. These boards are available cheaper in the market. There are a number of inventions performed in it and still it is going on.

3. ULTRASONIC SENSOR:

The ultrasonic sensor consists of transmitter, receiver and transceiver. The transmitter convert electrical signal into soundwaves. The receiver converts the soundwaves into electrical signal again. The transceiver performs both the receiver and transmitter operations. It also has crystal oscillators in it. It will perform the stabilization operation in the ultrasonic sensor.

Figure 2: Ultrasonic sensor

POTENTIOMETER:

Figure 3: Potentiometer

A Potentiometer is a manually adjustable variable resistor with three terminals. Two of the terminals are connected to the opposite ends of a resistive element, and the third terminal connects to a sliding contact, called a wiper, moving over the resistive element. By varying the position of the wiper, the output voltage or current in the circuit can be adjustable. Potentiometers are commonly used in various electronic devices and applications, such as volume controls in audio equipment, brightness controls in displays, and tuning controls in radios. In this project potentiometer is used to adjust the distance which means it is used to fix the measurement till what distance the sensor should detect the obstacle.

Buzzer:

Figure 4: Buzzer

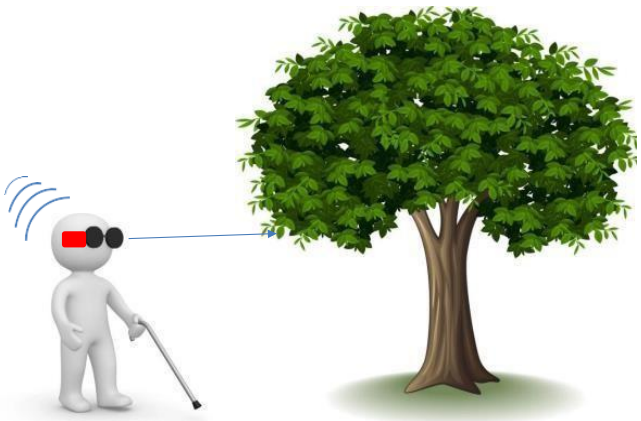
A buzzer is an electronic device that produces a buzzing or a beeping sound when an electrical current passes through it. It typically consists of a coil of wire and a diaphragm or membrane. When the current flows through the coil, it generates a magnetic field that causes the diaphragm to vibrate, producing sound waves. Buzzer sound can vary in pitch, frequency, and intensity depending on the design and application. Buzzers are commonly used in alarms, timers, notification systems, and electronic games to provide an audible alerts or signals.

VIBRATION MOTOR:

Figure 5: Vibration motor

A vibration motor, also known as a vibro-motor, is a compact electric motor designed to generate vibrations when activated. It typically consists of an eccentric rotating mass (ERM) attached to the motor shaft. The imbalance caused by the eccentric mass creates vibrations when the motor rotates. Vibration motors are commonly used in electronic devices to provide tactile feedback or alerts to users, they came in various size and shapes, ranging from tiny coin-sized motors to larger cylindrical or rectangular ones. The intensity and frequency of vibrations produced by the motor can be controlled by adjusting the speed and direction of rotation.

HOW DOES THE ULTRASONIC SENSOR WORKS?



Ultrasonic sensors emit high- frequency sound waves and measure the time it takes for the wave to bounce back after hitting an object. This data is then used to calculate the distance to the object. For blind people, these sensors are often integrated into wearable devices to detect obstacles and alert the user through vibrations or audible signals.

In this project, Ultrasonic sensors are used for object detection and obstacle avoidance. This sensor consists of transmitter and receiver. The transmitter converts electrical signal into soundwaves. The barrier principle determines the distance from the sensor to the reflector or to an object in the measuring range. This sensor measures the distance or the presence of a target object by sending a sound pulse.

Whenever any object or obstacle crosses in front of ultrasonic sensor within the fixed measurement, the ultrasonic sensor will make an alert to the user through the buzzer sound and the vibration that is connected through the PCB (Printed Circuit Board), which connects all the components together to make this obstacle detection system.

RESULT :

As shown in the above figure the ultrasonic sensor, the buzzer, the vibration motor will be fixed in the side of the glass worn by the blind people which is integrated into the red box. When ever any obstacle is detected by the ultrasonic sensor it will produce the buzzer and the vibration sound.

CONCLUSION :

The integration of ultrasonic sensors into wearable specs for blind individuals present a promising solution for obstacle detection and navigation assistance. Through rigorous testing and refinement, the system demonstrates reliable functionality, accuracy in obstacle detection, and usability for blind users. Overall, the project achieves its objectives of enhancing mobility and safety for blind individuals by providing real-time feedback about their surroundings, enabling them to navigate confidently and independently. With features such as accurate sensor calibration, effective feedback mechanisms, and adaptability to different environmental conditions, the wearable specs prove to be a valuable assistive technology tool for the blind community.

Furthermore, user acceptance testing confirms positive feedback from blind users regarding the system‟s performance and usability. The project‟s compliance with relevant regulations and accessibility standards ensure equal access for all users.

- Provides immediate feedback to wearer of this obstacle detection system through auditory, or haptic cues about the presence and proximity of obstacles.
- Allows the wearer to adjust the detection range based on their environment and preferences.
- Enables customization of alert types and intensity to suit the
- wearer‟s preferences and needs.

In conclusion. The obstacle detection system integrated into wearable specs successfully addresses the challenges faced ny blind individuals in navigating their surroundings, empowering them to lead more independent and fulfilling lives.

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