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"A solution for Inclusivity of blind people in industry"

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ABSTRACT

The project aims to provide a solution for the inclusivity of blind people in industries by designing and developing a pair of shoes equipped with ultrasonic and infrared sensors that detect obstacles and provide real-time feedback through a display and an alarm system. The shoes are powered by an Arduino microcontroller and have the potential to assist visually impaired individuals in navigating through unfamiliar environments and detecting obstacles, thereby increasing their safety and confidence in industrial settings.

The project involves a comprehensive study of existing assistive technologies and research related to inclusivity of individuals with disabilities in industrial environments. The shoes are designed using MEMS technology and demonstrate the potential of microcontroller and sensor technologies in improving manufacturing processes and increasing efficiency.

The shoes were tested extensively to evaluate their effectiveness in assisting the user in detecting obstacles and navigating through unfamiliar environments. The results showed that the shoes were effective in detecting obstacles and providing real-time feedback to the user, making them a potentially valuable tool for visually impaired individuals in industrial settings.

Overall, the project highlights the potential of emerging technologies and innovative solutions in promoting inclusivity and improving safety for individuals with disabilities in the workplace.

I. INTRODUCTION

The inclusion of individuals with disabilities in the workforce has been an ongoing challenge for many industries. Visually impaired individuals face particular challenges in navigating unfamiliar environments and detecting obstacles, which can be particularly hazardous in industrial settings. To address this challenge, this project aims to develop a solution for the inclusivity of blind people in industry by designing and developing a pair of shoes equipped with ultrasonic and infrared sensors that provide real-time feedback to the user through a display and an alarm system.

This project involves a comprehensive study of existing assistive technologies and research related to inclusivity of individuals with disabilities in industrial environments. The shoes are designed using Micro-Electro-Mechanical Systems (MEMS) technology and demonstrate the potential of microcontroller and sensor technologies in improving manufacturing processes and increasing efficiency. The shoes are powered by an Arduino microcontroller and have the potential to assist visually impaired individuals in navigating through unfamiliar environments and detecting obstacles, thereby increasing their safety and confidence in industrial settings.

The project involves extensive testing and evaluation to assess the effectiveness of the shoes in assisting the user in detecting obstacles and navigating through unfamiliar environments. The results show that the shoes are effective in detecting obstacles and providing real-time feedback to the user, making them a potentially valuable tool for visually impaired individuals in industrial settings.

Materials:

The material used in the project, including the Arduino microcontroller, ultrasonic sensor, IR sensor, lithium-ion battery, jumper wires, display, and alarm, were all chosen for their ability to create an effective solution for improving the safety and inclusivity of visually impaired individuals in industrial settings.

Arduino is a popular microcontroller board widely used in electronic projects due to its simplicity and ease of programming. It is used as the main controller in the shoes for blind people, allowing the ultrasonic and IR sensors to communicate with the display and alarm system.

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Ultrasonic sensors have been extensively used in previous research for developing assistive technologies for visually impaired individuals. Ultrasonic sensors use sound waves to detect objects and determine their distance from the sensor. This allows for the detection of obstacles and other objects in the environment, providing real-time feedback to the user.

IR sensors, or infrared sensors, are also commonly used in electronic projects and have been utilized in previous research to develop assistive technologies for visually impaired individuals. IR sensors detect infrared light, which can be used to detect objects and determine their proximity to the sensor. This allows for the detection of obstacles and other objects in the environment, providing real-time feedback to the user.

Lithium-ion batteries were chosen for their lightweight, high energy density, and long-lasting power supply, making them ideal for portable and wearable devices such as the shoes for blind people.

Jumper wires are used to connect the various components of the shoes, allowing for communication between the sensors, microcontroller, display, and alarm system. **"Jumper wire redirects here. For wire bridges, see jumper. For fly-wires, see enameled wire. For patch leads, see patch cable."**

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The **display** and **alarmsystem** provide real-time feedback to the user, allowing for immediate detection of obstacles and other hazards in the environment. The display can be used to provide a visual representation of the distance between the user and objects in the environment, while the alarm system can be used to provide audible warnings in case of imminent danger.

In conclusion, the material used in the above project has been carefully selected to create an effective solution for improving the safety and inclusivity of visually impaired individuals in industrial settings. The use of ultrasonic and IR sensors, along with the Arduino microcontroller, lithium-ion battery, jumper wires, display, and alarm system, provides a practical application of existing technologies in addressing the challenges faced by visually impaired individuals in the workplace.

II. METHOD:

Identify the problem: The first step is to identify the problem of inclusivity of blind people in industry and the challenges they face in the workplace. This can be done by conducting a literature review of previous research and studies on the topic.

Develop a solution: The next step is to develop a solution to the identified problem. This can be done by analyzing the existing technologies and devices and identifying their strengths and weaknesses. In your case, the solution is the shoes for blind people that uses ultrasonic sensor, IR sensor, display and alarm to provide navigation assistance and safety alerts.

Design and prototyping: The first step in creating the shoes is to design and prototype the system. This involves selecting the appropriate sensors, display, and alarm components and designing a prototype system that integrates these components into the shoes.

Sensor integration: Once the prototype is designed, the next step is to integrate the sensors into the shoes. This involves connecting the sensors to a microcontroller such as an Arduino board. The ultrasonic and IR sensors are typically connected to different digital pins on the Arduino board, and the voltage and ground pins are connected to the corresponding pins on the board.

Code development: After the sensors are connected, the next step is to write the code to detect obstacles and trigger the display and alarm. This involves programming the microcontroller to read the sensor values and use algorithms to determine if an obstacle is present. If an obstacle is

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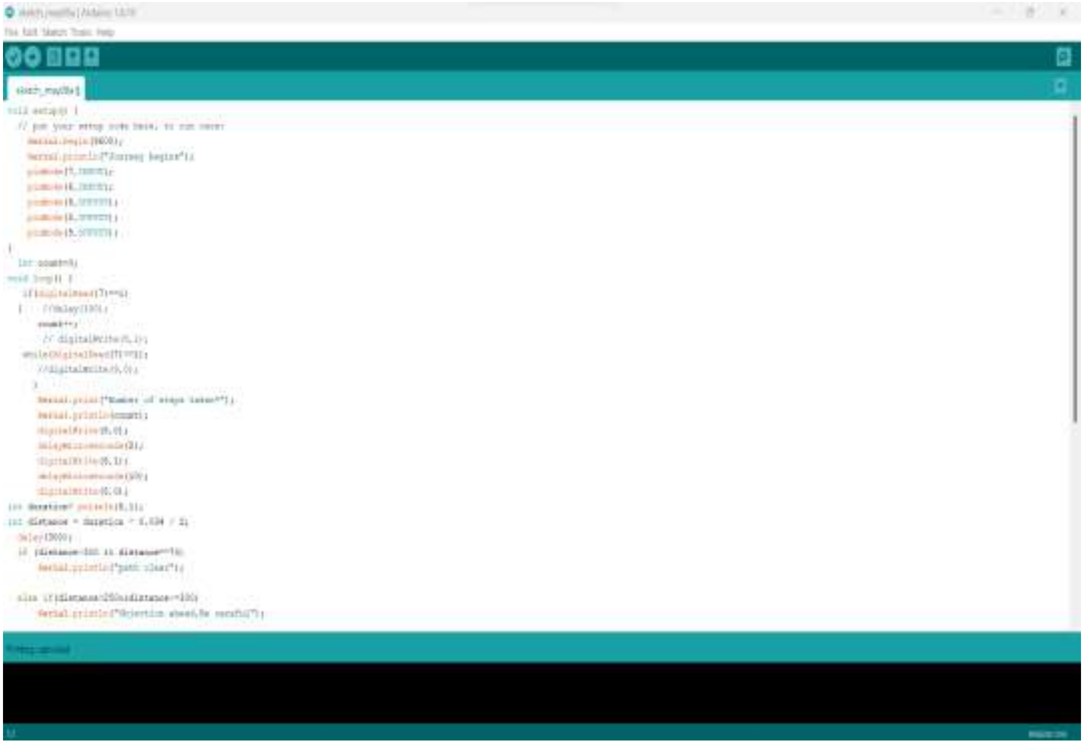
detected, the microcontroller triggers the display and alarm to alert the user.

Code:-



Working of Code

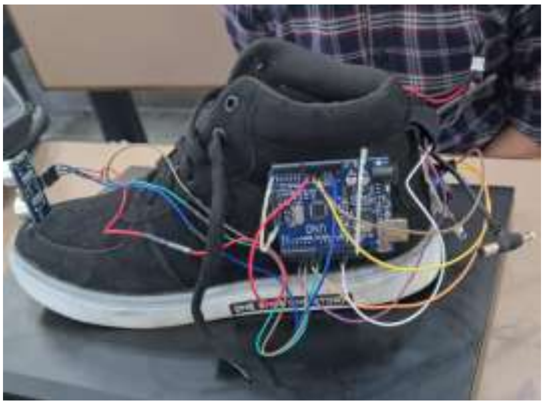
So the Smart shoes include two sensors that works independently for step count and object detection.The first sensor is IR sensor i.e. Infrared sensor. The IR sensor gives an output of 0 or 1 when connected to a digital pin and a output ranging from 0 to 1 when connected to an analog pin. So when an object approaches near the LEDs the light from the emitter gets reflected from the object and is received by the reciever LED. So we have connected the IR sensor at the back of the shoes so that whenever the person lifts his/her shoes,the IR sensor will give 0 as an output i.e. no surface is detected. So when the IR sensor will give 0 output , step count will increase by 1. So now when the person will take a step and his shoes will touch the ground again, the reciever LED will detect the reflected emitter rays that are reflected by the ground.In this manner the steps of a person can be counted.

The second sensor is Ultrasonic sensor that works on the principle of sound. The ultrasonic sensor gives an analog output ranging from 0 to 1400. The sensor is mounted on the front of the shoes for object detection. So there are two main components. Reciever end and transmitter end .The transmitter end sends sound wave in the forward direction and as soon as the sound wave is reflected from an object , the reflected soundwave is detected by the reciever end . If the reciever end do not receive any sound wave in a given speciefied time than there is no object in the range of the ultrasonic sensor. So this sensor helps in object detection .

These two sensors work independently for step detection and object detection which will help a blind person in his day to day life.

Testing and refinement: Once the code is written, the next step is to test the shoes to ensure that they are working properly. This involves testing the shoes in different environments and with different types of obstacles to ensure that the sensors are accurate and the display and alarm are triggered when necessary. Based on the results of the testing, the shoes can be refined by making adjustments to the sensor placement or the code.

Final product integration: After the shoes have been tested and refined, the final step is to integrate the components into the final product. This involves mounting the sensors, display, and alarm into the shoes and ensuring that the wiring is secure. The shoes are then tested again to ensure that they are working properly.



III. RESULT:

Based on the features and capabilities of your shoe prototype, it can be inferred that the shoes could be very useful for blind people working in precision manufacturing industries. The shoes could help these individuals navigate the complex machinery and equipment used in manufacturing facilities, as well as provide alerts for any potential hazards.

The ultrasonic and IR sensors in the shoes can detect obstacles and machinery in the user's path and provide real-time feedback through the display and alarm system, allowing the user to safely navigate through the workspace. Additionally, the shoes' compact and portable design makes them easy to useand wear in any environment.

Overall, the shoes for blind people that you have developed could have a significant impact on improving inclusivity in precision manufacturing industries by providing blind individuals with the ability to work more safely and efficiently. The shoes have the potential to reduce the risk of accidents and injuries, as well as improve the quality of work done by blind individuals in manufacturing.

IV. CONCLUSION:

In conclusion, the shoes for blind people developed for precision manufacturing industries have the potential to significantly improve the safety and efficiency of blind individuals in these industries. By incorporating ultrasonic and IR sensors, a display, and an alarm system, the shoes provide real-time feedback and alerts for potential hazards in the workspace, allowing blind individuals to navigate through the manufacturing environment safely and effectively.

The shoes can be seen as a step towards achieving greater inclusivity in the manufacturing industry, as they provide blind individuals with the ability to work alongside their sighted colleagues without hindering productivity or putting themselves in harm's way. The shoes have the potential to reduce the risk of accidents and injuries, and improve the quality of work done by blind individuals in manufacturing.

As the manufacturing industry continues to evolve, it is important to ensure that all individuals, regardless of their abilities, have the opportunity to participate and contribute. The shoes developed in this project could serve as a model for future developments aimed at improving inclusivity in manufacturing and other industries

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