The Biosis Bulletin: Bioscience and Information science Journal

https://stanfordgroup.org/

Vol 5, Issue 2, 2025

ARDUINO BASED CUSTOMIZED SMART GLASSES FOR THE BLIND PEOPLE

Mr. K. RAMBABU[1], P. DIVYA ROSHINI[2], V. BHUVANA[3]

[1]Assistant Professor, Dept. of ECE, PRAGATI ENGINEERING COLLEGE

[23]UG Students, Dept. of ECE, PRAGATI ENGINEERING COLLEGE

ABSTRACT

For all human beings' vision is primary requirement to survive in fast-changing environment. Scientific glasses are there to improve the eye sight of visually impaired people. But for blind people there is a need for smart glass to guide them to be independent. For that introduced a method to support visually challenged people. The existing methods are available to identify obstacles, stair cases, water proximity separately as well as combined. This Project extended the existing smart aid techniques for obstacle detection with the fire detection and also the background detection with a low cost solution using the input and output sensors connected through Arduino board. The environment in front of the subject is detected by sensors and then the signal will be sent to the processor. The processor will respond to the input and sends the corresponding signal to the output transducer. The buzzer sound or beep sound from the output transducer will alert the user accordingly.

The proposed model of smart glass for visually impaired enhance the features of the existing obstacle detection models. It is an embedded system integrating the pair of ultrasound transducer, flammable gas or smoke detector and Light Dependent Resistor (LDR) to identify the objects like obstacles, fire, smoke and darkness. The information obtained from sensors is given to the Arduino processor. Arduino UNO process the information and sends corresponding signal to buzzer. The corresponding buzzer sound will help the subjects to identify the objects or obstacles accordingly.

INTRODUCTION

Innovations in technology have continuously sought to enhance the quality of life for individuals with disabilities, and one such innovation is Arduino-based customized smart glasses for blind people. These smart glasses leverage the power of Arduino microcontrollers, along with various sensors and modules, to provide real-time assistance and improve navigation and interaction for the visually impaired.

In today's world, the number of visually impaired people is increasing day by day over the past decades. As reported by World Health organization (WHO), about 285 million people worldwide are estimated to be visually impaired. And also, the 90% of them still live-in low level of income. "The idea behind this work is to come up with smart and low-cost solution to help the visually impaired to lead independent lives". Smart glasses for visually impaired people are wearable devices that have sensor input components, a processing unit and an output transducer.

The gas sensor integrated into the smart glasses serves as a vital safety feature, capable of detecting the presence of harmful gases in the surrounding environment. This sensor can alert the wearer to potential hazards such as carbon monoxide or methane leaks, enabling them to take appropriate action to ensure their safety.Light-dependent resistor (LDR) sensors are utilized to detect changes in ambient light levels. In the context of smart glasses for the blind, LDR sensors can help users identify variations in lighting conditions, thereby facilitating navigation and enhancing situational awareness.Ultrasonic sensors play a crucial role in obstacle detection, allowing the smart glasses to perceive nearby objects and obstacles in real-time. By emitting ultrasonic waves and measuring the time it takes for them to bounce back, these sensors can accurately determine the distance to obstacles, enabling the wearer to navigate safely.The buzzer serves as an auditory feedback mechanism, providing alerts and notifications to the user based on input from various sensors. In the context of smart glasses for the blind, the buzzer can be used to indicate the presence of obstacles, changes in environmental conditions, or other relevant information, enhancing the user's awareness and facilitating navigation.

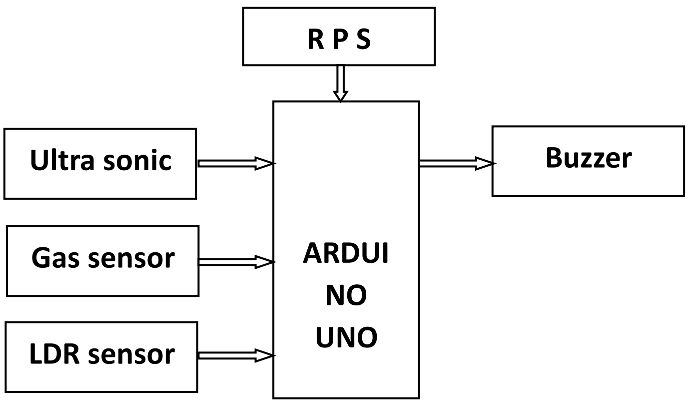


Figure.1 Block Diagram

LITERATURE SURVEY

Search for Industry Publications and Whitepapers:

Industry publications, assistive technology companies' websites, and whitepapers may contain case studies, best practices, and real-world implementations of Arduino-based smart glasses for blind users.

Look for reports from organizations specializing in assistive technologies, wearable computing, and disability advocacy groups.

Consider Standards and Regulations:

Explore relevant standards and regulations governing assistive technologies and accessibility features for visually impaired users. Standards bodies like the International Organization for Standardization (ISO) and disability advocacy organizations may have published guidelines specific to smart glasses for the blind.

Evaluate and Summarize Findings:

Evaluate each source based on its relevance, credibility, and contribution to your research.

Summarize the key findings, methodologies, technologies, and challenges identified in the literature.

Identify common trends, emerging technologies, gaps, and areas for future research in Arduino-based smart glasses for blind people.

Organize and Synthesize Information:

Organize the information gathered from your literature survey into a structured format, such as a literature review section in your research paper or report.

Synthesize the findings to provide a comprehensive overview of the state-of-the-art in Arduino-based smart glasses for the visually impaired.

Cite Properly:

Make sure to cite all the sources properly using the appropriate citation style (e.g., APA, MLA, IEEE) in your research paper or report.

PROPOSED SYSTEM

The proposed model of smart glass for visually impaired enhance the features of the existing obstacle detection models. It is an embedded system integrating the pair of ultrasound transducer, flammable gas or smoke detector and Light Dependent Resistor (LDR) to identify the objects like obstacles, fire, smoke and darkness. The information obtained from sensors is given to the Arduino processor. Arduino UNO process the information and sends corresponding signal to buzzer. The corresponding buzzer sound will help the subjects to identify the objects or obstacles accordingly.

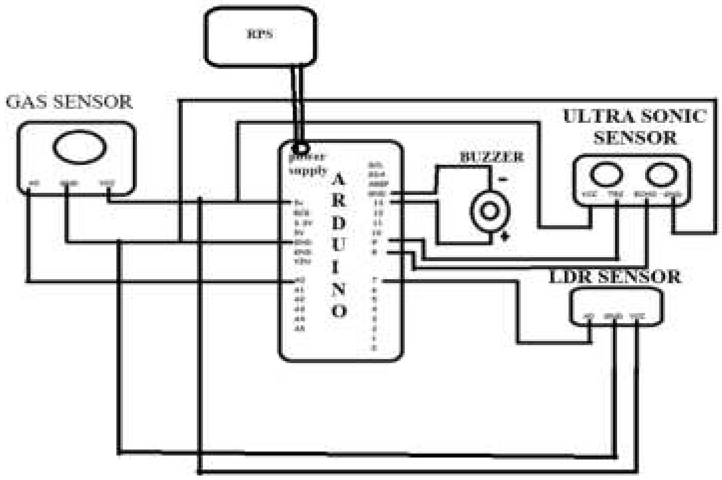


Figure.2 Schematic Diagram

RESULTS

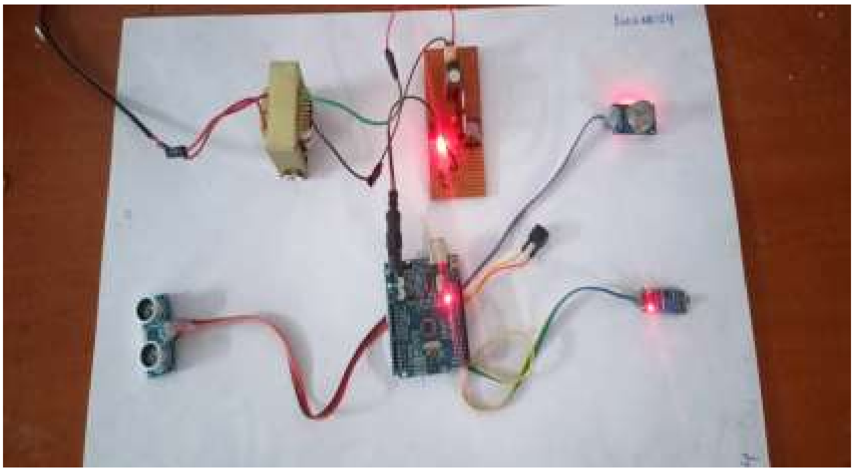
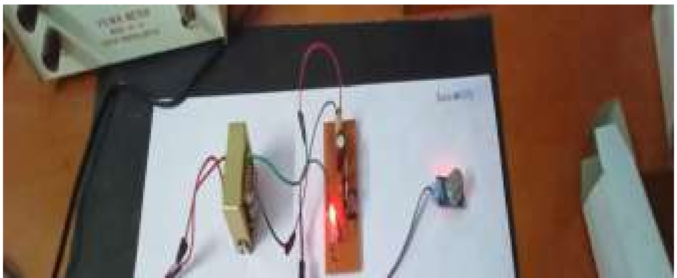


Figure.3 Working Kit



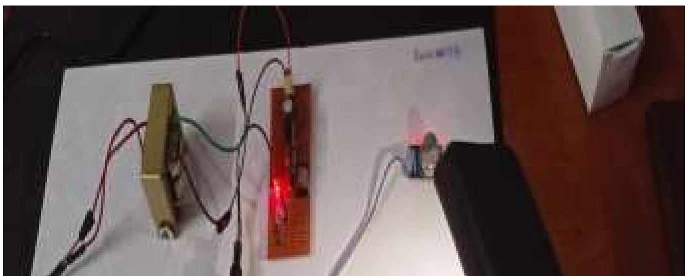


Figure.4 LDR without light

figure.5 LDR expose with Light

ADVANTAGES

1. Enhanced Safety: The smart glasses provide real-time feedback about obstacles, gas leaks, and lighting conditions, helping visually impaired individuals navigate their surroundings safely.

2. Increased Awareness: By alerting users to potential hazards such as obstacles and gas leaks, the smart glasses increase awareness of their environment, reducing the risk of accidents.

3. Customizable Alerts: The system can be customized to trigger different types of alerts for various hazards, allowing users to distinguish between different situations easily.

4. Cost-Effective: Arduino-based projects are generally affordable compared to commercial alternatives, making the smart glasses accessible to a wider range of users.

5. Open-Source Platform: Arduino is an open-source platform, facilitating collaboration, innovation, and the sharing of ideas and improvements within the maker community.

6. Modularity: The project's modular design allows for easy integration of additional sensors or functionalities, enabling further customization and expansion based on user feedback and requirements.

APPLICATIONS

The Arduino-based smart glasses for the visually impaired have several potential applications beyond their primary function of aiding navigation and hazard detection. Here are some possible applications:

1. Assistive Technology: The primary application of these smart glasses is to assist visually impaired individuals in navigating their surroundings safely. They can be particularly useful in indoor environments, outdoor spaces, and public transportation settings.

2. Environmental Monitoring: The sensors integrated into the smart glasses can be repurposed for environmental monitoring applications. For example, they can detect air quality, temperature, humidity, and ambient light levels, providing valuable data for environmental research or urban planning initiatives.

3. Smart Home Integration: The smart glasses can be integrated into smart home systems to provide additional functionality for visually impaired individuals. For example, they can be connected to home automation devices to control lights, appliances, and security systems using voice commands or gesture recognition.

4. Education and Training: The project can be used as an educational tool for teaching students about assistive technologies, sensor technologies, and programming. It can also be incorporated into training programs for orientation and mobility instructors working with visually impaired individuals.

5. Tourism and Exploration: Visually impaired individuals can use the smart glasses to explore new environments, visit museums, or navigate tourist attractions with greater independence and confidence. The glasses can provide audio descriptions of landmarks, points of interest, and historical sites.

6. Emergency Response: In emergency situations such as natural disasters or building evacuations, the smart glasses can provide real-time information about obstacles, exits, and safe routes for visually impaired individuals, assisting emergency responders in guiding and evacuating them to safety.

7. Healthcare Monitoring: The sensors in the smart glasses can be used for monitoring the health and well-being of visually impaired individuals. For example, they can track environmental factors that may affect respiratory conditions or trigger allergies, providing valuable insights for healthcare management.

8. Research and Development: Researchers and developers can use the smart glasses as a platform for exploring new sensor technologies, machine learning algorithms, and human-computer interaction techniques aimed at improving accessibility and quality of life for visually impaired individuals.

CONCLUSION

In conclusion, the Arduino-based smart glasses designed for visually impaired individuals represent a promising step towards enhancing accessibility, safety, and independence. Through the integration of ultrasonic, gas, and light sensors, coupled with a buzzer alert system, these glasses offer real-time feedback about obstacles, gas leaks, and lighting conditions, enabling users to navigate their surroundings with greater confidence and autonomy.

While the project presents several advantages, including enhanced safety, affordability, and customization options, it also comes with certain challenges and considerations. These include sensor reliability, user interface complexity, and social acceptance issues. Addressing these challenges through continued refinement, user feedback, and collaboration can help optimize the utility and usability of the smart glasses.

Moreover, the project extends beyond its primary function as an assistive device, with potential applications in environmental monitoring, industrial safety, education, tourism, healthcare, and research. By leveraging the capabilities of the smart glasses in diverse settings, we can unlock new opportunities for improving accessibility, enhancing user experiences, and driving innovation in assistive technology.

FUTURE SCOPE

The Arduino-based smart glasses for visually impaired individuals have considerable potential for future development and expansion. Here are some avenues for future scope and improvement:

1. Integration of Advanced Sensors: Incorporating more advanced sensors such as infrared cameras for object recognition, GPS modules for navigation, and environmental sensors for detecting additional hazards can enhance the functionality and effectiveness of the smart glasses.

2. Machine Learning and AI Integration: Utilizing machine learning algorithms and artificial intelligence techniques can enable the smart glasses to learn and adapt to users' preferences, optimize obstacle detection algorithms, and provide more personalized assistance based on individual needs and preferences.

3. Enhanced User Interface: Developing alternative user interfaces beyond auditory alerts, such as haptic feedback or bone conduction technology, can improve accessibility and user experience, catering to individuals with diverse sensory abilities and preferences.

4. Miniaturization and Wearability: Advancements in miniaturization and wearable technology can lead to smaller, lighter, and more discreet smart glasses designs, enhancing user comfort and acceptance, particularly in social settings.

5. Wireless Connectivity and IoT Integration: Integrating wireless connectivity features such as Bluetooth or Wi-Fi can enable the smart glasses to interact with other devices and services, facilitating seamless data sharing, remote monitoring, and integration into smart home environments.

6. Accessibility Features: Incorporating accessibility features such as voice commands, gesture recognition, and text-to-speech capabilities can further improve usability and inclusivity, catering to individuals with a wide range of abilities and preferences.

7. Community Collaboration and User Feedback: Engaging with visually impaired communities and soliciting user feedback throughout the development process can ensure that the smart glasses meet the specific needs and preferences of users, fostering a user-centered design approach.

8. Commercialization and Distribution: Exploring opportunities for commercialization and distribution of the smart glasses, either as standalone products or as part of larger assistive technology solutions, can facilitate broader adoption and accessibility for visually impaired individuals worldwide.

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