PROJECT REPORT

TITLE

IOT based lpg gas detection system

THE TEAM

1.Kaustav Mishra(23CS10030)

2.Krithi Bethu(23CS10010)

3.Parv Makwana(23CS10050)

4.Raman Dubey(23CH30026)

GROUP DETAILS

Section 15 ,Group ID-23

MOTIVATION

The project addresses safety concerns related to gas leaks, particularly in environments where gas appliances are used or stored. Gas leaks can pose significant risks, including fire, explosion, and health hazards. By developing a gas detection system, the project aims to mitigate these risks and provide an early warning mechanism for gas leaks.It aligns with the growing interest in home automation and IoT (Internet of Things) technologies. By integrating a gas sensor with an ESP8266 microcontroller and a web server, the project demonstrates how IoT devices can be used to enhance safety and convenience in residential environments.The project offered an oppurtunity to apply our skills in circuit design ,code development and it also helped us to learn how to set up a AP(acess point) network using NODEMCU board with ESP8266 microcontroller.The project helped to enhance our knowledge and understanding in basic electronics principles such as circuit design, sensor interfacing, and component integration .

WORKING PRINCIPLE

This project utilizes an ESP8266 microcontroller to create a gas detection system integrated with a web server. The gas detection system consists of a gas sensor connected to the microcontroller, which continuously monitors gas concentrations in the environment. When the gas sensor detects a concentration exceeding a predefined threshold, it triggers the microcontroller to actuate a servo motor, shutting off a gas valve. Additionally, the microcontroller hosts a web server, allowing users to remotely monitor gas levels via a web interface. The web server displays real-time gas concentration data and provides alerts when gas is detected. Users can access the web interface from any device connected to the same Wi-Fi network as the ESP8266. Overall, this project enhances safety by providing real-time gas monitoring and remote control capabilities, ensuring prompt response to gas leaks and potential hazards.

WORK METHEDOLOGY

**PROJECT PLANNING:** we began by defining the projects working principle,objectives,requirements and limitations .This included identifying sensors and components need for IOT based LPG gas detection system and outlining the desired functionalities.

**HARWARE SELECTION SETUP:** we carefully selected the hardware components based on project requirements.This included choosing NODEMCU board,MQ5 gas sensor,MG 995 servo motor 180 degree rotation,jumperwires,vero board,lithium ion battery and battery holder for lithium ion battery.

**TECHNICAL ASPECTS:** we carefully developed the circuit for IOT based LPG gas detection system and assembled the circuit on our PCB vero board.Then we wrote the code on Ardruino IDE,compiled and verified it ,and uploaded it to our board.

**TESTING AND CALIBRATION:** we conducted extensive testing and calibration to ensure the accuarcy and reliability of the IOT based LPG gas detection system.This included calibrating the threshold values of parameters that we were measuring ,validating the functionality of the code.

**ITERATIVE IMPROVEMENT:** Throughout the development process,we iteratively refined and improved the IOT based LPG gas detection system based on feedback and testing results.This involved adjusting hardware system,optimising the code or changing the sensors/buzzers/wires used.

**DOCUMENTATION AND REORTING:** Finally, we documented our work methodology. including detailed descriptions of the hardware and software components, testing procedures, and evaluation results in this report. This documentation serves as a comprehensive reference for future iterations of the project and for sharing our findings with others

In summary, our work methodology for the IOT based LPG gas detection project was characterized by careful planning, systematic development and testing, iterative improvement, and thorough documentation. This approach enabled us to create a reliable and effective LGP gas detector that met our project objectives.

LIST OF ITEMS USED

1.NODEMCU ESP8266

2.MQ5 Gas sensor

3.MG 995 servo motor (180 dergree rotatio)

4.Lithium ion battery

5.Vero board

6.Battery Holder

7.PCB Mount Buzzer

CHALLENGES FACED

**Technical Challenges:** In the development of this project, several technical challenges were encountered and overcome. Initially, configuring the ESP8266 microcontroller to function as an Access Point (AP) and web server posed difficulties, requiring thorough understanding of networking concepts and ESP8266 libraries. Additionally, integrating the gas sensor and servo motor with the microcontroller demanded careful attention to hardware interfacing and signal processing. Calibration of the gas sensor and fine-tuning the threshold for gas detection presented further challenges, requiring iterative testing and adjustment.

**Communication and Collaboration Challenges:** As a team project, communication and collaboration were crucial aspects. However, coordinating tasks and schedules among team members proved challenging at times. Clear communication channels and regular team meetings helped mitigate these challenges and ensure alignment on project goals and objectives.

**Learning Curve:** the project provided valuable hands-on experience in electronics, programming, networking, and IoT technology. The learning curve was steep but rewarding, as each challenge overcome contributed to a deeper understanding of the underlying concepts and practical application of knowledge.

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OTHER LEARNINGS

We developed a variety of skills while working on this project.

**Technical Skills:** Through this project, I acquired a diverse set of technical skills. I learned to program the ESP8266 microcontroller for embedded systems applications, including configuring GPIO pins and interfacing with sensors. Working with the gas sensor improved my understanding of analog signal processing and calibration techniques. Setting up the web server on the ESP8266 introduced me to web development concepts like HTTP communication and dynamic content generation. Troubleshooting hardware integration and software bugs enhanced my problem-solving abilities. Overall, this project provided valuable hands-on experience in electronics, programming, and networking, preparing me for future projects in IoT and embedded systems.

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**Problem-solving Skills:** Throughout this project, I sharpened my problem-solving skills by addressing various technical challenges head-on. From debugging hardware integration issues to resolving software bugs and network connectivity problems, I developed a systematic approach to identify, analyze, and solve problems efficiently. Collaboration with peers and leveraging online resources also played a key role in finding innovative solutions. Through persistent testing and iteration, I strengthened my ability to tackle complex issues, equipping me with valuable problem-solving skills for future projects.

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**Teamwork and Collaboration:** Collaborating with team members allowed us to leverage each other's strengths and expertise. By working together, we fostered a collaborative environment where ideas were freely exchanged, and collective decision-making led to innovative solutions. Effective communication and teamwork were essential in overcoming challenges and achieving project milestones.

**Project Management:** Managing the project required careful planning, organization, and time management. We learned to prioritize tasks, allocate resources efficiently, and adapt to changing circumstances. Project management skills such as task delegation. progress tracking, and presentation were honored throughout the project lifecycle.

**Personal Growth:** Beyond technical skills, the project contributed to our personal growth and development. It instilled a sense of responsibility, accountability, and perseverance in pursuing our goals. Overcoming challenges and achieving project success fueled our confidence and motivation to tackle future endeavors with Enthusiasm.

Overall, the challenges faced and lessons learned throughout the project were invaluable in shaping our learning experience and preparing us for future endeavors in the field of engineering and technology.

CONCLUSION

In conclusion, the development of the gas detection system integrated with a web server using the ESP8266 microcontroller has been successful in achieving its objectives. By leveraging the capabilities of the ESP8266, we have created a versatile and efficient solution for monitoring gas concentrations and enhancing safety in various environments. The project's working principle, which involves continuous gas monitoring, threshold-based detection, servo motor actuation, and remote monitoring via a web interface, has been effectively implemented and demonstrated. Through this project, we have gained valuable insights into electronics, programming, networking, and practical applications of IoT technology. Furthermore, the project offers significant potential for further enhancements and customization to meet specific requirements and address additional use cases. Overall, this project serves as a testament to the power of innovative technology solutions in addressing real-world challenges and improving safety and efficiency in diverse settings.

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