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CookSafe: Smart Gas Stove Timer with Automatic Regulator Control Using Servo Motor

Venkata Koteshwararao[1], Himavarshitha M[2], Indushree S[3], Kousalya B S[4], Likithashree[5]

[1]Professor, Department of Computer Science and Engineering, Dayananda Sagar Academy of Technology and management

[2,3,4,5]Department of Computer Science and Engineering, Dayananda Sagar Academy of Technology and management

Abstract- Human carelessness, such as failing to turn off the gas regulator after cooking, is a common cause of gas-related mishaps in home kitchens. This paper introduces CookSafe, a smart gas stove safety system that uses a servo motor and a user-defined timer to automatically control the gas regulator. The servo motor automatically activates the gas regulator after the user uses push buttons to set the cooking time. The servo motor rotates back to turn the regulator off after the predetermined amount of time has passed, guaranteeing safe operation. An Arduino microcontroller, a servo motor, an LCD display, and control buttons are used to implement the system. CookSafe offers an affordable, dependable, and easy- to-use way to enhance kitchen safety and stop gas leak incidents.

Keywords: CookSafe, Smart Gas Stove, Arduino, Servo Motor, Timer Control, Gas Safety, Automation.

I. INTRODUCTION

Due to its effectiveness and convenience, Liquefied Petroleum Gas (LPG) is frequently used in homes for cooking. However, poor handling and human carelessness—for example, failing to shut off the gas regulator after cooking—can result in gas leaks, fire risks, and catastrophic mishaps. These kinds of situations are frequent in homes and present serious safety hazards. The development of automation and embedded systems has made it feasible to incorporate intelligent safety features into commonplace appliances. Automating gas regulator control can improve safety and drastically lessen reliance on human intervention. This paper introduces CookSafe, a smart gas stove timer system that uses a servo motor to automatically turn the gas regulator ON and OFF. The system makes sure that the gas supply is turned off automatically.

II. RELATED WORK

Various gas safety systems have been developed to prevent domestic gas accidents. Gas leakage detection systems using sensors such as MQ-series sensors are commonly used to detect LPG leakage and trigger alarms. However, these systems respond only after gas leakage occurs.

Some research works propose the use of solenoid valves and relay-based automatic shut-off systems. While effective, these solutions increase system complexity and cost. IoT-based gas monitoring systems have also been introduced, but they depend on continuous internet connectivity and may not be suitable for all environments.

Compared to these methods, mechanical control of the gas regulator using a servo motor offers a simple, economical, and reliable solution. The CookSafe system focuses on prevention by automatically controlling the gas regulator using a timer-based approach.

III. HARDWARE COMPONENTS DESCRIPTION

The CookSafe system is designed with a combination of crucial hardware elements that collaborate to automate the operation of the gas regulator and improve kitchen safety. The choice of components emphasizes reliability, cost- effectiveness, and ease of integration for home use.

At the heart of the CookSafe system lies the Arduino Uno microcontroller, which acts as the main processing unit. It handles the control logic, oversees the cooking timer, processes user inputs from buttons, and produces control signals for the servo motor. The Arduino Uno is selected for its straightforwardness, extensive community support, and adequate input/output pins necessary for connecting multiple devices. Its real-time processing ability guarantees precise timing and dependable system functionality. A servo motor is utilized to mechanically adjust the gas regulator knob.

The servo motor rotates to specific angles that correspond to the ON and OFF positions of the gas regulator. Unlike solenoid valves or intricate mechanical setups, the servo motor offers accurate position control with minimal energy usage. This feature allows it to rotate the regulator directly without altering the internal gas pipeline, thus ensuring safety and simplifying installation.

An LCD display (16×2) is incorporated to give visual feedback to the user. It presents vital information such as the chosen cooking duration, countdown status, and system notifications. This facilitates user interaction with the system and helps users comprehend its current operational state. The LCD improves usability by making the system more intuitive and accessible, particularly for older users.

Push buttons serve as the main input devices for users. These buttons enable the user to determine the desired cooking duration and start the cooking process. The implementation of basic push buttons guarantees straightforward operation and removes the necessity for complicated input mechanisms. The button inputs are consistently monitored by the Arduino to recognize user actions. A regulated power supply is employed to deliver the required voltage to all components of the CookSafe system. This power supply guarantees stable and uninterrupted functioning of the Arduino, servo motor, and display module. Proper power regulation is crucial to avoid malfunctions and ensure the long-term reliability of the system.

IV. METHODOLOGY

The functioning of the CookSafe system initiates with the gas regulator in the OFF position. When the user begins cooking, the necessary cooking duration is established using push buttons. Once the timer is configured, the Arduino engages the servo motor, which turns the gas regulator ON by rotating. The timer then begins its countdown while the cooking proceeds as usual. After the designated time elapses, the Arduino instructs the servo motor to rotate back to its original position, thus switching the gas regulator OFF. The system subsequently resets to its secure initial state, prepared for the next operation. This automated process guarantees that the gas supply is never unintentionally left ON.

VI. RESULTS AND DISCUSSION

The CookSafe system underwent experimental evaluation with various cooking time configurations to assess its effectiveness, dependability, and uniformity. During the trials, the servo motor efficiently turned the gas regulator to the ON position right after the user adjusted the timer. After the designated cooking duration was completed, the servo motor automatically switched the regulator back to the OFF position without any manual effort needed. The system showed consistent performance throughout the testing period, with precise timing and reliable servo motor reactions. Power usage was kept minimal, making the system ideal for ongoing home use. The results observed suggest that CookSafe successfully minimizes gas wastage and significantly lowers the likelihood of gas-related incidents due to human error, thus enhancing overall safety in the kitchen.

VII. ADVANTAGES OF THE PROPOSED SYSTEM

The suggested CookSafe system presents numerous benefits compared to traditional manual gas stove usage. By automating the control of the gas regulator, this system lessens the need for human oversight and removes the possibility of forgetting to switch off the gas post-cooking. This greatly

lowers the risk of gas leaks and potential accidents. The system is crafted to be straightforward, user-friendly, and affordable, ensuring it is available to a diverse array of users. Furthermore, CookSafe demands minimal upkeep and can be effortlessly incorporated into current gas stove configurations without significant changes. Its simplicity of use makes it especially ideal for households with seniors, children, or individuals with hectic schedules.

VIII. UPGRADATION AND FUTURE ENHANCEMENTS

Future iterations of the CookSafe system may include a number of upgrades to increase safety and usability, even though the system now uses a timer-based approach to effectively automate gas regulator control. When the cooking time is up, a buzzer alert can be added to let the user know and encourage them to see if the meal is cooked well. The removal of the cooking utensil from the stove can be sensed, which will trigger an automated gas shutdown, reducing needless gas usage. Further security safeguards, such as IoT-based remote monitoring, mobile app alerts, and gas leak detection sensors, can be added to increase the system's dependability. These enhancements would turn CookSafe into a smarter and more complete approach to kitchen safety.

IX. CONCLUSION

This paper presented CookSafe, a smart gas stove timer system that automatically controls the gas regulator using a servo motor. The system ensures automatic ON and OFF operation of the gas supply based on a user-defined timer, thereby significantly reducing the risk of gas-related accidents caused by human negligence. The experimental results demonstrate that the system operates reliably with low power consumption and high accuracy. Due to its economical design, simplicity, and ease of use, CookSafe is well suited for real-world domestic kitchen environments. The proposed system contributes to improved household safety and encourages the adoption of smart automation technologies in everyday home appliances.

REFERENCES

1. Ghosh, “Smart Gas Stove: Controlling a Simple Gas Stove Using IoT,” International Research Journal of Engineering and Technology (IRJET), vol. 7, no. 6, pp. 3800–3804, 2020.
2. R. Chavan, P. Patil, and S. Jadhav, “Smart Gas Stove with Inbuilt Safety Features,” Proceedings of the IEEE International Conference on New Trends in Engineering, 2023.
3. S. Patil and R. Deshmukh, “Automatic Gas Cooking Control System Based on Microcontroller,” International Journal of Engineering Research & Technology (IJERT), vol. 9, no. 4, 2020.
4. K. Mahajan, A. Thakur, and S. Verma, “LPG Gas Leakage Detection and Automatic Shut-Off System Using Arduino,” International Journal of Advanced Computer Engineering and Communication Technology, vol. 8, no. 2, 2019.
5. M. Banzi and M. Shiloh, Getting Started with Arduino, 3rd ed., Maker Media, 2014.
6. Kurniawan, Arduino Programming for Beginners, Packt Publishing, 2019.
7. Techpedia GYTI, “Stove Burner Shutoff Timer Project,” Government of India Student Innovation Project Repository.