E-PROCEEDINGS

INTERNATIONAL TINKER INNOVATION & ENTREPRENEURSHIP CHALLENGE (i-TIEC 2025)

"Fostering a Culture of Innovation and Entrepreneurial Excellence"

23 January 2025
PTDI, UiTM Cawangan Johor
Kampus Pasir Gudang

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A-ST057: CONTACTLESS SWITCH FOR CONTROLLING LOADS

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ABSTRACT

In recent years, the growing demand for automation and remote-control systems has revolutionized the way we manage electrical devices, offering unparalleled convenience and efficiency. Among the emerging innovations in this field is contactless switching technology, which allows users to control electrical loads without the need for physical interaction with traditional switches. This breakthrough not only enhances convenience but also significantly improves safety and accessibility in various environments. Conventional switches for controlling electrical loads often come with significant limitations and challenges, primarily requiring physical contact for operation. This design can be inconvenient, unhygienic, or even unsafe in specific environments such as hospitals or kitchens. Additionally, individuals with limited mobility or disabilities may struggle to operate standard switches, limiting their independence and accessibility. These inefficiencies and drawbacks underscore the need for innovative alternatives like contactless switching. Moreover, an accessible solution for individuals with disabilities or mobility challenges, enabling them to control electrical devices effortlessly. By incorporating technologies such as infrared and radio frequency, this project aims to showcase the feasibility and practicality of contactless control in real-world applications. This initiative highlights the potential of contactless switching to transform everyday interactions with electrical systems, paving the way for smarter, safer, and more accessible solutions in automation. The adoption of contactless switches marks a significant step toward safer, more convenient, and inclusive solutions for managing electrical systems in various settings.

Keywords: Conventional switch, contactless switch, IoT, load, Arduino

1. Product Description

The contactless switching system is an innovative solution designed to revolutionize the control of electrical loads by eliminating the need for physical interaction with conventional switches. This system not only enhances convenience but also contributes to improved safety and accessibility. The aim of this project is to design and implement a contactless switching system capable of controlling distinctive electrical loads wirelessly. By leveraging technologies like infrared and radio frequency, this project seeks to demonstrate the feasibility and effectiveness of contactless control in a practical setting. This contactless switch will make it easy for users to turn on fans or lights automatically. By using a PIR sensor, the system will automatically activate the light/door or OFF the light/door. Moreover, the gas sensor will detect as a sign of safety for the user. The switch can also be accessed via smartphone by using blynk application that set in the smartphone without

having to use manual switch. **Figure 1** depicts the block diagram of the overall project. The purpose of this wireless system is to facilitate users with limited mobility and save energy and more convenience that makes inclusive solutions for managing electrical systems.

1. Methodology

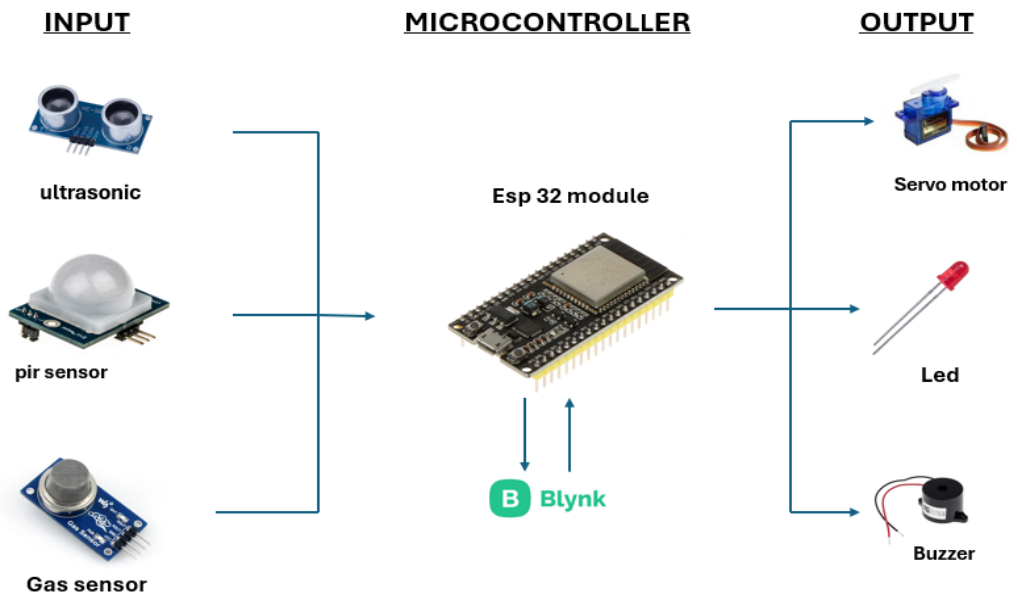

Figure 1. Block diagram of overall project.

Figure 1 presents the block diagram of the contactless switch for controlling loads. The Arduino UNO serves as the central component and functions as the project's brain, managing all the components through the implementation of specific coding. This comprehensive block diagram illustrates the system's architectural framework, detailing the essential components that involve movement to detect motion, smoke to detect gas. The input hardware includes a PIR sensor and ultrasonic in order to detect the movement and distance of the user. Additionally, the gas sensor is used to detect unwanted smoke in the house as a warning sign to the user. The output is a buzzer, a servo motor, and two LEDs. The servo motor and a DC motor is used for opening or closing the door and fan to ON/OFF respectively. The LEDs indicate the movement of the user when detected or undetected. Also, the blynk application is accessible using smartphone that makes it easier for user to turn ON/OFF without having to use a manual switch. The purpose of this wireless system is to facilitate users with limited mobility, save energy and provide smarter, safer, and more accessible solutions for diverse settings.

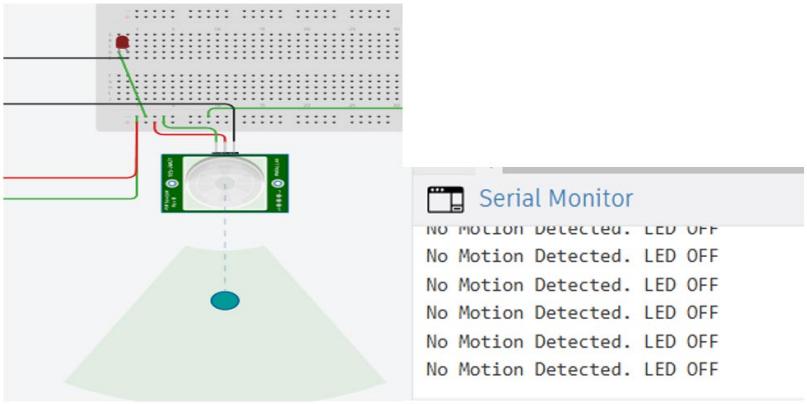

Figure 2. Simulation Result when there is no motion detected.

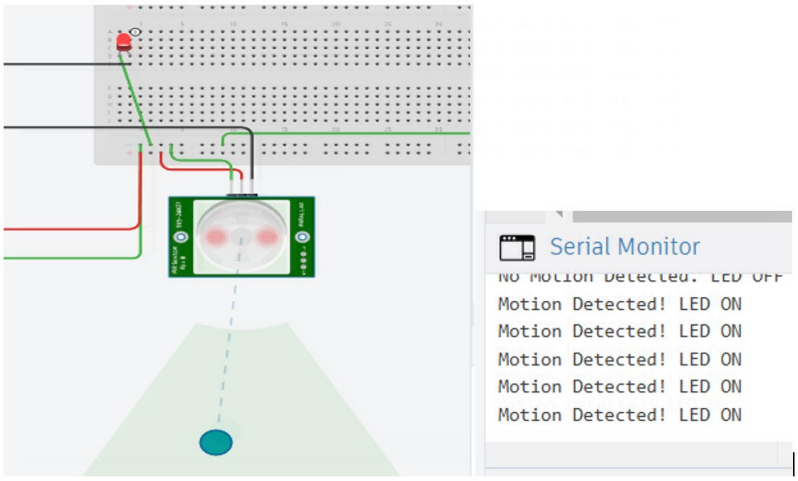

Figure 3. Simulation result when there is motion detected.

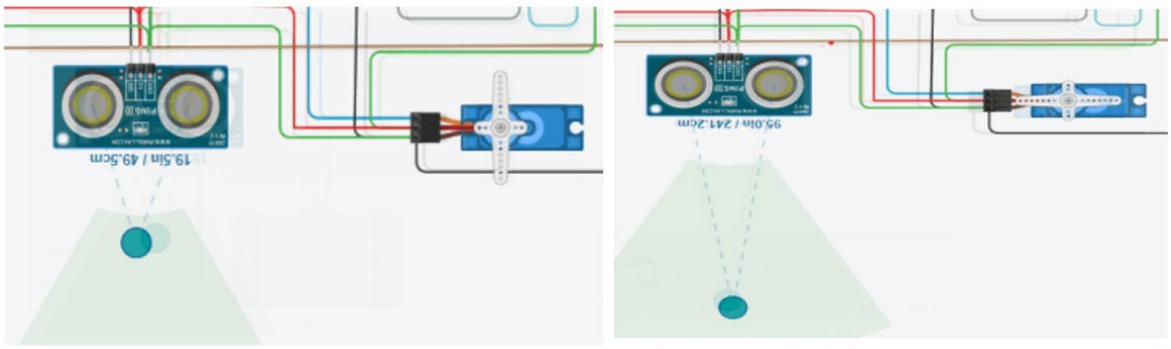

Figure 4. Movement distance detected by the ultrasonic sensor

Figure 2. and **Figure 3.** illustrates the PIR sensor which indicates the motion of the user. When there is no movement, the LED will not light up and when there is movement detected by the PIR sensor the LED will light up as in **Figure 2.** and **Figure 3** respectively.

Simulation results in **Figure 4.** illustrate the system's response to the variation of movement distance detected by the ultrasonic sensor. When the distance is at a distance of 49.5cm, the microservo will move indicating the door is open, On the other hand, when the object is at a distance of more than 100cm, the microservo moto will be closed, indicating the door is closed. This binary ultrasonic sensor effectively communicates the system's ability to detect and respond to the movement of objects, demonstrating its role in controlling the movement of the microservo that functions as a door.

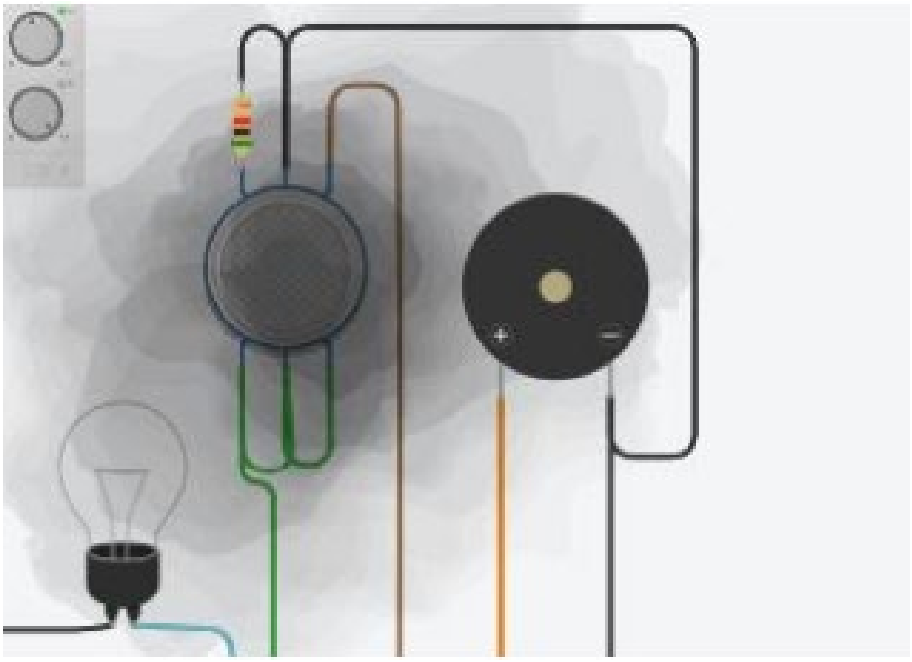

Figure 5.

Figure 5. depicts the gas sensor when the smoke is detected. If there is smoke detected, the piezo will sound, indicating that there is smoke in the house. This can improve the safety features that are important in the house.

2. Novelty and uniqueness

The project introduces an innovative contactless switching technology that eliminates the need for physical interaction with traditional switches. This approach addresses key limitations of conventional systems, such as hygiene concerns, safety risks, and accessibility challenges, by integrating advanced technologies like infrared, radio frequency, and Bluetooth for remote and efficient control of electrical loads. Furthermore, the system not only enhances convenience and efficiency but also prioritizes inclusivity by providing a user-friendly solution for individuals with mobility impairments or disabilities. Its design focuses on improving safety, particularly in environments like hospitals and kitchens, while leveraging wireless communication for real-time, touch-free operation. This combination of hygiene, safety, and accessibility sets it apart as a transformative innovation in the field of automation.

3. Benefit to mankind

The increasing demand for automation and remote-control systems has driven significant advancements in managing electrical devices, emphasizing convenience, efficiency, and accessibility. Among these innovations, contactless switching technology has emerged as a transformative solution, enabling users to control electrical loads without physical interaction with traditional switches. This technology addresses key limitations of conventional switches, such as the inconvenience, hygiene concerns, and safety risks associated with physical contact, particularly in environments like hospitals and kitchens. Furthermore, contactless switches promote inclusivity by providing an accessible means of controlling electrical devices for individuals with disabilities or limited mobility.

4. Innovation and Entrepreneurial Impact

Contactless switches offer an inclusive alternative for individuals with limited mobility or disabilities, empowering them to operate electrical devices effortlessly. By leveraging technologies such as infrared or radio frequency this project demonstrates the feasibility and practicality of contactless switching in real-world applications. This initiative underscores the potential of contactless switching to enhance hygiene, reduce risks, and provide smarter, safer, and more accessible solutions for diverse settings, marking a significant step toward the future of automation.

5. Potential commercialization

The increasing demand for automation and remote-control systems creates a significant opportunity to commercialize contactless switching technology. This innovation effectively addresses key issues in traditional switch designs by eliminating the need for physical contact, thereby enhancing hygiene, safety, and accessibility across various applications. For instance, in healthcare and sanitary environments such as hospitals, clinics, and kitchen where maintaining hygiene is crucial and this technology minimizes the risk of contamination by enabling touch-free operation. Additionally, in smart homes, the system seamlessly integrates into home automation ecosystems, providing convenient, hands-free control of lighting, appliances, and other devices. The combination of convenience, hygiene, safety, and accessibility in this project as a versatile product with strong commercialization potential in diverse sectors.

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