



PASSWORD-BASED CIRCUIT BREAKER FOR ELECTRIC LINEMAN SAFETY

Setti Harshita, GIET University, 22ece043.settiharshita@giet.edu

Labhala Sasya, GIET University, 22ece066.labhalasasya@giet.edu

Kothakota Sidhardha, GIET University, 22ece029.kothakotasidhardha@giet.edu

Ami Kumar Parida, GIET University, amiparida@giet.edu

Abstract: One type of security device used to stop unwanted access to electrical circuits is the password based circuit breaker. In order to authenticate, it requires a password. If the right password is not supplied, the circuit breaker remains closed and cannot be opened. Upon entering the proper password, the electric circuit becomes available and the circuit breaker opens. Industrial environments frequently utilize password-based circuit breakers to safeguard delicate equipment and guarantee that only individuals with the proper authorization can access it. In addition, they can be applied to the equipment in domestic situations. Mainly used to guarantee lineman safety in electrical substations This technology is utilized in homes and structures. The findings show a notable decrease in the likelihood of electrical mishaps, underscoring the possibility of this technology's widespread industry use. In addition to improving lineman safety, this innovation raises the general dependability of electrical distribution networks.

Keywords: Arduino uno, Relay module, 4*4 matrix keypad, bulb, jumper wires.

1.Introduction:

A Circuit Breaker for Electric Linemen that is Password-Based (PBCBELS). A method called safety was created to improve linemen's safety while they operate on electrical lines. Linemen are typically at risk from traditional systems, particularly in the event that an unintentional re-energization occurs during maintenance [1].The objective of this project is to guarantee an extra degree of safety by keeping the power supply off during repair. To ensure that only authorized workers have control over the electrical line while repairs are being made, the circuit breaker can only be turned on or off by entering a secure password. Electric linemen face significant risks while working on power lines, especially when the line is live or accidentally re-energized during maintenance [2].Traditional safety measures may not be foolproof, as manual communication between linemen and control rooms can sometimes fail, leading to serious accidents. The password-based circuit breaker offers a technological solution to this problem, improving operational safety and ensuring that linemen have full control over the power system before performing maintenance tasks. This system provides an added layer of



security, preventing the circuit from being turned on until the password is entered [3]. As a result, it enhances safety protocols by ensuring that the control of electrical circuits is restricted to authorized personnel, reducing the likelihood of electrical accidents and improving safety for linemen working on the field. Because of the user-friendly architecture of the password-based circuit breaker system, linemen can rapidly and effectively handle electrical circuits while following safety procedures [4]. The significance of this system, its working principles, and its possible effects on linemen safety and general operational effectiveness in the electrical sector are all covered in this introduction. We will examine this novel solution's design, operation, and the important role it plays in protecting the lives of individuals who toil diligently to maintain the integrity of our electrical infrastructure as we dig deeper into its details [5].

2. Literature Review:

Sudha Ganesh, S. Saranya Arduino based circuit breaker for power distribution lines to enhance the safety of linemen. One of the biggest and most deadly problems that electricians face globally is electrocution. A password-protected Arduino-controlled circuit is incorporated into this suggested method to prevent electrocution of linemen. It features a keypad, an Arduino unit connected to a relay, and a liquid crystal display that indicates whether the line's power supply is turned on or off [6]. Manikanta SP, Srinivasarao T, Lovina PA to keep electric line workers safe, the system is made to use a password to operate a circuit breaker. A linemen uses a keyboard to input the password. The system signals the appliance to turn on if the password is accurate. The system stays locked and the appliance cannot be turned on if the password is entered incorrectly. Additionally, the system contains a display that shows the appliance's status [7]. Patil PJ, Zalke RV, Tumasare KR, Shiwankar BA, Traffic hazards are one of the many problems the world faces. The large number of cars on the road is the main factor contributing to this traffic risk. Consequently, it creates the most difficult problems, which raises the number of fatalities from traffic accidents that happen all over the world. It thus makes the provision of sufficient transport facilities necessary in order to lower the number of collisions and save lives. A vehicle accident detection model is designed and developed using GPS, GSM, accelerometer, Arduino UNO technology, and vibration sensor. [8]. Kore P, Ambare V, Dalne A, Amane G, Kapse S, Among the most crucial pieces of equipment in a

power network are distribution transformers. Data collection and condition monitoring are crucial issues in power electric systems due to the vast number of transformers dispersed over a huge area. This system's primary goal is to use IOT for distribution transformer monitoring and control [9].

3. Design:

Here is a summary of how our project is set up. We started by gathering a 4x4 matrix keypad, an Arduino Uno, a relay module, and an LED and resistor just for safety. Initially, we linked each keypad row and column pin to a different digital pin on the Arduino; imagine putting them into D2 through D9. To keep things organized, we then connected the relay module to an additional digital pin. The Arduino's GND went directly to the relay module's GND, while the relay's VCC secured a convenient 5V power source. We wired the relay's control input to a selected digital pin—in this case, D10—to operate the relay. Next, we connected one end of the LED to the output terminal of the relay and connected the other end to a resistor in series. Depending on your goals, the LED's opposite end was connected to either GND or another power source. After setting up the hardware, we started coding, either creating our own code or loading pre-written Arduino code to test the keypad, relay, and LED. We crossed our fingers and hoped things would go smoothly after uploading the code to the Arduino.

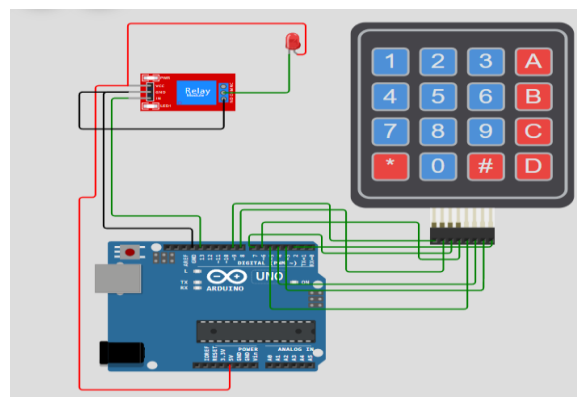


Figure 1: Simulation Of PBCBELS

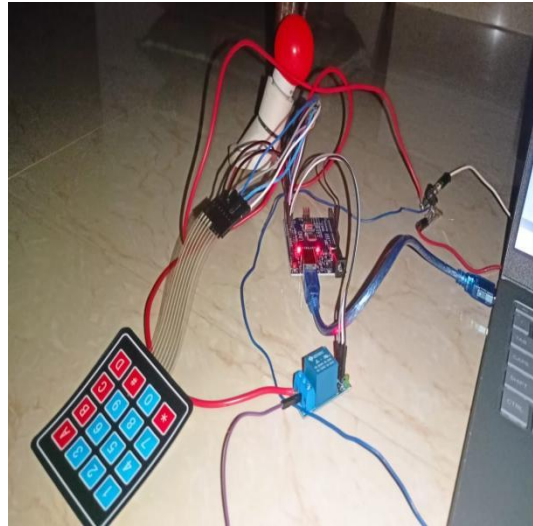


Figure 2: Design Of PBCBELS

4. Result Analysis:

A working circuit breaker that requires a password to be input before permitting electrical current to flow through would be the outcome of creating a password-based circuit breaker with an Arduino Uno, relay, and keypad. The circuit breaker would be controlled by an Arduino Uno, and the password would be entered on a keypad. The relay shuts off and permits current to pass via the power circuit when the proper password is entered. The load or connected item will be powered. If an incorrect password is entered, the circuit remains open (no power flow), and sometimes an alert or error message is displayed. After multiple incorrect entries, the system may enter a lockout state, temporarily disabling input to prevent brute-force attacks. The time between entering the password and activation or deactivation of the relay. Faster response time is generally better for usability. Verifying the accuracy of the microcontroller's password comparison algorithm. Incorrect passwords should never activate the relay.



Figure 3: Result Of PBCBELS

5. Conclusion:

Using an Arduino Uno, a relay module, a keypad, and a load, this password-based circuit breaker project shows how electronic control systems may be used practically to improve electrical safety. An extra degree of protection is added by this system, which makes sure that only authorized individuals can turn on or off the associated load (such as lights, machines, or other appliances) by needing a password to manage the circuit breaker. The Arduino is used in the project to validate a password that is input using a keypad. The Arduino closes the circuit and permits current to flow to the load when the relay is activated by the right password. The circuit stays open, preventing unwanted access to the load, even if the password is typed incorrectly. This technique removes the possibility of external influence by ensuring that the lineman is the only person with control over the system. The lineman can work the loads from the main center rather than going to each circuit breaker source. Thus, it is a very economical, safe, and useful way to use circuit breakers.

6. References:

1. Elakkia, E., Lokesh, P., Krishna, P. G., Sajid, S. M., & Nandini, B. (2021). Security based Circuit Breaker for Maintenance and Management Using IoT. Turkish Online Journal of Qualitative Inquiry.



2. Arunabala, C., Brahmateja, G., Raju, k., Gideon, k., & Reddy, b. v. (2022). Gsm Adapted Electric Lineman Safety System With Protection Based Circuit Breaker. International Journal of communication and computer Technologies,
3. Yadav, T., Singh, M., Singh, S., & Singh, K. K. (2020). Protection of distribution line using password based circuit breaker. Int Res J of Modernization EngTechnolSci, e-ISSN, 2582-5208.
4. Manivannan, S., et al. “Design implementation and evaluation of password protected circuit breaker for reliable power system protection and maintenance.” Advances in Materials Research. Springer, Singapore, 2021.
5. Onwuemeodo, C. L., Duru, C., Anyasodor, C. C., & Obiefule, N. D. (2022). Design and construction of Internet of Things (IoT) password based circuit breaker. Journal of Electrical Engineering, Electronics, Control and Computer Science.
6. Sudha Ganesh, et.al, Arduino Based Circuit Breaker for power Distribution lines to enhance the safety of Lineman. Department of Electronics and Communication Engineering , Chennai, India.(2023)
7. Manikanta SP, Srinivasarao T, Lovina PA (2020) “Password based circuit breaker”. J Eng Sci11(6), ISSN No: 0377–9254
8. Patil PJ, Zalke RV, Tumasare KR, Shiwankar BA, Singh SR, Sakhare S (2021) IoT protocol for accident spotting with medical facility. J Artif Intell 3(02):140–150
9. Kore P, Ambare V, Dalne A, Amane G, Kapse S, Bhavarkar S (2021) “IOT based distribution transformer monitoring and controlling system”. Int J Adv Res Innovative Ideas Education (IJARIE)5(2), ISSN(O) 2395–4396