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Implementation of Protective Device for Lineman Protection in Real Time Operation

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Research Article

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***Abstract*:**
This study suggests using an OTP-based password to operate an electrical switch. The duty of entering the secret password is connected to a keypad. Due to a lack of communication between the electric substation officials and the linemen's working team, the number of fatal electrical mishaps involving linemen is rising during electric line repairs. This suggested framework provides a solution that may ensure the lineman's safety. because the lineman has the authority to switch on and off. As a result, the system is set up so that a password is needed to turn the electrical switch on and off. To create a one-time password, the lineman must carry the RF-ID tag that will be placed into the RF-ID reader. The lineman will get the OTP. Lineman will trip the supply after the proper OTP has been inserted, and once it has been safely repaired, he may switch the supply on for the appropriate phase once again. The framework uses a microcontroller from the Arduino family for full control and operation. To input the secret one-time password, the microcontroller is interfaced with the matrix keypad. The password that is stored in the microcontroller's read-only memory is compared to the secret OTP that was input. Only electrical switches may be switched on or off if the OTP matches the one that was saved; if not, the incorrect password will be shown. The electrical switch's activation and deactivation are shown by a light-emitting diode. The user does not need to memorize the secret password because of the usage of EEPROM. To monitor lineman operations via SMS, the microcontroller is interfaced with the Global System of Mobile (GSM). A notification about the activation and deactivation of the electrical switch will be sent to a higher authority when the lineman trips the supply.

INTRODUCTION

An electrical circuit breaker is a naturally operating switch designed to protect an electrical circuit from damage brought on by excessive flow from a short circuit or overload. Its primary purpose is to cut off the current stream as soon as a defect is detected. An electrical switch may be reset to resume normal operations, unlike a fuse, which only functions once before needing to be replaced. That can be carried out manually or physically. The main challenge for electrical linemen and staff is to maintain, repair, and operate the electrical power lines that provide electricity to homes and companies. This is a dangerous, difficult, and exhausting endeavor. A high voltage flows through the electrical cables that provide electricity to our homes and workplaces. Indeed, even a little mistake may have severe consequences; in the majority of instances, it results in severe burns and fatalities.

As a result, we came to the conclusion that security is our biggest concern in daily life. Everyone should have as much security as is practical. The proposed system provides all the answers and ensures the safety of the lineman and staff. Electrical accidents involving linemen are on the rise these days due to the lack of information and communication between the electrical substation staff and support staff (lineman). Because this suggested system has a unique configuration that requires a secret one-time password to activate the electrical circuit breaker, the lineman will maintain control over whether the line trips on or off.

A microprocessor from the AVR family provides total protection for the suggested system. The matrix keypad, which will be used to input the secret OTP, is interfaced with the microcontroller. An OTP will be asked once the lineman inserts the RF-ID reader into the RF-ID tag. The password saved in the microcontroller's ROM is compared with the secret OTP that was delivered. Only the lineman may trip the supply if the secret password supplied matches; if otherwise, the incorrect password will be shown. It requests the right password once again. All of the information will

be shown on the LCD. Linemen do not need to travel to the substation to block the circuit after repairs; the password will be given to their registered cellphone number. After the repairs, the lineman may do this.

Higher-ranking authorities will also get a piece of information on the individual and location of the repair. No one else is allowed to use the electrical switch while it is being repaired. A buzzer will be linked so that the individual attempting to do so without authorization can be apprehended, and a notification will be sent to the officers so that appropriate action may be done.

By making simple adjustments to the system, it may be used for a variety of systems, such as refrigerators and door locking systems. In order to conserve energy, it may also be utilized to regulate electrical appliances. This may be used to conserve electricity in establishments like hotels and retail malls. It may also be employed in any public space, such as a genetic laboratory where very sensitive electricity is required.

II LITERATURE SURVEYS

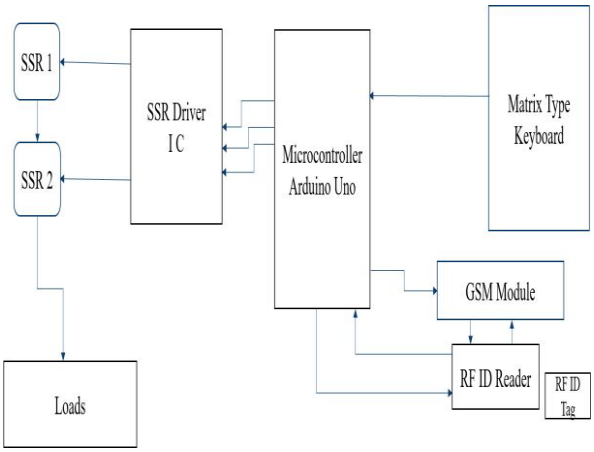
Safety of Electric Line Workers using a Microcontroller and GSM Module: This suggested approach provides a solution that ensures linemen, or support crew, are safe. After detection of a fault in the electric line, the lineman sends SMS and then the supply line is turned off which can again be turned on after correction and repairing of fault but the main disadvantage is that lineman again has to go to the substation to switch on the power supply. The microcontroller is where it all operates. Lineman security alert signals sent to the power circuit: This proposed system is planned in such way that when support staff i.e. lineman goes to repair he makes a call to the circuit breaker using GSM, which is connected to the main supply then it automatically switch off the power supply of a particular line and whenever the lineman finish his work then again he has to switch on the power supply of that line by going to substation. Linemen and senior authorities did not communicate. Using a user-changeable password-based circuit breaker to safeguard electric linemen: The microcontroller's EEPROM contains the password, which is updated once the supply is tripped using it. The lineman must once again memorize the password. Here, the circuit is turned on or off by a relay, and the password is entered using a keypad. The incorrect or correct password input will be shown by a bulb. All tasks must be completed physically since it is not a planned procedure. A password-based circuit breaker is a naturally operating switch designed to protect an electrical circuit from damage brought on by an overload or short circuit. Its primary job is to identify a fault state and cut off the current. When worked physically lethal electrical can occur to the lineman are increasing due to the electric line fixing because of the absence of information and coordination between the working staff and the substation electric staff. So as to maintain an intentional distance from such accidents, the breaker can be so structured to such an extent that just approved individual can work it with a secret key. However, they must keep the password in mind.

III PROPOSED SYSTEM

The globe is expanding quickly. However, when electric faults arise during maintenance, all of the consumer's distribution lines are severed. As a result, the locations where defects do not exist must also deal with an issue. The industry primarily has an issue. Therefore, a system that is automatically regulated and capable of preventing accidents should be in place. A rectified power supply is utilized in conjunction with an AVR microprocessor. The microcontroller, which is utilized to communicate with higher authorities and linemen, is interfaced with GSM. A matrix keyboard is connected to the Arduino microcontroller in order to input the one-time password. The lineman receives a one-time password on his cell phone, which is compared to the password initially saved in the microcontroller's EEPROM. If the password is input correctly, the supply will trip; if not, the incorrect password will be shown and the right password will be requested once again.

In case of fault maintenance work can be done bycutting off one line's supply alone will prevent another line from tripping off. In order to produce a one-time password, the lineman must carry an RF-ID tag that will be placed into an RF-ID reader. The lineman will get the OTP on his registered phone. Once the issue has been fixed, they may switch the supply on from there alone. That password will unlock the supply, allowing them to operate without danger. LEDs are used to indicate if the supply is tripping on or off. Higher-ranking authorities will get a communication about the supply connection and disconnection.

IV METHODOLOGY



The embedded C programming language is used to code the electrical circuit breaker. The Arduino microcontroller is interfaced with a matrix keypad, EEPROM, voltage regulator, relay drive, RF-ID reader, and LCD.

FIG. 1: BLOCK DIAGRAM

A common connection between alternating current and direct current should not exist at the moment of connecting, as shown by the circuit diagram. With the aid of a 5 volt alternating current source, the controller receives a 5 volt regulated direct current power supply. Turn on both the DC and AC connections as there is now a supply in both. Because the relay has a 230 volt supply, avoid touching it. It says "enter password" on the LCD. Using a matrix keyboard, enter the password in response to the "*" sign on the LCD. Since the password entered is accurate, the circuit breaker will be shown as unlocked, and the LCD will display the circuit breaker's altered status. If the password is typed incorrectly, "access denied" will be shown, and the correct password will be input. By inserting the RF-ID tag into it, the appropriate individual may request the password again due to the OTP connection. The only way to switch it on after repair is to input the OTP he was given. This allows many loads to be opened or closed simultaneously. As a result, we have designed a system that is not only simple to use but also safer and more environmentally friendly. In essence, using a microcontroller may save many lives.

There is no possibility of anybody else meddling with the proposed system since the secret OTP ensures that only the lineman may operate it. Since they won't have to go as far to open or shut the circuit, linemen should be able to work stress-free. As a result, it is a very safe, prudent, and beneficial way to use circuit breakers.

- Algorithm
- • This is a systematic process. In this case, the lineman is alone in charge of the whole password request process. The lineman will request a one-time, confidential password to cut the circuit after another repair. Higher authorities are also informed throughout each of these procedures. This process is quite safe. Additionally, the gadget has a buzzer to alert users if the wrong password is input. In addition, if someone else attempts to interfere with the circuit, the LCD will show "unauthorized". Any suspicious action will also be reported to authorities via SMS.

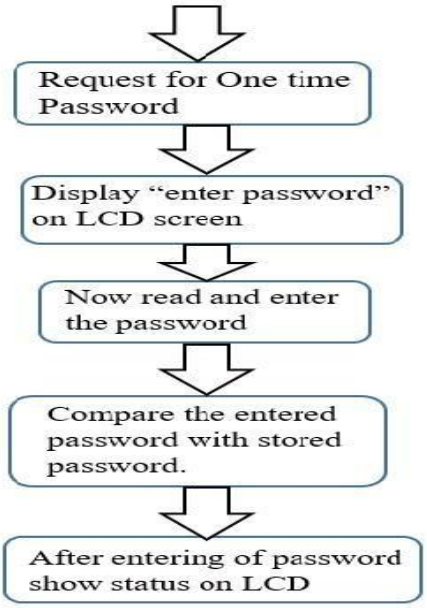
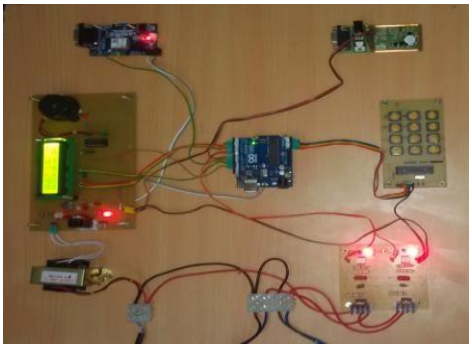


FIG. 2: ALGORITHM



V RESULT AND DISCUSSION

FIG. 3: HARDWARE CONNECTION

At first circuit breaker will be in locked condition. It will When the lineman inserts the RF ID tag into the RF-ID reader, request the one-time password they got. The system will open if the password matches one that has been saved; if not, itwill show the wrong password. The buzzer will give intimation about the wrong activities. The whole activities will be monitored by higher officials since all the information will be sent to them using GSM.

FIG. 4: FIRST OF ALL IT WILL ASK FOR AUTHENTICATION

FIG. 5: IF THE CORRECT CARD IS GIVEN THAN IT WILL SHOW THE SELECT THE CIRCUIT BREAKER TO BE OFF

FIG. 6: AN OTP WILL BE SEND TO HIGHER OFFICIALS AND LINE MAN

FIG. 7: IF PASSWORD WRONG

This suggested framework provides a solution that ensures the lineman's well-being. No one else can alter the supply at that period since the lineman has the authority to turn it on and off. The ultimate purpose of this framework's course of action is to demand a one-time, secret password in order to operate the electrical circuit breaker. Consequently, the lineman may shut the circuit once again after a successful repair.

They can operate securely and don't have to remember anything thanks to one-time-based password security. This will safeguard the employees and lower the accident rate. In the event of a problem, the whole area's supply does not need to be opened. Only the defective region may be turned off; if repairs are completed successfully, it can be turned back on. So this will decrease the frequent power cut of several area due to fault occurred at one place

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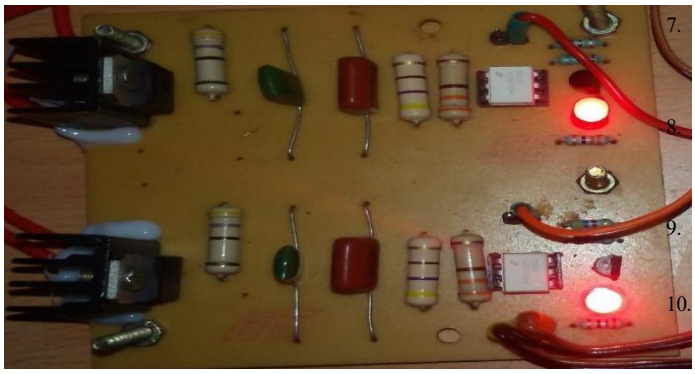

Fig. 8: Both loads are on

FIG. 9: AFTER PUTTING CORRECT OTP DESIRED CIRCUIT BREAKER WILL SWITCH OFF

VI CONCLUSION

A one-time password may be used to trigger the circuit breaker. The suggested technique may be used successfully and efficiently with the freshly created code, and the password is random. Only authorized individuals may get an OTP and a random password with the aid of an RF-ID reader and tag. As a result, staff members and electric linemen are adequately protected against password theft. It is inexpensive and simple to install. There are several additional public spaces where this approach may be used. This suggested solution is inexpensive and simple to set up. This framework may also be implemented in many other open areas.

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