IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 11, Issue 5, May 2023

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 5, May 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1105053 |

Smart Card Based Lineman Safety

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ABSTRACT: Electrical accidents to linemen and maintenance staff while repairing electrical substations and overhead lines have been increasing. The most common cause of electrical accidents is contact with overheated wires. These accidents can result in severe injuries, such as burns, neurological disorders, and even death. To prevent these accidents, we propose a Smart Card Based Lineman Safety System that uses RF technology and microcontrollers to control power supply to overhead lines. The system consists of two microcontrollers, one placed on the main pole of each line and another on the power distribution fuse box. The lineman or electrician swipes their smart card on the power turn off/on sensor placed on the main pole. The microcontroller then sends a signal through an RF transmitter to the microcontroller on the power distribution fuse box, which turns off/on the power supply to the line. The system also includes sensors for real-time monitoring and reporting of power outages or other issues. This system provides a cost-effective and reliable solution for improving safety and efficiency in electrical maintenance work.

KEYWORDS: RFID, RF Technology, Arduino,

I. INTRODUCTION

Nowadays, electrical accidents to the line man are increasing, while repairing the electrical substations and maintenance staff. There are many causes of electric shock and electrocution within the workplace, the most common of this is contact with overheated wires. This occurs when people misjudge the height or ground and overhead wires when carrying equipments such as pole and ladders. Other frequent causes of electrical injuries include: - Not isolating electrical supply Working on „live" electrical equipment, Inadequate maintenance Even if you survive an electrical shock, there can be serious side effect, including burns, eye damage, partial loss of limb function, neurological disorders such as confusion and memory loss, and injuries caused after the shock (e.g. falling off a ladder) So we develop project for electrician or lineman to avoid electrical injuries.

The system is fully controlled by the 8 bit microcontroller which is family member of Arduino. Here we use two microcontroller, one is placed on pole and another is placed on power distribution fuse box. RF Transmitter and sensor is interfaced with microcontroller placed on pole and RF receiver and switching circuit is interfaced with microcontroller which placed on power distribution fuse box. The Village or City consists of number of overhead lines. Each line contains one main pole. The smart card swap circuit placed on main pole of each line. When line man or electrician swap their card on power turn off sensor placed on main pole of each line the microcontroller take action and transmit signal through Rf transmitter, Rf receiver can receive that signal and microcontroller interfaced with rf receiver can take action to turn off power supply of this line through power distribution fuse box . When line man complete their work, he will swap their smart card to power turn on sensor then microcontroller transmit signal through rf transmitter to power distribution fuse box microcontroller.An important aspect of this system is its scalability. It can be easily implemented in a variety of settings, from small villages to large cities, and can be adapted to meet specific needs and requirements. It can also be integrated with other smart technologies, such as IoT sensors and data analytics platforms, to create a more comprehensive and efficient infrastructure.

Overall, the use of microcontrollers and RF technology in this system offers a cost-effective and reliable solution to the problem of electrical accidents in the workplace. By improving safety and efficiency, this system can have a positive impact on both the workers and the communities they serve.

II. RELATED WORK

A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by overload or short circuit. Its basic function is to detect a fault condition and interrupt current flow. Unlike a fuse, which operates once and then must be replaced, a circuit breaker can be reset (either manually or automatically) to resume normal operation. When operated manually we see fatal electrical accidents to the line man are increasing during the electric line repair due to the lack of communication and coordination

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between the maintenance staff and the electric substation staff. In existing system whenever any of the problems occur at distribution lines, lineman have to informs the substation operator to shut down the power of that specific line on which fault has occurred through making a phone call to substation operator or by going by himself to the substation for the maintenance of that distribution line, There is a significant possibility of miscommunication between the electric lineman and the staff or operator at the sub-station, which could lead to errors or misunderstandings.This communication gap may risk the life of an electric lineman or a transformer or other components, or household appliances.

IN EARLIER DAYS:-There was no perfect system to avoid electrical injury and death.Electrician can manually turn off power supply from power distribution box and they will do their work on electrical pole, if someone can turn on power supply. Electrician will affect with electrical injuries or death.NOW A DAYS:-here we are develop using RFID smart card based lineman safety system.

III. PROPOSED ALGORITHM

A. *Design Considerations:*

1. Microcontroller Arduino Nano: A microcontroller is a crucial component within a system that controls a specific function of a device. It accomplishes this by interpreting data from its input/output peripherals utilizing its central processing unit. This particular system is entirely controlled by an 8-bit microcontroller that belongs to the Arduino family. Two microcontrollers are utilized in this system - one is placed on a pole, and the other is placed on the power distribution fuse box. The microcontroller on the pole is connected to an RF transmitter and sensor, while the microcontroller on the fuse box is linked to an RF receiver and switching circuit.

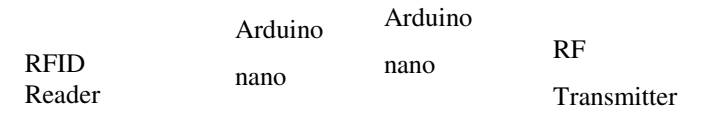

Fig1. Transmitting Block Diagram

Fig2. Receiving Block Diagram

2. RF Transmitter: The RF transmitter module wirelessly transmits serial data through its RF antenna. The transmission rate ranges from 1 Kbps to 10 Kbps, and the transmitted data is received by an RF receiver module operating at the same frequency as the transmitter. The transmitter module consists of three pins: Vcc, Din, and Ground. The input voltage range for the Vcc pin is 3V to 12V. During transmission, the transmitter module consumes a minimum current of 9mA, which can increase to 40mA. The data pin in the center transmits the signal, which is modulated using ASK and then transmitted at a frequency of 433MHz.

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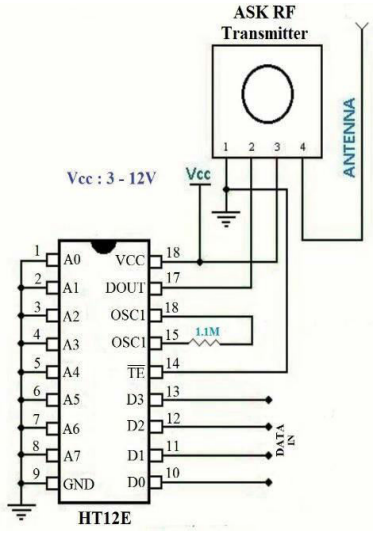

Fig3. RF Transmitter

3. RF Receiver: The RF receiver module receives the transmitted data from the RF transmitter. The receiver module has four pins: Vcc, Dout, Linear out, and Ground. The Vcc pin must be powered by a regulated 5V supply, and the operating current of the module is less than 5.5mA. The Dout and Linear out pins are shorted together to receive the 433MHz signal from the air. This signal is then demodulated to retrieve the data, which is sent out through the data pin. It is essential to note that data can only be sent from one end to another, and not the other way around, as the receiver only receives transmitted data.

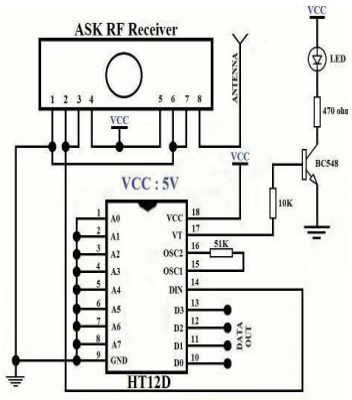

Fig4. RF Receiver

4. Light-Emitting Diode (LED): An LED is a semiconductor device that emits visible or infrared light when a current flows through it. When the diode is forward biased, minority electrons move from p to n, while minority holes move from n to p. This increases the concentration of minority carriers at the junction, causing them to recombine with majority charge carriers and emit light.

5. Transistor: A transistor is a small semiconductor device that can regulate or control the flow of current or voltage, amplify signals, and act as a switch or gate. It typically consists of three terminals made of semiconductor material, and a voltage or current applied to one pair of terminals controls the current through another pair. Transistors can amplify signals because the output power can be higher than the input power. They are often found embedded in integrated circuits.

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6. Power Supply: A DC power supply is a device that converts AC to DC or changes the voltage level of a DC signal. Most electronic devices and circuits are powered by a DC power supply, and many are in the form of wall adapters.

7. Relay: A relay is an electromagnetic switch that can turn on or off a much larger electric current using a relatively small current. It contains an electromagnet, which becomes a temporary magnet when electricity flows through it. Relays are used to protect electrical systems and equipment from overcurrents or voltages, and they can minimize damage to connected equipment.

8. Driver: A driver is a circuit or component used to control another circuit or component, such as a high-power transistor, LCD, stepper motors, or SRAM memory. It regulates current flowing through a circuit or controls other factors in the circuit. Specialized integrated circuits can control high-power switches in switched-mode power converters. Amplifiers can also be drivers for loudspeakers, and voltage regulators can keep attached components operating within a broad range of input voltages.

B. *Description of the Proposed Algorithm:*

This project gives solution to this problem to insure line man safety. The main object of this project to provide automotive system for electrician to avoid electrical injury. The system is fully controlled by the 8 bit microcontroller which is family member of Arduino. Here we use two microcontroller, one is placed on pole and another is placed on power distribution fuse box. RF Transmitter and sensor is interfaced with microcontroller placed on pole and RF receiver and switching circuit is interfaced with microcontroller which placed on power distribution fuse box. The Village or City consists of number of overhead lines.

Each line contains one main pole. The smart card swap circuit placed on main pole of each line. When line man or electrician swap their card on power turn off sensor placed on main pole of each line the microcontroller take action and transmit signal through RF transmitter, RF receiver can receive that signal and microcontroller interfaced with RF receiver can take action to turn off power supply of this line through power distribution fuse box. When line man complete their work, he will swap their smart card to power turn on sensor then microcontroller transmit signal through RF transmitter to power distribution fuse box microcontroller through RF receiver and that microcontroller can take action to turn on power supply of this line.

IV. ALGORITHM FOR THE PROPOSED SYSTEM

Step 1) Initialize the microcontroller on the main pole and power distribution fuse box.
Step 2) Connect an RF transmitter and a power turn off/on sensor to the microcontroller on the main pole.
Step 3) Connect an RF receiver and a switching circuit to the microcontroller on the power distribution fuse box.
Step 4) Install a smart card swap circuit on the main pole of each overhead line.
Step 5) When a lineman or electrician arrives to work on a line, they swipe their smart card on the power turn offsensor.
Step 6) The microcontroller on the main pole detects the smart card and sends a signal through the RF transmitter.
Step 7) The microcontroller on the power distribution fuse box receives the signal through the RF receiver and turns off the power supply to the line using the switching circuit.
Step 8) When the work is completed, they swipe their smart card on the power turn on sensor to turn on the power supply.
Step 9) The microcontroller on the main pole receives the signal from the smart card and sends a signal through the RF transmitter to the microcontroller on the power distribution fuse box.
Step 10) The microcontroller on the power distribution fuse box receives the signal from the RF receiver and turns on the power supply to the line.
Step 11) The system runs continuously to ensure safety and efficiency in electrical maintenance work.

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V. SIMULATION RESULTS

The final result of this project is to prevent electrical accidents and injuries to linemen or electricians while repairing or maintaining electrical substations and overhead lines. The system is controlled by two microcontrollers placed on the pole and the power distribution fuse box. The smart card swap circuit is placed on the main pole of each line. When a lineman or electrician swaps their card on the power turn off sensor, the microcontroller takes action and transmits a signal through the RF transmitter. The RF receiver then receives the signal, and the microcontroller interfaced with the RF receiver can take action to turn off the power supply of that line through the power distribution fuse box.

Similarly, when the lineman or electrician completes their work, they will swap their smart card to the power turn on sensor, and then the microcontroller will transmit a signal through the RF transmitter to the power distribution fuse box microcontroller. This will turn on the power supply of that line, allowing the lineman or electrician to safely complete their work without the risk of electrical shock or injury.

Therefore, the final result of this project is a safer working environment for linemen and electricians, which can ultimately reduce the number of electrical accidents and injuries in the workplace.

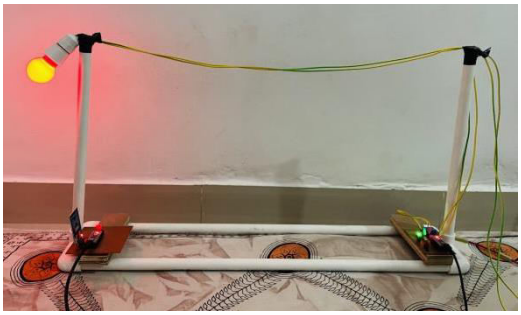

Fig.5 Working Device

Fig.6 Turning on the overhead lines using RF Card

Fig.7 Turning off the overhead lines using RF Card

VI. CONCLUSION AND FUTURE WORK

In conclusion, the proposed system based on microcontrollers and RF technology has the potential to significantly improve the safety of line men and electricians working with overhead power lines. By using smart cards for authentication and remote power control, this system can prevent electrical injuries caused by contact with overheated wires or working on live electrical equipment.

In addition to enhancing safety, this system can also improve the efficiency and reliability of power distribution by allowing for real-time monitoring and control of power supply status. With further development and

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testing, this system could be implemented on a larger scale, potentially reducing the number of electrical accidents and fatalities in the workplace.

Future work for this project could include adding additional features such as remote monitoring of power consumption, detecting faults in the power lines, and integrating with other smart grid technologies. Furthermore, the system could be optimized for different types of power lines and environments, and the microcontrollers could be programmed to adapt to changing conditions and user requirements. Overall, the proposed system shows great potential for improving safety and efficiency in the power distribution industry, and further research and development are needed to fully realize its benefits.

REFERENCES

1] Jay Kumar, Surya Kumar, Praveen Tyagy "PASSWORD BASED CIRCUIT BREAKER", International Journal of Recent Research AspectsISSN: 2349-7688, Volume 3, Issue 1, March 2016.

[2] J.Veena, Afreen, Sunil Kumar, Santhosh "ELECTRIC LINEMAN PROTECTION USING USER RFID RAEDER BASEDCIRCUIT BREAKER", ISSN: 2393- 8374,VOLUME-2, ISSUE-5, 2015.

[3] Santosh Ashok Kamble , "CIRCUIT BREAKER BASED ON ANDROID", International Research Journal of Engineering and Technology,ISSN: 2395-0056 Volume: 07, Issue: 07, July 2020.

[4] Vishal D. Kare, Sachin Kumar, Naveen "Ultra-Fast Acting Electronic Circuit Breaker", Third International Conference on Advances inElectrical, Electronics, Information, Communication and Bio-Informatics (AEEICB), Chennai, 2017.

[5] Diarah Reuben Samuel, Egbune Dickson, OsuekeChristian, "Microcontroller Based Code Locking System with Alarm", IOSR Journal ofElectrical and Electronics Engineering (IOSR-JEEE), ISSN: 2278-1676,p- ISSN: 2320-3331,Volume 9, Issue 1 Ver. II (Jan. 2014)R. E.Mueller, Pratik Yadav, Suraj B, "Temporary protective grounding of distribution circuits," in Proc. 21st Annu. North-Amer. Power Symp., 1989,pp. 270–280.

[6] M. E. Valdes, "Adapting failure mode and effects analysis (FMEA) to select hazard mitigation measures," in Conf. Rec. 59th IEEE IAS Annu.Meeting PCIC, 2014.

[7] Guide for Safety in AC Substation Grounding, IEEE Std 80-2000, pp. 8, 11, and 26.

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Impact Factor: 8.379

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ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

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