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Fingerprint Base Circuit Breaker using ATMEGA328

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Abstract: *In the current scenario, the practice of requesting business personnel to switch off power lines for maintenance or repairs poses a serious risk as in miscommunication, and can result in loss of life.*
This project presents a new system designed to mitigate this risk by providing a safer tool for changing lines. The system uses a fingerprint sensor to verify inaccessibility, ensuring that only authorized personnel can use the line. When requesting a transmission through the fingerprint sensor, the system allows you if the fingerprint matches the stored record, so that the line can be turned on/off as needed The LCD display provides real-time access information—allowing or denying access. Additionally, a relay is used to connect or disconnect the load, indicating its status as on or off, depending on the operation of the system.
The microcontroller configures all system functions and can be programmed to respond to authorized requests. Overall, the objective of this proposed system is to reduce human error and enhance the safety of power line maintenance personnel.

Keywords: fingerprint sensor

I. INTRODUCTION

Fingerprint-based circuit breakers represent a remarkable advance in electrical security and control, combining biometric technology with traditional circuit security methods As concerns about unauthorized access and electrical hazards grow, these devices residential and commercial -Provide safe and effective solutions for industrial applications
At its core, the fingerprint based circuit breaker works like traditional circuit breakers, designed to interrupt power flow in the event of overload, short circuit and other faults but the main difference is a biometric fingerprint scanner to be combined.
Fingerprinting circuit breakers is an important new feature in electrical security, providing improved security, accountability and reliability Combining the principles of circuit security with modern biometric technology, these devices don't seem to help for not only protecting homes and businesses but paving the way for smarter, more integrated electricity systems They do.
As technology continues to improve, we can expect further developments in this area, which could lead to more sophisticated solutions for lightning protection and management
How it works: At its core, a fingerprint-based circuit breaker operates similarly to conventional circuit breakers, which are designed to interrupt electrical flow in case of overloads, short circuits, or other faults. However, the key differentiator is the integration of a biometric fingerprint scanner.

II. LITERAURE SURVEY

Conducted research on enhancing a GSM integration of mobile communication technologies into safety systems. This research suggests the potential for incorporating mobile communication capabilities into electric functionalities. Mallik Arjun Hudedmaniet al. (2017) proposed a password for the safety of line-men during maintenance work. This system off measures, utilizing password authentication to control electrical circuits and ensure the safety of maintenance personnel. The literature reviewed highlights various approaches and technologies aimed at line maintenance. These include the utilization of OTP Standards, integration of low-power processing technologies, exploration of mobile communication capability implementation of password-based authentication systems. By drawing insights from

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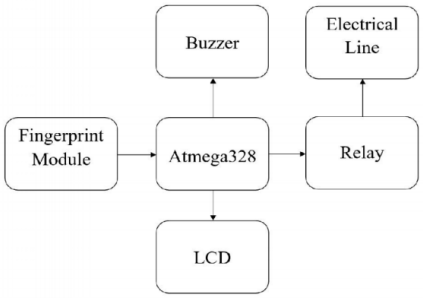
existing research, this study aims to contribute to the development of innovative and effective safety solutions for electric line maintenance integration of mobile communication technologies into safety systems. This research suggests the potential for incorporating mobile communication capabilities into electric line safety systems to improve monitoring and control Mallik Arjun Hudedmani et al. (2017) proposed a password-based distribution panel and circuit breaker operation system men during maintenance work. This system offers an alternative approach to enhancing safety measures, utilizing password authentication to control electrical circuits and ensure the safety of maintenance The literature reviewed highlights various approaches and technologies aimed at enhancing safety measures for electric line maintenance. These include the utilization of OTP-based circuit breakers, adherence to established safety power processing technologies, exploration of mobile communication capability based authentication systems. By drawing insights from existing research, this study aims integration of mobile communication technologies into safety systems. This research suggests the potential for line safety systems to improve monitoring and control based distribution panel and circuit breaker operation system ers an alternative approach to enhancing safety

III. PRPOSED METHODOLOGY OF SOLVING IDENTIFIED PROBLEM:

Block diagram of propose system



Component Description:

• Fingerprint Module: This module controls the fingerprints of individuals who want to access the system. It converts fingerprint data into a digital format for authentication

• Microcontroller (Atmega328): Acting as a central operating unit, the microcontroller controls the operation of the entire system. It controls the authentication process, relay control, and communication with other components to ensure smooth operation.

• 16X2 LCD Display: The LCD display provides a truly intuitive interface by providing information such as access status and current time, enabling more user-friendly use of the system.

• Relay: The relay part is used to control the power lines, so that they can be connected or disconnected as required by maintenance activities The microcontroller operates based on the certification status.

• Buzzer: The buzzer is activated for audible events or status changes. Increases situational awareness as the system operates.

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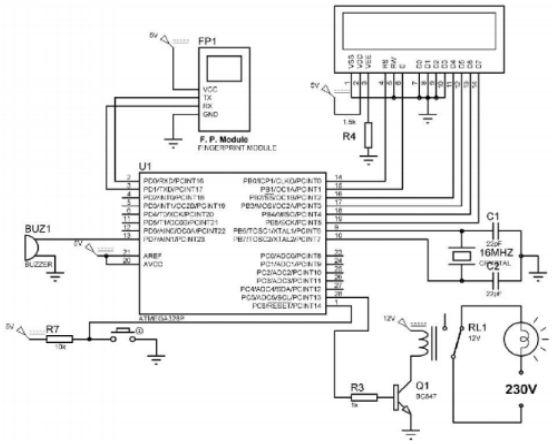
IV. CIRCUIT DIGRAM



Once scanned, the system compares the fingerprint information with authorized personnel records. If the fingerprint matches an authorized user, their name is displayed on the LCD screen, indicating access to the system. Fingerprint Processing: The process begins with a request to verify a fingerprint. The system verifies authorized employee records using fingerprint information. If the fingerprint matches an authorized user, their name is displayed on the LCD screen, indicating access to the system.

HARDWARE DETAILS :

ATMEGA328 is a high performance, low power controller from M.

It is based on AVRRISC architecture .It is the most popular of all the AVR controllers used in ARDUINO

LCD Display An LCD (Liquid Crystal Display) screen is an electronic display module and has several types of LCD displays are the most basic modules and are commonly used in various devices and circuits. A 16x2 LCD means it can display up to 16 characters per character and there are 2 such characters. Each color in this LCD is displayed in a 5x7 pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix display can display up to 224 colors and symbols. This LCD has two registers, Command and Data.

Fingerprint Sensor R307 Fingerprint Module Optical fingerprint sensors consist of fingerprint alignment algorithm, high-capacity FLASH chips and other hardware and software set, static display, simple configuration, fingerprint input, image horizontal functionality, fingerprint matching, searc storage and other functionality.

Relay Module A relay is an electrical switch that opens and closes under the control of another electrical circuit. In its basic form, the switch is operated by an electromagnet to open or close each Henry 1835. Since the relay can control an output circuit with more power than the input circuit, it can be considered that, in the sense that broadly, a form of electromagnetic amplifier

Hardware Design The ATMEGA328 is a high performance, low power controller from Microchip. ATMEGA328P is 8 based on AVRRISC architecture .It is the most popular of all the AVR controllers used in ARDUINO boards. The LCD (Liquid Crystal Display) screen is an electronic display module and has a wide range of functions. A 16x2 square footage

V. ADVANTAGES

Enhanced Worker Safety

Prevention of Electrical Accidents: Safety devices can detect hazardous conditions like high voltage or electrical faults, reducing the risk of electrocution.

Injury Reduction: Advanced PPE and real-time alerts minimize physical injuries, such as burns, cuts, and falls, by providing timely warnings and protection.

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Increased Efficiency

Faster Hazard Detection: Real-time monitoring and predictive analytics allow wiremen to identify and address risks before they escalate, leading to smoother operations.

Reduced Downtime: With better safety protocols in place, work stoppages due to accidents are minimized, improving productivity.

Compliance with Safety Standards

Regulatory Adherence: Devices that automatically check for compliance with safety regulations (e.g., OSHA, IEC) help businesses meet legal requirements and avoid penalties.

Standardized Safety Practices: Uniform safety measures across the industry ensure consistency in protection and reduce variability in safety practices.

Improved Training and Skill Development

Simulated Training Scenarios: VR/AR tools help wiremen practice high-risk tasks in a safe environment, improving their preparedness and decision-making.

On-the-Job Learning: Wearable safety devices can provide real-time guidance, aiding in skill development while performing tasks.

Reduced Human Error

Automation and Alerts: Automated hazard detection, smart PPE, and alert systems reduce human error, which is a common cause of accidents in electrical work.

Real-Time Feedback: Immediate feedback helps wiremen correct unsafe behaviors in real time, leading to better adherence to safety protocols.

Cost Savings

Fewer Accidents and Injuries: Fewer workplace accidents mean lower healthcare costs, insurance premiums, and potential legal liabilities.

Increased Productivity: With better safety measures, projects are completed more efficiently, reducing overall project costs and time delays.

DISADVANTAGES:

Facial expressions are not considered.

Use single fingerprint at a time

Future Scope :

1.Smart Technology: IoT for real-time monitoring and predictive analytics.

2.Advanced PPE: Improved, lightweight gear and AR for hazard alerts.

3.Automation: Drones and robots for inspections and wire handling.

4.Enhanced Communication: Real-time tracking and emergency alerts**.**

APPLICATIONS:

Use in electrical circuit

use electric man safety

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