NOVATEUR PUBLICATIONS
INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING RESEARCH AND TECHNOLOGY
[IJIERT] ISSN: 2394-3696 Website: ijiert.org
VOLUME 10, ISSUE 4, April -2023

PASSWORD BASED CIRCUITBREAKER USING ARDUINO

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Abstract

The password-based circuit breaker is a device that allows or denies access to an electrical circuit based on the input of a correct password. This project uses an Arduino R3 board, relay, keypad, LCD display, and breadboard to create a secure and reliable circuit breaker system. The user inputs the correct password via the keypad, and the circuitbreaker is either enabled or disabled based on the validity of the password. The system provides visual feedback to the user through the LCD display, which shows the status of thecircuit breaker and any errors or prompts. Thispassword-based circuit breaker can be used in a variety of applications, such as securing valuable electronic equipment or protecting children from dangerous electrical devices. Overall, this project provides an effective and user-friendly solution for controlling access to electrical circuits.

I. INTRODUCTION

As soon as the maintenance work is finished then line manshould enter the same password as used to disconnect the line earlier.

II. LITERATURE SURVEY

Below is a literature review of work carried out in recent years related to password-based circuit breakers and the components used in the project.

1. Password-Based Circuit Breaker for Electrical Appliances: G. Divya and M. Kalaivani present a paper ona password-based circuit breaker that can control the switching of electrical appliances. The system uses a microcontroller and a keypad to enter the password. If theentered password is correct, the system sends a signal to turn on the appliance. Otherwise, the system remains in a locked state and the appliance cannot be turned on. The system also features a display to show the status of the appliance.
2. Arduino Uno R3 Microcontroller Board: The Arduino Uno is a widely-used microcontroller board for building electronic projects. It has a range of input and output pins that can be used to interface with other components, such as sensors, actuators, and displays. The board can be programmed using the Arduino software, which is based onthe C++ programming language.

Nowadays, electrical accidents to the line man are 3.Keypad for Arduino: A keypad is a common input device

increasing, while repairing the electrical linesdue to the lack of communication between the electrical substation and maintenance staff. This project gives a solution to thisproblem to ensure line man safety. In this proposed system the control (ON/OFF) of the electrical lines lies with line man.This project is arranged in such a way that used in electronic projects. It consists of a grid of buttons that can be pressed to send a signal to the microcontroller.There are a variety of keypad modules available for use with Arduino boards, including membrane and mechanical

keypads: maintenance staff or line man has to enter the password to 4.Liquid Crystal Display (LCD) for Arduino: An LCD is a

ON/OFF the electrical line. Now if there is any fault in electrical line then line man will switch off the power supply to the line

by entering password and comfortably repair the electrical line, and after coming to thesubstation line man switch on the supply to the particular line by entering the password.The relay ON/OFF operation will be indicated by the LED's; also it sends a message to the receiver aboutthe line disconnection.

display device that can show text and graphics. There are several types of LCDs available for use with Arduino boards, including character displays and graphical displays. They can be used to provide feedback to the user or displaydata from sensors or other inputs.

5. Relay Module for Arduino: A relay is an electrical switchthat can be controlled by a signal from a microcontroller. Relay modules are available for use with Arduino boards and can be used to control high-power devices, such as motors or lights.

6. Breadboard for Prototyping: A breadboard is a deviceused for prototyping electronic circuits.

It consists of a grid of holes into which components canbe inserted and connected together using wires. Breadboards are often used during the development of electronic projects to test and modify circuit designs before building a final version on a printed circuit board.

III. BLOCK DIAGRAM

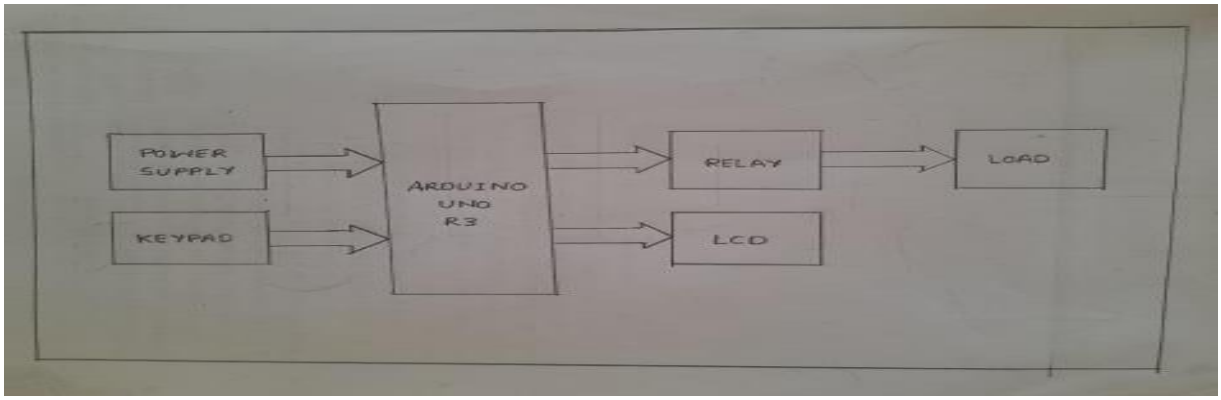


Fig. Block Diagram

IV.PROBLEM IDENTIFICATION

Circuit breakers play a vital role in maintaining system security.

V. CIRCUIT DIAGRAM

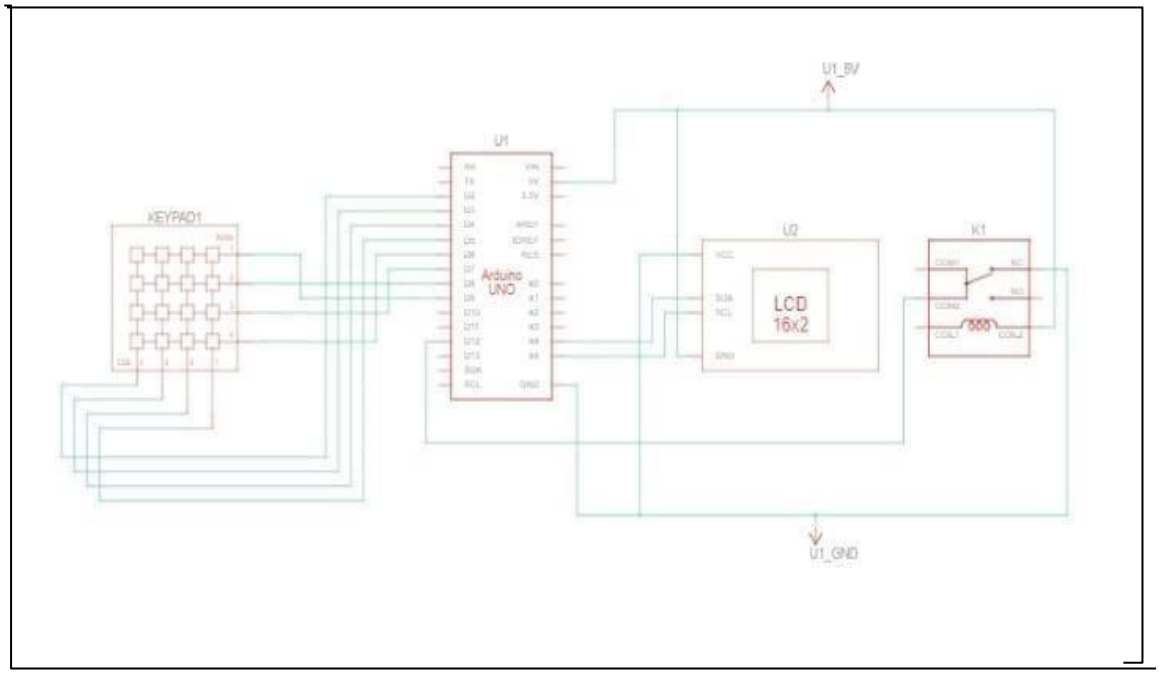


Fig. 2 Circuit Diagram

A. When password is correct

If the password is correct,the Arduino R3 activates the relay,and the electrical appliance is turn on . Since their malfunctioning could results in further component

B. When password is incorrect

outages and may lead to the insecure operating conditions.

During maintenance of distribution lines there is a chance of communication gap between the electric line and sub-station operator or staff. This communication gap may risk life of electric line man. The control to turn ON/OFF the line lies withthe line man only.During maintenance the entire line is turned off this cause inconvenience to the consumers. Improper communication between maintenance staff and substation If the password is incorrect, the Arduino R3 denies access tothe electrical appliance, and the remain off

Password-based circuit breaker using Arduino R3, relay, keypad, and LCD display is a simple yet effective project that enhances the security of electrical systems by allowing access only to authorized personnel. The project can be

causes the electrical accidents. At present if there is any easily modified to suit different applications and can be used maintenance work at the distribution the entire line will be turned off which causes inconvenience to the consumers. The entered password is compared with password stored in the ROMof the microcontroller. If the password entered is correct, then only the line can be turned ON/OFF. A relay is controlled by a in various scenarios where security is a concern.

VI. METHODOLOGY

relay driver IC, which is interfaced to the microcontroller also it Password based circuit breaker using ardino r3 relay keypad
is interfaced with the GSM modem. Whenever there is a LCD display bread board give me for methodology Here ismaintenance work in the main line ,the line can be disconnected only when the password entered will match with the stored password. The relay ON/OFF operation will be indicated by the LED's; also it sends a message to the receiver about the line disconnection. As soon as the maintenance work is finished then line man should enter the same password as used to disconnect the line earlier.
a general methodology for creating a password-based circuit breaker using an Arduino, relay, keypad, LCD display, and breadboard:Gather the necessary materials: Arduino Uno R3, relay module, 4x4 keypad, 16x2 LCD display, breadboard, jumper wires, and a power supply.Connect the power supply to the breadboard and then connect the Arduino's 5V and GND pins to the breadboard's power rails.Connect the relay module to the Arduino by connecting the module's VCC to the Arduino's 5V pin, GND to the GNDpin, and IN1 to Arduino's digital pin 9.Connect the keypad to the Arduino by connecting its rows to Arduino's digital pins 2-5 and its columns to digital pins 6-9.Connect the LCD display to the Arduino by connecting its VSS and RW pins to the GND rail, VDD and A pins to the 5V rail, and its E, R/W, RS, and D4-D7 pins to Arduino's digital pins 8, 7, 6, and 5-2 respectively.Write a program in Arduino IDE to control the circuit breaker. The program should include functions to initialize the keypad and LCD display, read input from the keypad, and display messages on the LCD.Add a password verification system to the program. When the circuit breaker is powered on, the program should prompt the user to enter a password via the keypad.If the password is correct, the relay should be activated and the program should display a message on the LCD indicating that the circuit breaker is active. If the password is incorrect, the program should display an error message and wait for the correct password to be entered.Test the circuit breaker by entering the correct password and verifying that the relay is activated, and by entering an incorrect password and verifying that the program displays an error message.Finally, enclose the circuit in a suitable housing to protect the components and provide a user- friendly interface for entering the password.

VII. COMPONENTS DESCRIPTION

1. **ARDIUNO :** The Arduino Uno R3 is a microcontroller board that is based on the ATmega328P microcontroller. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, and a power supply. The board can be powered by either a USB connection or an external power supply. It is compatible with a wide range of shields and accessories, which allowit to be easily expanded to suit a variety of projects.The digital input/output pins on the Arduino Uno R3 can be used

as either input or output pins. They are rated for a maximum current of 40 mA and can be set to either high or low logic levels. They can also be used for pulse-width modulation (PWM), which allows the output voltage to bevaried in a range of values. This feature is useful for controlling the brightness of LEDs or the speed of motors.

The analog inputs on the Arduino Uno R3 can be used to read analog signals from sensors or other analog devices. They are rated for a range of 0-5 volts and have a resolution of 10 bits, which means that they can detect 1024 different voltage levels. This allows for precise measurement of analog signals.The 16 MHz quartz crystal on the Arduino Uno R3 provides the clock signal for the microcontroller. The clock signal is used to synchronize the operations of the microcontroller, ensuring that instructions are executed at the correct time.

The USB connection on the Arduino Uno R3 allows it to be connected to a computer for programming and communication. The board can be programmed using the Arduino Integrated Development Environment (IDE), which is available for Windows, Mac, and Linux.The IDEprovides a simple interface for writing, compiling, and uploading code to the Arduino.

2. **RELAY MODULE :**Relay is one kind of electro- mechanical component that functions as a switch. The relay coil is energized by DC so that contact switches canbe opened or closed. A single channel 5V relay module generally includes a coil, and two contacts like normally open (NO) and normally closed (NC). This article discusses an overview of the 5V relay module & its working but before going to discuss what is relay module is, first we have to know what is relay and its pin configuration

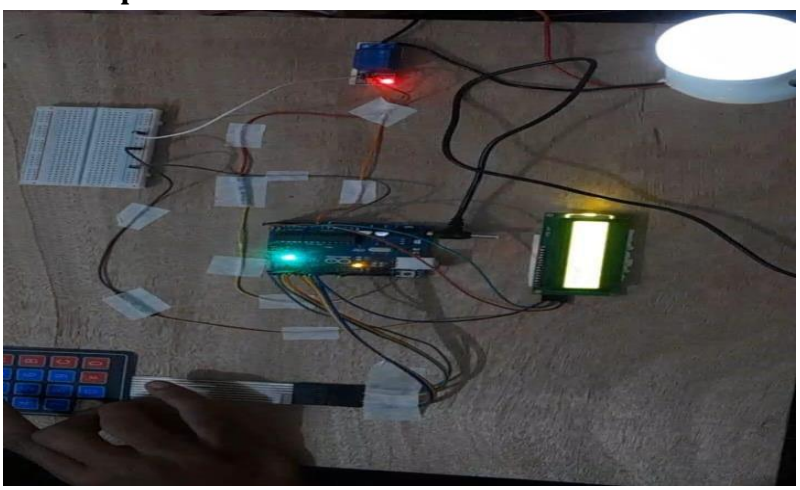
3. **KEYPAD :**

When we want to interface one key to the microcontroller then it needs one GPIO pin. But when we want to interface many keys like 9, 12 or 16 etc., then it may acquire all GPIOpins of microcontroller.To save some GPIO pins of microcontroller, we can use matrix keypad. Matrix keypad is nothing but keys arrange in row and column.E.g. if we want to interface 16 keys to the microcontroller then we require 16 GPIO pins but if we use matrix 4x4 keypad then we require only 8 GPIO pins of microcontroller.

4. **LCD DISPLAY :**

This is a 16x2 LCD display screen with I2C interface. It is able to display 16x2 characters on 2 lines, white characters on blue background.Usually, Arduino LCD display projectswill run out of pin resources easily, especially with Arduino Uno. And it is also very complicated with the wire soldering and connection. This I2C 16x2 Arduino LCD Screen is usingan I2C communication interface. It means it only needs 4 pins for the LCD display: VCC, GND, SDA, SCL. It will save at least 4 digital/analog pins on Arduino. All connectorsare standard XH2.54 (Breadboard type). You can connect with the jumper wire directly.To avoid the confliction of I2C address with other I2C devices, such ultrasonic sensor, IMU, accelerometers, and gyroscope, the I2C address of the module is configurable from 0x20-0x27. And its contrast canbe adjusted manually.Another alternative option is I2C 20x4Arduino LCD Display Module if more characters are required.

VIII. RESULT Design And Implementation:



The result of a password-based circuit breaker using Arduino R3, relay, keypad, LCD display, and breadboard would be a functional circuit breaker that requires a password to be entered before allowing electrical current to flow through. The circuit breaker would be controlled by an Arduino microcontroller, and the password would be entered using a keypad. The system would display messages on an LCD display to guide the user through the process of entering the correct password. When the correct password is entered, the relay would be activated, allowing electrical current to flow through the circuit. If an incorrectpassword is entered, the system would not activate the relay, and no electrical current would flow through the circuit. The circuit breaker would be useful for securing electrical devices or appliances and preventing unauthorized access.

ADVANTAGES

1. Security: Password- based circuit breakers provide anway of controlling power supply to a load. By requiring a password to turn the circuit on or off, unauthorized access can be prevented, ensuring safety and security. The LCD display will provide real-time feedback on the status of the circuit, while the relay will act as a switch to control the power supply.

The project will have a wide range of applications, such as in homes, offices, and industrial settings, where the need for secure power control is paramount. The use of the Arduino board and other electronic components will ensure that the circuit is efficient, with minimal power losses, and has a longer lifespan. The project also has the potential to be extended to control multiple loads simultaneously, making it even more useful in various applications.

CONCLUTION

It can work on a single given known password. The password to operate can be changed and system can be operated efficiently with the changed password. No other person can reclose the breaker once the changed password is extra layer of security to prevent unauthorized access to given into system other than the person who had changed it.

Electrical Circuits.

2. Convenience: It is easy to use and does not require anyphysical key or tool to operate the circuit

breaker.

3. Flexibility: The password can be easily changed orupdated, providing flexibility to the user.
4. It is a cost-effective solution as it does not require anyadditional hardware for operation.

X. Future Scope

The scope of the "password-based circuit breaker" project is to design a circuit that can control the power supply to a load, such as a bulb, using a password entered through a keypad. The project will utilize the Arduino Uno R3board,a relay, a keypad, an LCD display, and a breadboard to implement the circuit.

The project aims to provide a more secure and convenient

It gives no scope of password stealing. It is effective in providing safety to the working staff. It is economical. It canbe easily installed.

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