DESIGN AND IMPLEMENTATION OF OTP BASED CIRCUIT BREAKER

Shrawan Sharma [1]
UG Scholar
Excel College of Eng. & Tech

Mr.B. Prasanth [2]
Assistant Professor
Excel College of Eng. & Tech

Pankaj Chettri [3]
UG Scholar
Excel College of Eng. & Tech

Sanjeet Silwal [4]
UG Scholar
Excel College of Eng. & Tech

ABSTRACT

If we are to use the OTP based system, automation technology becomes mandatory in any aspect, which can be possible by using embedded system design where the combination of both mechanical and computer systems. At the current scenario the human accidents are increasing at a rapid pace, so our project focuses mainly on reducing or eliminating the accidents and ensure safety to the workers. In this project the control of the circuit breaker is done by using Arduino which is used to send the OTP to the user to operate the circuit breaker (CB). This project is arranged in such a way that the maintenance staff has to enter the OTP with the help of a keypad to get access to the circuit breaker.

Keywords: OTP, CB

INTRODUCTION

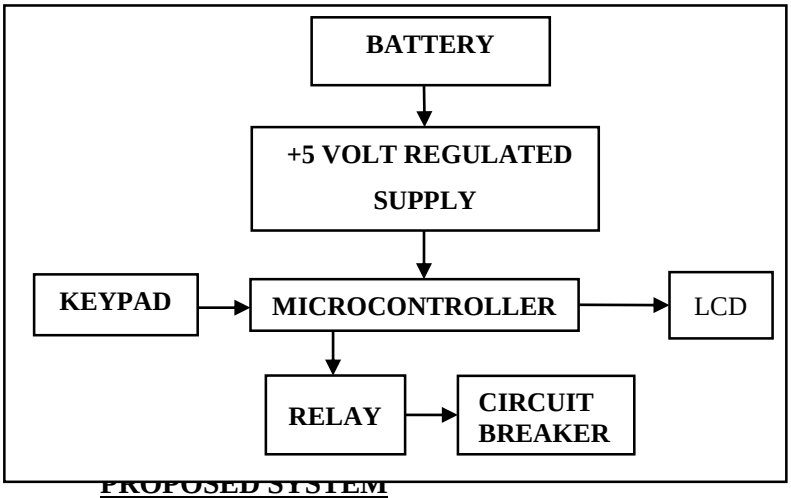
Circuit Breaker has a vital role to play in switching operation whether it is for a routine network operation and protection of other devices in power systems. Periodical inspection and preventive maintenance are generally performed to check the circuit breaker's health. The preventive maintenance schedule is usually done on the recommendation of the circuit breaker vendors although the recommended schedules are averse to change. Security is a prime concern in today's scenario and everyone wishes to be safe as much as possible. So, this project mainly aims at providing the safety to the electrical line man by using an OTP which is a unique code generated each time he wishes to access the circuit breaker. Severe electrical accidents with the electrical line staff are on the verse of rise due to the insufficiency of co-ordination and communication between the control room staff and the electrical line man. This project provides a solution which ensures the safety of the line man. The power to turn on or off the circuit breaker is only with the line man because this system is arranged in such a way that a one-time password is generated each time one wishes to access the circuit breaker. So, the thus generated password is sent to the electrical line man over his phone (which is already registered in the program). This system is fully controlled by a controller. A matrix keypad is interfaced with the Arduino which facilitates to enter the password. The thus entered password is compared with the generated password. If the password happens to be correct then only the circuit breaker can be turned on or off.

I. SYSTEM DESIGN

EXISTING SYSTEM

In the existing system, a password is used as a security key using a microcontroller. Basically, a password is programmed to the microcontroller. So, whenever a line man wishes to get access to the circuit breaker, he needs to enter the same password in the console which gives access to the circuit breaker. Another method they have used is a radio-frequency identification (RFID) based control system which allows only authorized personnel to enter a particular area or a particular station where a circuit breaker is placed.

The authorized personnel are provided with a unique ID or a tag which is used to access that station. For example, the RFID systems are used in contactless payment system. Generally, a RFID system consists of 3 components viz: a transceiver with a decoder, an antenna and a transponder which is digitally programmed which provides all the information about the password. The general block diagram of the existing system is shown in the figure below:



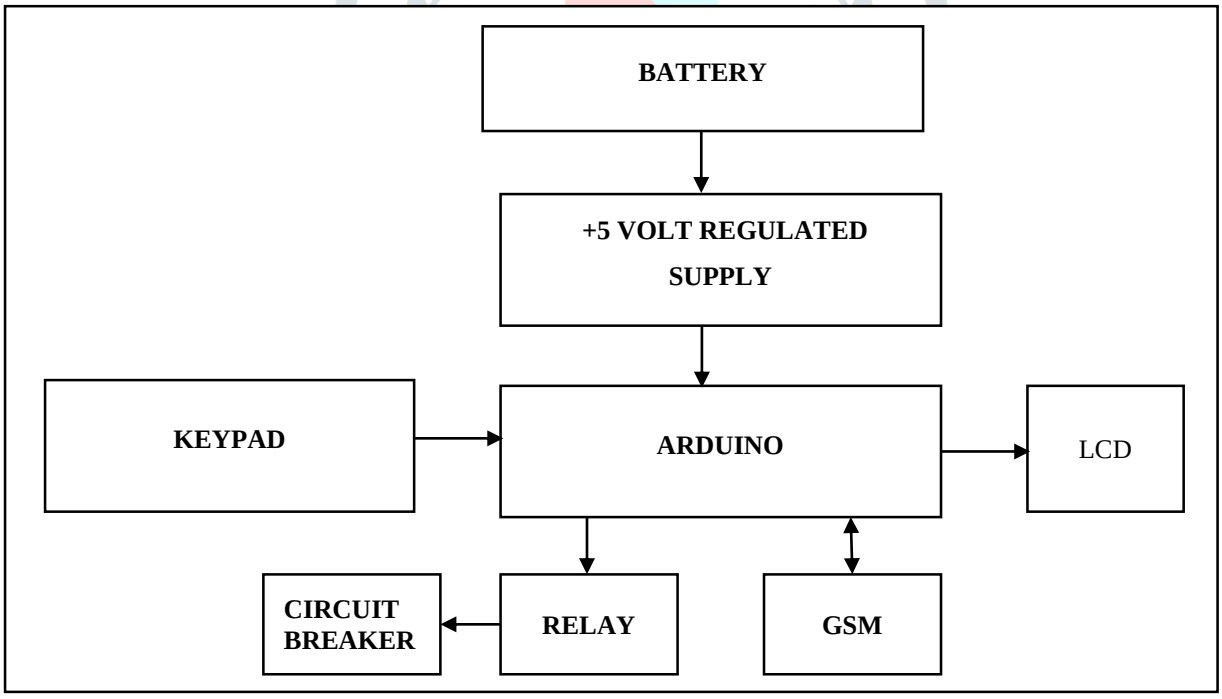
Disadvantages

1. Security is not enough.
2. It needs more components.
3. A password can be easily known by another person.
4. It needs ID in case of the RFID based system.
5. It is not cost effective.
6. This system is not so advanced.

PROPOSED SYSTEM

In our proposed system if a person wishes to access the circuit breaker, he needs to enter the uniquely generated one-time password. If the password happens to be incorrect, it will show an error message and gives another 2 chances to enter the correct password but still if the correct password isn't entered then it will inform the personnel via message that someone tried to broke in the circuit breaker. The OTP is sent to the authorized personnel's phone with the help of the GSM module. If the password entered is correct then the relay switch opens the circuit breaker, where a relay is an electrically operated switch. Most of the relays can mechanically operate the switch with the help of an electromagnet, but other fundamentals are also used in the relays such as solid-state drives etc. For maintaining a constant voltage level, a voltage regulator system is employed which may use a simple feed-forward or a negative feedback design.

PROPOSED BLOCK DIAGRAM



Battery: Battery converts the chemical energy into electrical energy. It is used to supply the power to the system. Batteries can either be high energy or high power but it cannot be a combination of the both. Batteries generally consists of one or more electrochemical cells with external connections for powering electrical devices

Relay: Relays are switches that are operated both electrically and mechanically which contains an electromagnet and also a set of contacts. In our proposed project we have used relay as the switch which operates the circuit breaker. The relay can have multiple contacts like make and break contact. When it is mandatory to control a circuit by using an independent low-power signal, or when various circuits are to be controlled by one signal, in such scenario relays are used.

LCD: It is a display unit used in the system to display various information. We have used 16*2 LCD display in our project which is used to display certain messages such as incorrect password, errors etc.

Arduino: An arduino is a microcontroller based kit which has open source hardware feature. Basically in our project we have used arduino as an open source platform. So, an arduino consists of a programmable circuit board and a software which consists of integrated development environment which is used to upload the code to the physical board.

GSM Module: GSM modem is a device which can be either a mobile phone or a modem device which can be used to make a computer communicate over a network which requires a SIM card which operates a network range subscribed by the network operator. The main purpose of using a GSM module in our project is to get OTP in the registered mobile phone of the line man. In the existing system, this component is not present because there is no facility of OTP.

Keypad: We have used a matrix keypad which is the most commonly used input devices. The matric keypad used in our project is used to type the OTP to operate the circuit breaker.

Circuit Breaker: A circuit breaker is a switching device that can be used manually and automatically for controlling and protecting an electrical power components. The circuit breaker is basically a protection device that are employed in the power system to protect the components of the power system from certain faults such as over current, short circuit etc. This is the main component of our project, various components are utilized in our project to operate this circuit breaker which is used by the electric line man to trip off the supply when carrying the maintenance

work.

4. The fault protection is high.

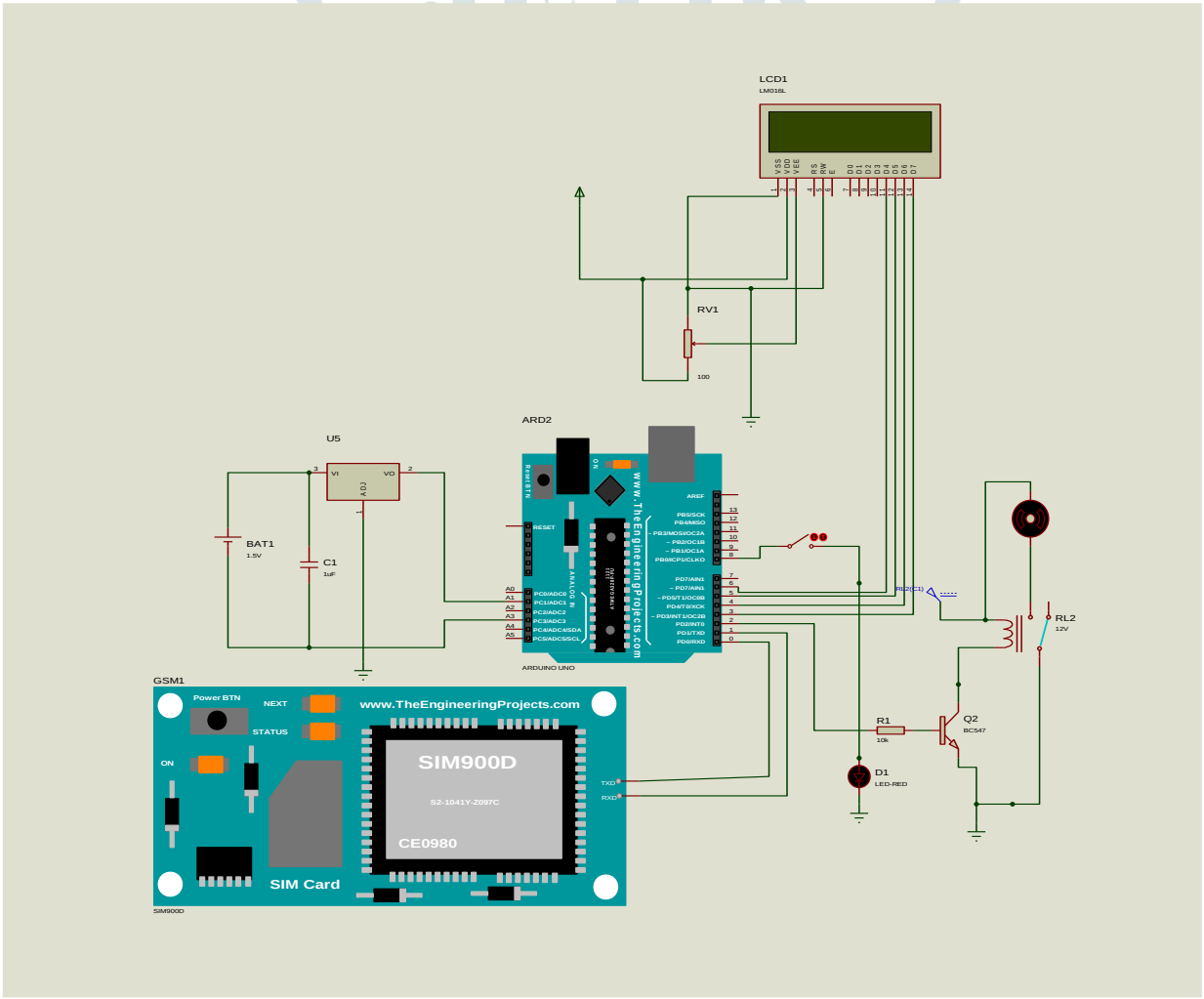
ADVANTAGES

1. Very much effective and compact.
2. It can be easily handled and secure.
3. OTP is the safest form for security system.

APPLICATIONS

1. Petrol pump.
2. Circuit breaker application.

II. SOFTWARE DESCRIPTION



We have used proteus design suite for primary electronic design automation. Firstly, we simulated all the components using this software then we have implemented our project. The simulation of our project using this software is shown above with the help of a screenshot of the screen. Here for testing purpose we have used motor as the load. The GSM utilizes SIM to send OTP to the user.

III. CONCLUSION

In this project we have covered all the activities taking place at the Power Station and fuel management system (as this method can also be used at the fuel management system) and to automate the activities by using OTP based circuit breaker system we provide maximum efficiency to our users who are the management staff. This project can also provide maximum comfort environment for the line staffs by actually replicating their huge log books which they use for keeping the track of all the records manually. It also maximizes the ease with which users will be able to use the system by providing data retrievals on a password-based system.

IV. REFERENCES

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V. BIBLIOGRAPHY

Shrawan Sharma

Currently pursuing his Bachelors in Engineering (4th year) from Excel College of Engineering and Technology, Pallakapalayam (Namakkal District) affiliated to Anna University, Chennai

Mr. B. Prasanth

Currently working as an Assistant Professor in Excel College of Engineering and Technology (Namakkal District) affiliated to Anna University, Chennai. Completed his B.E from Paavai College of Engineering (Anna University) and M.E in Embedded Systems Technologies from Kongunadu College of Engineering and Technology

Pankaj Chettri

Currently pursuing his Bachelors in Engineering (4th year) from Excel College of Engineering and Technology, Pallakapalayam (Namakkal District) affiliated to Anna University, Chennai

Sanjeet Silwal

Currently pursuing his Bachelors in Engineering (4th year) from Excel College of Engineering and Technology, Pallakapalayam (Namakkal District) affiliated to Anna University, Chennai.