

Algorithm-based Security System using GSM Modem

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Abstract: In this world, that it would be a school, office, banks or apartment the only thing which we concern is safety and security. In this case, we are trying to keep our personal belongings safe like data, money and other important files to be secured from unauthorized persons. To overcome this technology, we are going to represent a fingerprint and algorithm-based security system that provides complete security and making unable to access for unauthorized person or someone else. Therefore, in this system, we are going to tighten the security for the unauthorized person. In this system, we are going to authorize the person's fingerprint who is going to open the locker or door. This fingerprint recognition is only done by the Arduino Uno to check for authentication. In this case, if the person has the correct fingerprint matched with the registered fingerprint, the door will automatically open otherwise the GSM module will be triggered and the registered person will get the concern alert message and the buzzer connected will be intimate the sound to alert the surroundings officially. Here we have done a few algorithms for more safety purposes.

Keywords: Ultrasonic sensor, Buzzer, Arduino UNO, GSM Modem.

I. INTRODUCTION

The most important in our daily life is security. Ensure that the safeguarding of all individuals and their things at home is the most important thing to prevent illegal security from being thieved. Security has become the most important element in rural and specific areas in our everyday life. They will attempt to theft or take our personal belongings like ornaments, documents, files, especially cash and other important which we keep in safety [1]. To overcome this, most of them were using locks or any other closing system to prevent theft. By using this type of locks, it will be very simple for the person who is going to theft because these locks are easy to break with advanced tools. Hence, we decided to create a complicated algorithm-based security system with advanced features using an ultrasonic sensor and with fingerprint scanner [10]. In addition to that, we are going to

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implement the GSM modem for generating OTP to the concerned person and also causing an alert message [9]. In this system, a buzzer connected will be intimate the sound when the theft is trying to theft from the home or locker.

A. Creation of security system hardware and software

The project consists of a fingerprint scanner, ultrasound sensor, and the module GSM, which transmits a warning message to a mobile telephone. The following modules are part of this security system.

Hardware:

1. Fingerprint module
2. Motor
3. GSM Module
4. Keypad and Seven Segment display
5. Arduino Uno
6. Ultrasonic sensor

Software:

1. Arduino IDE
2. Embedded C

II. BLOCK DIAGRAM

A. Block Diagram and Block Illustration

This segment explains the block of the Locker System using Arduino UNO. This block diagram is considered to be an important factor and thus only using this easy implementation is held in case of many projects. The below figure shows the block diagram of the finger-print based security system.

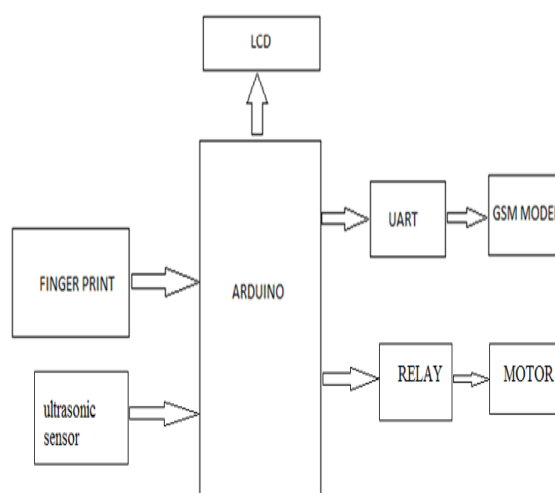


Fig. 1. Locker System Block diagram

III. HARDWARE COMPONENTS

A. Arduino UNO

An open-source microcontroller that we used is Arduino Uno [1]. The software that we tend to use is an IDE (Integrated Development Environment). This device allows us to search the actual board and to move it. The following options exist for this Arduino UNO.



Fig. 2. Arduino UNO

- The microcontroller used here is an Arduino UNO.
- This board consists of the 5V in operating voltage.
- The Uno is a microcontroller board supported atmega 328p.
- The atmega 328p has 32kb of non-volatile storage for storing code.
- The board has 14 digital input and output pins, 6 analog inputs and USB connectors.
- It also consists of icsp circuit and a button to reset.
- The uno area unit typically programmed with the arduino computer code.
- This board accepts voltage between seven and twenty volts.
- The clock speed that we tend to used is 16MHz.

B. Ultrasonic sensor

This device is basically a tool that is employed for measuring the diameter by exploitation sound waves [5]. This kind of sensing element is employed to find the motion of the object that comes close. This consists of the electrical device to send and receive the pulses that offer back the data regarding an object's proximity. this can be one among the simplest ways in which to sense the proximity and notice levels with high responsibility. This sensing element can accurately calculate the space of the thing with the assistance of pulses. space is calculated by the causation and receiving of pulses [3]. The rule of this module is extremely straightforward. Once it sends the pulse out at 40kHz that travels the air if there's an obstacle or object, it'll regain to the sensing element. In this manner, we are able to calculate the time and distance of the thing. This sensing element has the subsequent options.

- It consists of 5V DC power provide.
- It has Trigger pulse input and Echoes pulse output.
- The most frequently used here is 40Hz.
- This parameter has the subsequent dimension of 45*20*15mm.



Fig. 3. Ultrasonic Sensor

C. GSM Modem

The special name for a GSM modem is Sim card recognition and is used on mobile phones. This GSM looks like a smartphone in particular. It allows the device to use the GSM modem and connect to the computer over its mobile network. This type provides internet connectivity. This system allows Short Message Service and Multimedia Messaging Service to be sent and received [2]. Once the module is connected to the smartphone, the modem and mobile telephone are liked.



Fig. 4. GSM Modem

D. Fingerprint Scanner

One of the most important security systems in biometrics is fingerprint [8]. Each one has unique identification marks in their finger. Each one has different patterns and different combinations in their fingers. This pattern is called the fingerprint. This fingerprint scanner is widely used in all over the country for security purposes. These fingerprints cannot be changed or removed from the finger. These fingerprints are used in police stations, security industries, mobile phones and most recently on computers.



Fig. 5. Fingerprint

E. LCD (Liquid-Crystal Display)

Liquid Crystal Display shows the message which is encoded in the computer. There are different types of LCD displays according to their shape, size, and color. It is multiple ranges of applications that can be operated in liquid crystal display televisions, computers, smartphones, laptops and panels of instruments. For consumer electronics ventures, including mini video games and digital clocks, liquid crystal display is also used.



Fig. 6. Liquid crystal display (LCD)

IV. SOFTWARE COMPONENTS

A. Arduino IDE

The software which we used is the Arduino IDE. The expansion of IDE is Integrated Development Environment. It allows the program to be written or imported into the UNO board. Once the code is done it should be imported to the Arduino Uno. Then the Arduino starts the process. This code is done by the user according to their output.



Fig. 7. Arduino IDE

V. WORKING

At the earlier stage, we should initialize the fingerprint and modem connected with Arduino Uno. This complete process is now connected with the buzzer to indicate the alert sound of this system. This system can be used where ever we needed. The Modem would transmit the warning message to the mobile phone linked to the Arduino UNO.

A. Ultrasonic sensor

At first, the ultrasonic sensor should be placed in on the door or windows with some distances. The sensor will check whether any motion of the objects detects inside the room [3]. This sound wave enables somebody is moving in their home. Whenever the person enters into the room the ultrasonic sensor senses the object or motion of the person, and at once it will send the notification to the concerned person as a message. This will alert the person where ever they are through mobile phones [4]. If the same person enters the room the notification will be sent to the mobile phone.

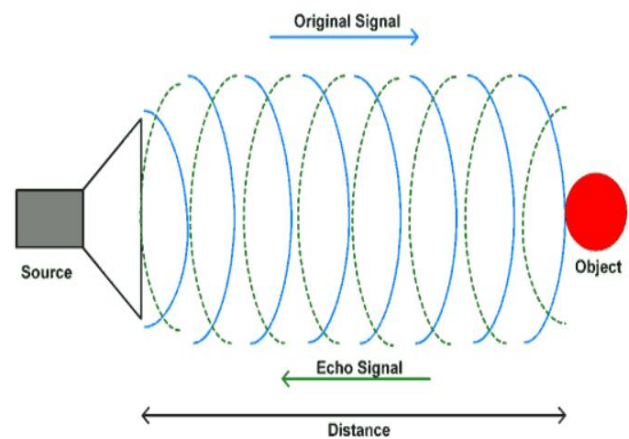


Fig. 8. Ultrasonic Sensor waveform

B. Fingerprint scanner

The second process is the fingerprint scanner. One of the best biometrics is fingerprint [10]. The fingerprint scanner inspects and matches the user's fingerprint that has previously been initialized. When the fingerprint is wrong, GSM Modem will send a warning message to the appropriate mobile phone [7]. The OTP is transmitted on a mobile phone if the fingerprint corresponds. But this is not the correct password to open the door. Here we used some algorithms to have the correct password to free the locker door.

C. Security and algorithm

We used advanced algorithms for protection here. In this algorithm, the OTP which is sent by the GSM modem should be calculated with this algorithm. At the early stage, the key should be initialized. For example, if the key digit is (1,0, -1), this key should be added or subtracted with the OTP sent by the GSM modem.

Example:

The OTP sent by the GSM Modem -	5 4 8
The Key that we initialized here is -	1 0 -1

The final password is	6 4 7

This is the final password to open the safety locker. This key can be changed according to the person concerned.

Suppose the OTP sent by the GSM modem is (951). The key which we used here is (1,0, -1). The final password will be generated as follows,

The OTP sent by the GSM Modem -	9 5 1
The Key that we initialized here is -	1 0 -1

The final password is	9 5 1

In this way, the final password will be generating.

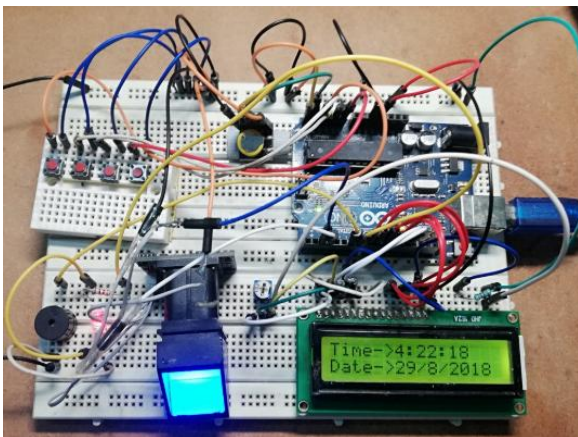


Fig. 9. Components connected with Arduino Uno

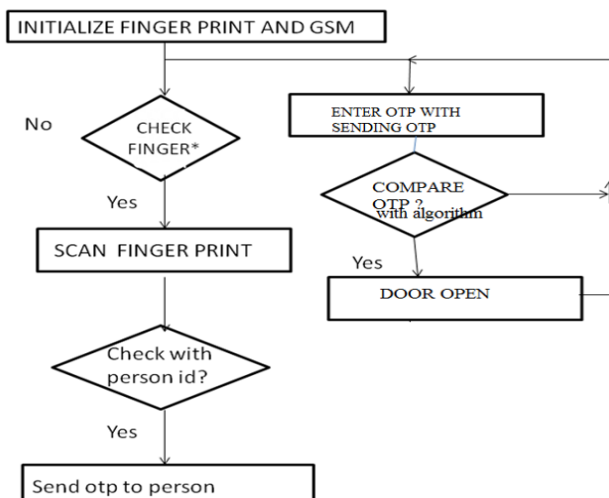


Fig. 10. Diagram of fingerprint-based security system

VI. RESULT AND DISCUSSION

The home locker security system is tested and implemented using the ultrasonic sensor, GSM module, soft password, and the fingerprint scanner as a developed system. The function of this fingerprint-based home locker security system is to create an image-based security system that allows the individual who opens the locker to capture the photo of the concerned person. Besides this iris scanner for security purposes should also be installed.

VII. CONCLUSION

The microcontroller compares the passwords entered by keyboard and received through mobile phone. If these passwords are correct the microcontroller provides necessary control signal to security system. Future work of this paper is planned to a develop security system based on fingerprint face recognition for visual identification of the person.

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