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Intrusion Detection Recording System with Biometric Lock

Lincy V J[1*], P V Bhaskar Reddy[2], Monica Patel T[3], Muskan Kesharwani[4], N Raksha[5]

[1,2,3,4,5]*School of Computer Science and Engineering, REVA University, Bengaluru.*
*Email: lincyjoseph555@gmail.com , bhaskarreddy.pv@reva.edu,in, tmonicapatel@gmail.com ,
muskankesharwani987@gmail.com, raksha.n2029@gmail.com*

*Corresponding author's E-mail: lincyjoseph555@gmail.com

Article History	Abstract
	We are coming across cases, where the education system is being distorted and perverted. As the present security of our education system has several loopholes that can be exploited to obtain access to the locations were question papers are being kept, posing a significant threat to society, to address this problem we engineered an intrusion detection recording system with a biometric lock. Our project is a result of combination of two already existing methodologies – Wireless Biometric Lock and Noise detector with automatic recording system. This combination provides us with a more secure system than the existing individual implementation. Thus, our project is a noise sensor-based device with an automatic recording system that can also lock the locker or door using a fingerprint-based biometric interface which not only detects intrusion but also traps the person who tries to intrude.

1. Introduction

Security breaches in schools, workplaces, hospitals, and other high-security locations have proven to be a serious problem. Highly confidential papers and documents must be secured[5]. Using a noise detection system, our application aims to detect intrusion in highly secure areas where papers, accounting data, and other important information are present. Suppose an intrusion is detected, the person in charge is notified to lock the area using a biometric lock because the leak of this poses a greater risk to society[2]. Our noise detector machine not only senses noise but also records it in audio form and saves that in a connected device, which can be used for further investigation if required[1]. We created an Arduino-based noise detection system with automatic recording and a biometric lock. Furthermore, a biometric app interface will allow the user to lock doors and lockers. Biometric services, such as fingerprints, offer mechanisms for enforcing secure device logs and safeguarding an individual's right to privacy.

Components

The hardware requirements for an intrusion detection recording system with a biometric lock are as follows: Arduino Uno, Bluetooth HC 05, Jumper Wires, Servo motor, Buzzer, Lock, Sound Sensor module, Battery

Arduino Uno

The Arduino UNO is a microcontroller with ATmega328 at its core. The Arduino UNO board is the only Arduino board that I know of. Of all Arduino boards, the Arduino board is the most used board of all Arduino boards. The boards are based on the Arduino platform. The board has 14 digital I/O pins along with six analog input pins, as well as a USB connector, reset button, power jack, etc. A USB port is used to charge the board, or it can be powered directly from the board's DC supply.

Fig1. Arduino Uno

Bluetooth HC 05

When it comes to technology and communication, wireless connectivity is quickly displacing conventional connections. Designed to be used instead of cable connections The HC-05 communicates with the electronics via serial communication. Typically, it is used to transmit files between devices such as cell phones within a small range. It operates at a frequency of 2.45GHz. The data transfer rate can range from 1Mbps to 10Mbps and is within a 10-meter range.
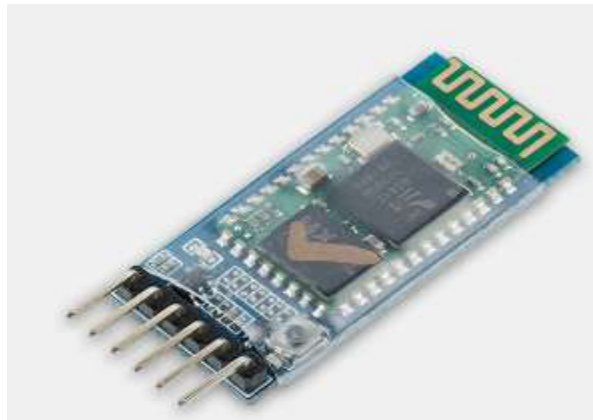

Fig2. Bluetooth HC 05

Jumper Wires

A jumper wire is an electrical wire (or a set of them) containing a connector or pin at each end of a cable. These wires are used to link components with each other without soldering on the breadboard or other prototypes, internally or with other equipment or components.

Fig3. Jumper Wire

Servo motor

The motor is used to open the door by providing rotational motion. This device needs to be powered to function.

Fig4. Servo Motor

Buzzer

Electromechanical buzzers use a bare metal disc and an electromagnet. The magnet swings and the metal disc vibrates as a voltage is applied, producing a magnetic field. There is an audible disturbance as a result of this. This buzzer uses less current, generates more vibration, and has a broader frequency range. Electromechanical devices can produce low-frequency sound.
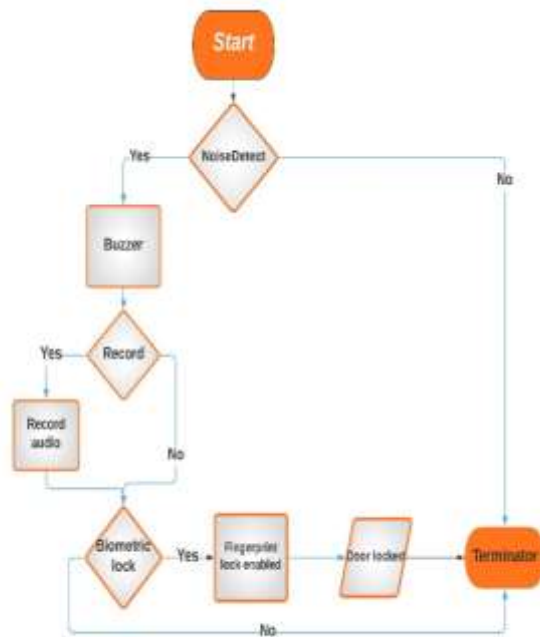

Fig5. Buzzer

Sound sensor module

The sound sensor is one type of module which detects noise. This device is used to detect the intensity of noise generated. Some of the most popular applications for this module include switching, security, and monitoring. The sensitivity of this sensor could be enhanced for ease of use.

Fig6. Sound Sensor Module

Flow Chart

Working

The sound detection sensor operates in the same way as our ears do, with a diaphragm that transforms vibration into signals. A sound sensor, on the other hand, is made up of an in-built capacitive microphone, a peak detector, and a sound-sensitive amplifier.

Sound waves travel through the molecules of air. The diaphragm in the microphone vibrates as a result of such sound waves, causing capacitance to shift. The shift in capacitance is then amplified and digitalized for sound strength processing. The buzzer is powered by the battery.

As soon as sound sensor detects noise, the buzzer beeps indicating the intrusion, the user's device which is connected via Bluetooth will be notified. The concepts of device "inquiry" and "inquiry search" are used in Bluetooth technology. Scanning systems is use to find devices of known frequencies. It responds with the necessary information to evaluate the type of the device.

Our application allows the user to choose whether or not to record audio. The recording would be saved in the user's device if the user wishes to log. If the user gets suspicious, he can use the biometric lock to lock the door, it can also be used for unlocking. Biometric lock work by scanning the fingerprint data and translating it to a numerical template [3]. When a finger is put on the sensor, it scans the print. The device will do nothing if no match is found. If a match is made, the electronic lock will be triggered allowing users to lock/unlock the door[4,6].

To perform all of the above tasks, we created two separate mobile applications. one app to warn the user of an intrusion and, if necessary, record the audio. A biometric locking device app is also available. Both apps rely on Bluetooth for communication.

Design and Estimation

VCC pin of HC 05 Bluetooth and Sound Sensor Module are connected to the 5V of Arduino. The VCC pin of Buzzer is connected to the D12 pin of the Arduino. GND pins of HC 05 Bluetooth, Servo Motor, Buzzer, and Sound Sensor Module are connected to the GND pins of Arduino. Transmitter (Tx) and Receiver (Rx) pins of the HC 05 Bluetooth module are used for serial communication with Arduino. They are connected to the D3 and D4 digital pins of Arduino. Analog output pin 9 of Arduino is connected to the Servo motor. Pin A7 of Arduino is connected to the output pin of the Sound Sensor Module.

Interfacing of all components with Arduino UNO is as
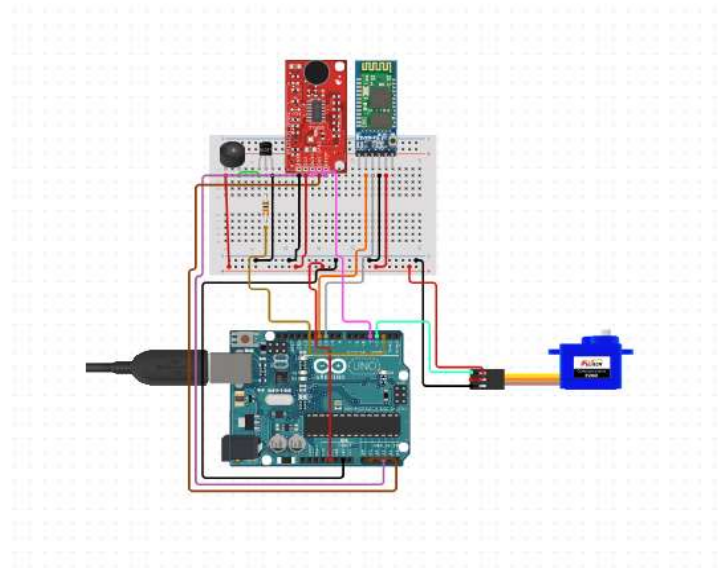
shown in the below figure.

Fig7. *Intrusion detection recording system with biometric lock*.

3. Results and Discussion

The Software will be created using the MIT App Inventor.

To begin, we build an app interface and added the following components.

- Fingerprint
- List view
- text view
- Image Button
- A list picker
- Sound record
- A text level
- buttons
- Tiny Database
- Client for Bluetooth

An appropriate code block is created using the above components.

Our idea is ready for testing after a successful connection and the creation of an interface. When an intruder is identified, the person in charge is notified to lock the area down with a biometric lock. Our noise detector machine not only detects noise but also records it in audio form and saves it to a smartphone for later analysis.

The layout of the app before and after the recording of noise is as shown below.

Fig.8 Recording Application Interface

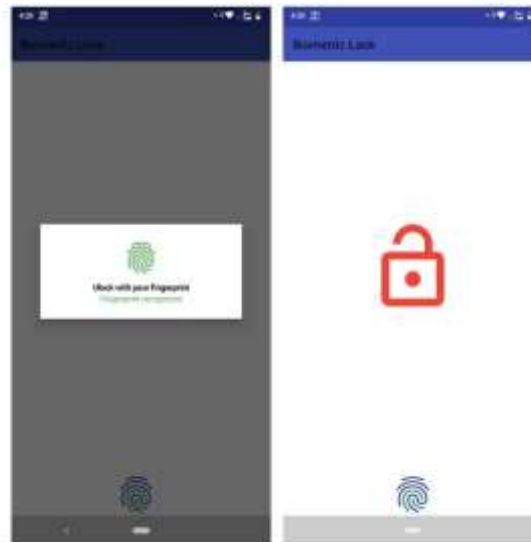The layout of the biometric app is shown below:

Fig9. Biometric Application Interface.

4. Conclusion

Existing biometric lock, recording system, and noise detection technologies are insufficient to prevent paper leaks or any other type of attack. These threats may be avoided if a recognition technique were used in addition to an intrusion detection scheme that is currently in place. There have been a number of threats and efforts to gain access to the extremely sensitive information. Biometrics are used in the most accurate authentication schemes. A number of biometrics solutions are beginning to complement host-based intrusion detection systems.

In conclusion, some researchers demonstrated that these methods are inefficient, which motivated us to develop a Intrusion detection recording system with biometric lock.

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