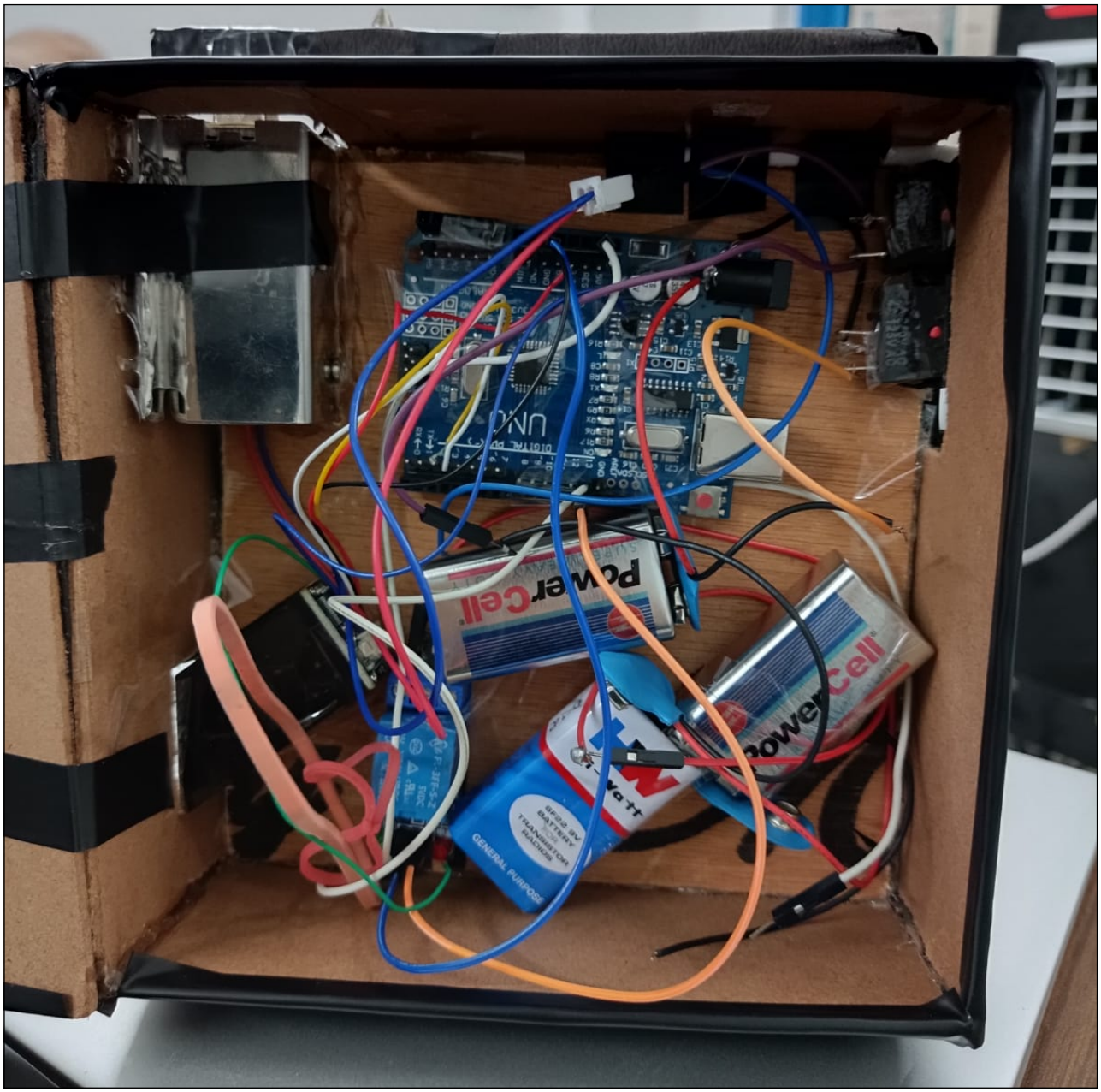
Cyclock

GE-101 project

Hakuna Matata



Aim

This project simply aims on designing a fingerprint Arduino based cycle lock.

Objectives

1. Creating a cycle lock that gets opened with unique fingerprint.
2. Interfacing fingerprint sensor with Arduino Uno to store fingerprints.

Abstract

This project is based on the problem encountered by many students in our college; misplacing of cycles. Every other day, there's a mail titled 'Lost cycle'. Even after using locks, students are not able to take care of their cycles because of the existence of master keys. Cyclock is a fingerprint based cycle lock which is unique to the person who is owner of the cycle. Because it is fingerprint based, it cannot be replicated. It keeps your cycle safe. Cyclock is equipped with a manual number lock too, so in case of situations where the fingerprint sensor stops working, the person would not have to go through any struggle and cyclock would also not have to be broken.

Acknowledgment

The team, Hakuna Matata, would like to thank our professor, Mr. Anupam Bandyopadhyay, under whose guidance we got a chance to learn a lot. The course has helped us enhance our knowledge in different areas. From Arduino codes to electrical circuits to workshop, we have come a long way in these 12 weeks and have gained a little experience in almost every field, thanks to the opportunity provided to us. The team would also like to show its gratitude towards our TAs who constantly motivated and helped us while we were struggling with our project. We also say our big thanks to the Power Electronics Lab of IIT Ropar which lent us the required electrical components we needed for our prototype.

Materials Used

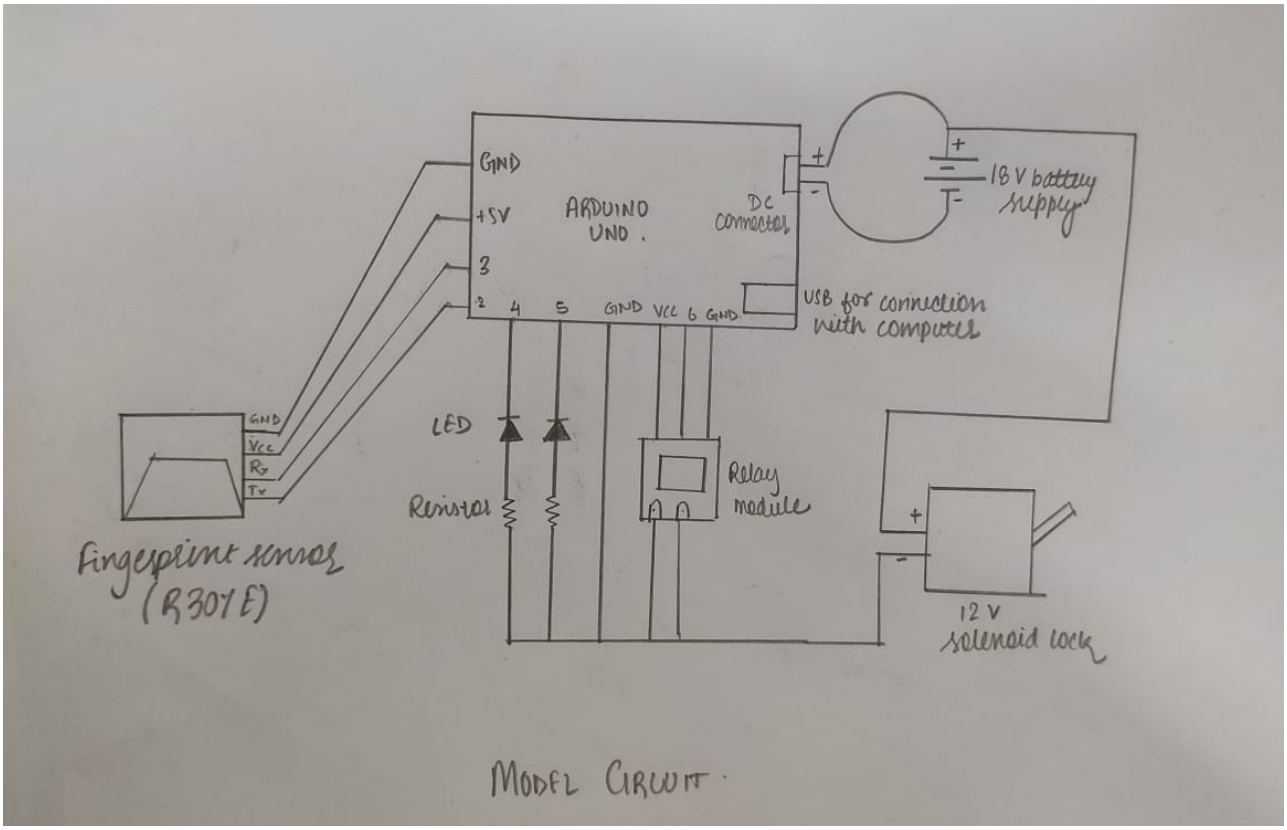
- Arduino UNO R3
- 12 Volt Solenoid Lock
- R307 fingerprint sensor
- 9 Volt batteries (2)
- 5 Volt single channel relay module
- PCB

- Jumper wires
- Manual cycle number lock
- Cardboard
- PVC tape
- Switches
- Glue gun
- Chart Paper
- Rubberbands

Method

Understanding the circuit:

- Components of the circuit are connected and soldered according to the below given diagram.
- 2-9 Volt batteries are connected in series to provide required voltage to solenoid lock and Arduino board.
- Positive terminal of the DC power supply (9v batteries in this case) is connected to the positive terminal of 12v solenoid lock and negative terminal of the battery is connected to DC connector of Arduino UNO board.
- Negative terminal of the solenoid lock is connected to channel relay and Arduino board.



- R307 fingerprint sensor is connected to the appropriate connectors (given in the diagram) in the Arduino board using jumper wires.

Understanding the working of a fingerprint sensor:

- Everything is glued to a cardboard box.
- Arduino code is made which will save the user's fingerprint.
- The fingerprint sensor is interfaced with the Arduino Uno.
- User's fingerprint is enrolled and saved to the fingerprint sensor.
- R307 scanner can save upto 137 different fingerprints
- It saves your fingerprint data into the inbuilt memory and we use this data in our database.
- Then we compare this saved file with every finger scanned on the scanner.
- For example, if a user saves his finger into the database then the system will compare every single fingerprint with his and if it gets the same fingerprint then it will send the command to open the lock otherwise the lock will remain close.
- Fingerprint sensor captures the image of the fingerprint and makes the pattern inside the memory of the fingerprint.
- The shape of the pattern will break into the binary code and then save into the memory of the fingerprint.
- For each and every fingerprint it will save the different patterns according to the fingerprint because as we know we all have different fingerprints even in our hand each fingerprint having its own unique fingerprint.
- It will never match the other finger and according to the research,
- The accuracy of the fingerprint is near about 98% which is good enough to secure any system.

Relay Module:

- This is a LOW Level 5V 2-channel relay interface board, and each channel needs a 15-20mA driver current.
- It can be used to control various appliances and equipment with large current. It is equipped with high-current relays that work under AC250V 10A or DC30V 10A.
- It has a standard interface that can be controlled directly by microcontroller.
- It relays signal between battery and Arduino board.

Working of Arduino:

- Arduino is an open-source hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices.

- Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (for prototyping) and other circuits.
- The microcontrollers can be programmed using the C and C++ programming languages, using a standard API which is also known as the Arduino language, inspired by the Processing language and used with a modified version of the Processing IDE.
- The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (for prototyping) and other circuits.

Incorporating manual lock:

- If in any unavoidable situation, the fingerprint sensor stops working or the battery dies and the lock is closed, a manual lock is made so that whole cyclock does not get destroyed.
- A number based manual cycle lock is taken and it is modified by cutting the plastic part of the lock and attached to a rod. This lock is attached to the cyclock with the help of a support.

Advantages

Security

No matter where you look across the globe, no two sets of people have the exact same set of fingerprints. The design of every fingerprint is completely unique to the individual and cannot be replicated easily. This type of cycle lock is hard to hack as no person will have your fingerprint. The design of the lock will never permit a person without your authorisation to use your cycle. This is one of the major benefits of the fingerprint locks. Unlike many traditional password locks (which were considered innovative at the time), it is almost impossible to hack a fingerprint system without the fingerprint required.

No problem of lost keys

If you have got the habit of losing keys, then it can be annoying to wait. Also, you would have to carry your cycle keys everywhere you go.

Extremely Difficult to Override

Cyclock is extremely difficult and in most cases entirely impossible to override. Key based locks can easily be opened using a master key. Even in case of number based locks, once a person knows your password, he/she has the access of your cycle for a lifetime.

Fingerprint systems cannot be hacked by a person attempting to gain access. For them to do so, they would need a fingerprint that matches your own which would be impossible to gain access to.

User-friendly

Cyclock is very easy to use. You need not to be techie to use locks with fingerprint access. Once you have programmed the system it will work efficiently without any further maintenance. Should any problems occur, we have attached a manual numlock to our prototype to keep your cycle safe.

Conclusion

Cyclock aims to get rid of security issues students have of their cycles. Not only cycles, cyclock can be modified to protect any of your belongings. Rooms, lockers, wardrobes anything can be secured using our prototype.

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