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# Internal Locking System Using Arduino

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***Abstract:*** ***This study is regarding the need of better security at our domestic places as the old-fashioned security systems can be breached easily. House security as well as personal security at domestic places these days has become a basic necessity. The Internal Locking System works in such a way that we can lock any door without actually being inside the room (locking it from the outside), leaving less possibilities from a direct breakage. This system can also be used to make a stronghold in our houses which can protect us from any threat outside. Simply by understanding how the door works we can create a strong blocking system. All doors have hinges which are fixed to one side and help the door open in sideways. The purpose of this system is to stop/block that momentum (Just as how a foot stopper works). We place the blocker underneath the door in such a way that the blocker raises up and blocks the door. Since it blocks the door from the bottom and middle, it makes it harder to break-in thorough brute force. Further adding a biometric system can strengthen the overall security. We can use fingerprints which are widely used for biometric systems as they are unique and we can further up it by introducing a pad lock, which needs a unique set of sequence that only the user knows. The whole idea of this system is study is making a user-friendly security system with easy installation and maintenance.***

## I. INTRODUCTION

### A. *Motivation*

As the technology is getting better on a daily basis, there is always a better and effective solution for every problem. Even though things are sophisticate to make they are easy to understand and use.

In the recent days (Pandemic and also post-pandemic) there has been a significant spike in the cases of domestic violence in India. Though they're only the cases that have been reported there are still a massive number of unspoken cases and incidents that don't come into the light, as some may feel it as a taboo to discuss their internal conflicts in the public eye and seek a help, most woman often stay quiet and be the victims. As per studies, this increase of domestic violence cases is mainly due to the affect of being locked-in at one place for a long period of time. Often men like to go out and get themselves involved in some activities that helps them relive their stress from work or etc., Because of being locked down a place in quarantine, this stress has been gradually building up in them and they're often getting irritated over small inconveniences, as a result taking it out on their children or women in their houses.

So, in order to decrease the victims of the violence and ensuring their safety until they receive some help, we can create a strong hold at their place. When they feel threatened, they can lock themselves in the room and stay assured that others from the outside cannot break-in, as they wait for help.

This system can also help securing your valuables from theft, in case you're away and someone broke in. The old-fashioned central locking system integrated with some modern equipment can also be broken easily, but this locking not only locks the door but makes sure that it stays intact.

### B. *Problem Statement*

1) *Exsisting Method:* This is a very simple yet an innovative project, generally we use lock and key method in our everyday lives as security purpose, from our securing our houses to securing our important belongings we use lock and key method. There is always a wide margin of risk with our basic lock and key method, as they might get stolen or misplaced easily. Keys can easily be stolen or lost and might cause some chaos if they fall in the wrong hands. Although there are several other locking systems that doesn't use a key (Ex: Card, Biometric, Iris, etc.), the fact that majority of the households not using them is the complexity of installation, maintenance and drawbacks. These advanced locking systems are highly costly and are barely affordable by a middleclass household.
2) *Proposed Method:* The method that is proposed is not as complex as rocket science and the interface is also user-friendly. We make use of simple and abundant resources to make a locking system. Simple components like Arduino UNO, linear accurator and relay module we can develop this system. This system has a wide range of ways to make it control the triggering. We can use a simple switch model interface, a biometric fashion interface and also a password (pad-lock) interface.

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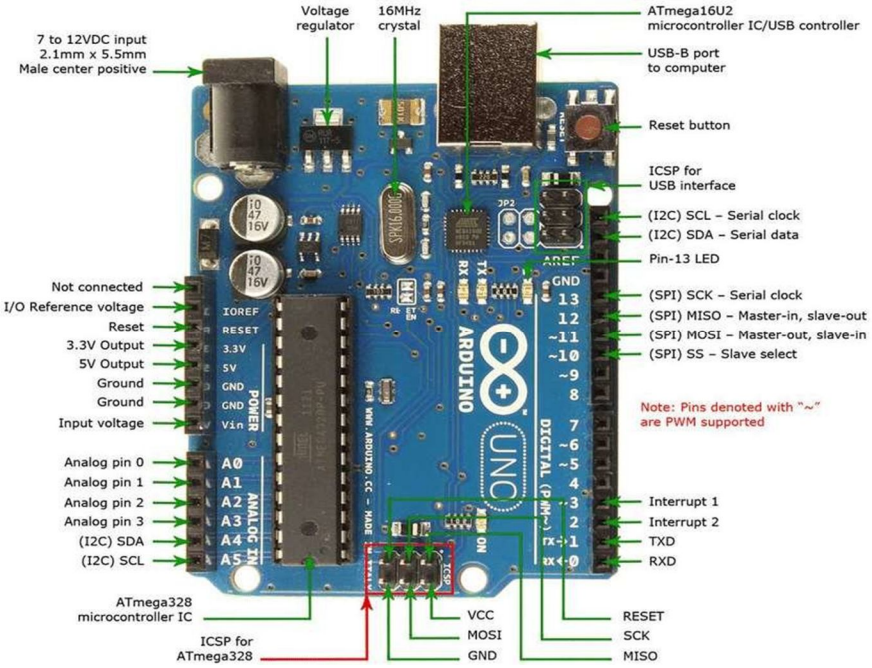
## II. COMPONENTS USED

### *A. Arduino UNO*

Arduino is a control system like a mini-CPU, which reads any kind of input that has been programmed. It is a user-friendly and an open-source system that is widely used and available in the market. You can program the board to whatever you desire it to do with some set of instructions to the microcontroller on the board.

In order to use the write the instructions for the Arduino board one must the Arduino programming language (wire-based). As this is an open-source software everyone can have access to the site and code their own programs. There are also wide-varieties of libraries that you can use and experiment with and they're all free to access on their official site. The software is quite simple to understand for beginners, it also provides a demo class in order to help the new users. It is also very flexible as it is compatible with almost all the operating systems.

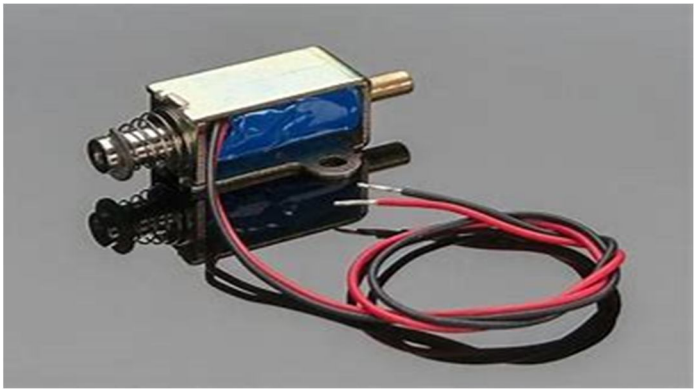
The Arduino board provides the user multiple ways to give an input. It has 14 digital pins that can be use for input/output, 6 analog inputs, 16MHz crystal oscillator, a USB connection, Power Jack, ICSP Header and a reset button.




### *B. Solenoid Valve*

A central locking system or a normal locking system uses a key to push or pull the latch of a lock, and we have to operate it manually. But solenoids are electro-magnetic locks, here the latch works automatically. When the required amount of supply voltage is given to them, the latch shoots up automatically. The latch will hold its position until the interrupt is further triggered. Instead of them we can also use linear acurators, but this will cost us more in production.

So, what we do is we attach a extension to the tip of the solenoid and with the help of that we can push the blocker further up.

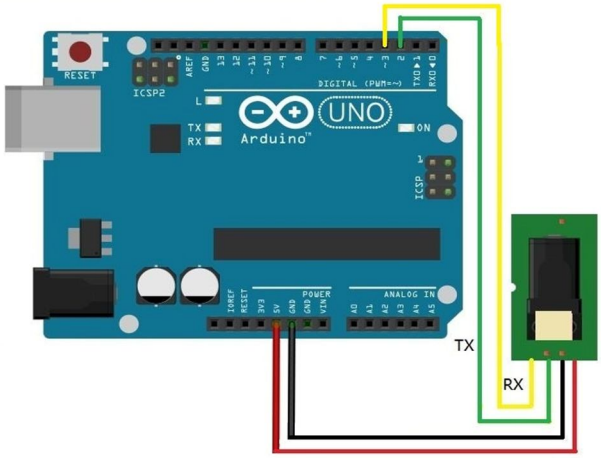


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*C. Locking Interface*

There are various ways with which we can make this model work. Our proposed methods are

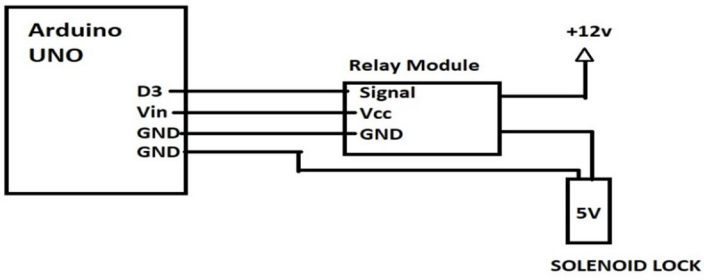
1) *Switch Interface:* A simple switch interface can be used to trigger the solenoid's interrupt. Switch on means the locking system is activate and switch off means the locking system is back in its initial state.
2) *Fingerprint Interface:* We can also use a fingerprint sensor module (R307) to trigger the interrupt. There are different versions of fingerprint sensors available in the market like R305, R307. Here we use fingerprint sensor R307 to detect and verify the user's fingerprint. To use the fingerprint sensor, we have to import the code that helps the UNO to read the inputs. For the code to be compatible with the sensor we have to include the fingerprint sensor library in the code, this will help the board to recognise the sensor's readings. The AdaFruit libraries are easily available over the internet and are free to use.




3) *Keypad Interface:* In this model we use a keypad with a passcode. The board is programmed so that when the user enters the correct sequence of the code, the UNO checks and verifies the sequence entered. If the sequence entered matches the sequence registered, the solenoid gets triggered. In this model we can use either a letters keypad (Alphabetical) or a number keypad or a combined universal keypad. This makes it more secure as there are 10,000 possible combinations on a numerical keypad alone, and if we use a keyboard there are 14,641 key combinations. So, this makes it very hard to crack the password to the lock.

*D. Relay Module*

A relay module is nothing but an electrical switch. The main purpose of the relay is to direct the current or we can also say that it can open and close a circuit. It mainly works with the help of an electromagnet, which controls the flow of the current. When the relay is given a voltage, the current flows through the coil inside the relay, which creates a magnetic field, which in turn activates the armature. The connection and disconnection of the movable contacts with the fixed contacts is what controls the flow.




The relay has 6 pins, 3 on each side. On the left we have Signal pin followed by Vcc pin and Ground pin. Then on the right we have NO (Normally Open), Com (Common) and NC (Normally Closed).

When a load is connected to Normally closed (NC) then the load will ON before the switch. When a load is connected to Normally Open (NO) then the load will be OFF before the switch.

*1) Features Of Relay*

*a)* Normal Voltage is 5V DC supply
*b)* Normal Current is 70mA
*c)* AC load current Max is 10A at 250V AC or 125V AC
*d)* DC load current Max is 10A at 30V DC or 28V DC
*e)* Operating time is 10m seconds
*f)* Release time is 5m seconds
*g)* Maximum switching is 300 operations per minute

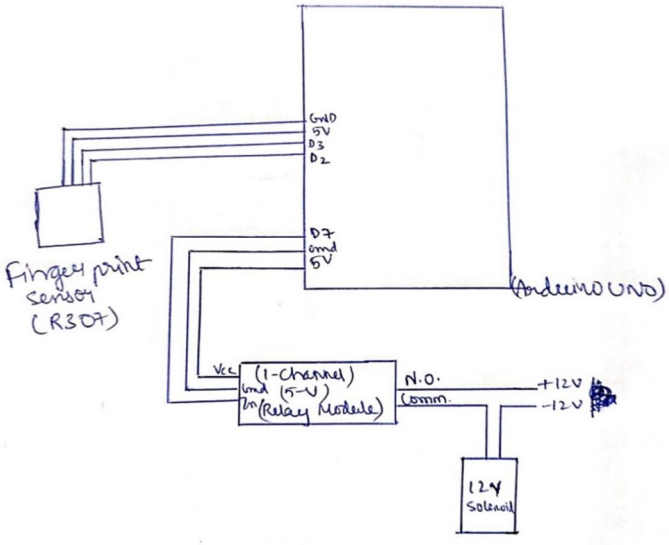
## III. FRAMING OF CIRCUIT

The circuit design is very simple and is user-friendly, this allows all kinds of people to use this system.
In order to trigger the lock, one has to use the authorized fingerprint or any other means depending on the type of module used. This allows the relay to let the current flow into the circuit thereby completing the circuit. In case an unauthorized data has been entered the circuit will not respond and stays stationary.
After activation of the lock, the system pushes a compartment that will block the door. This compartment will be installed under the door and will be infused into the ground. This will help us lock the door internally. If someone is trying to enter the house or the room by brute force, will be stopped as the door is blocked. The compartment that blocks the door absorbs all the moment that has been onto the door.



The compartment looks something like this. It will be installed into the ground to ensure sturdiness.

## IV. CIRCUIT DIAGRAM



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## V. WORKING PROCESS

The working process of this project as described earlier is simple, it can be done in three different ways and all the working codes are mentioned above.

*1)* Switch
*2)* Fingerprint
*3)* Keypad

The process of all the methods is same but the way of triggering the solenoid lock which tiggers the door block from the floor module.

When you turn on the circuit using anyone of the 3 methods, after that the relay comes into play which gives direction to the power to flow correctly through the circuit and through the Arduino UNO board and pre written codes the solenoid locks push the door block which absorbs all the momentum.

## VI. RESULT

The "Internal Locking System using Arduino UNO" successfully blocks the door by absorbing all the momentum from the door and stops the person from entering the room in a secure yet cost effective manner.

## VII. ADVANTAGES

*A.* This project can be used at any domestic places as well as an industrial place.
*B.* Safety of the property or person behind the door is guaranteed.
*C.* Easy to use and setup.
*D.* User-friendly interface allows the user to change setting at their will.
*E.* Budget friendly and less maintaince

## VIII. DISADVANTAGES

*1)* If somebody locks themselves in unknowingly or unintentionally it becomes hard to get them out as the registered user should be present to open the lock.
*2)* Any malfunctions and errors are difficult to rectify.

## IX. CONCLUSION

There are many similar implementations in the market, but what makes this design unique is the scope of development. As newer and better technology is being brought into the market, there are many ways to make it even more advanced and secure.

## X. FUTURE SCOPE

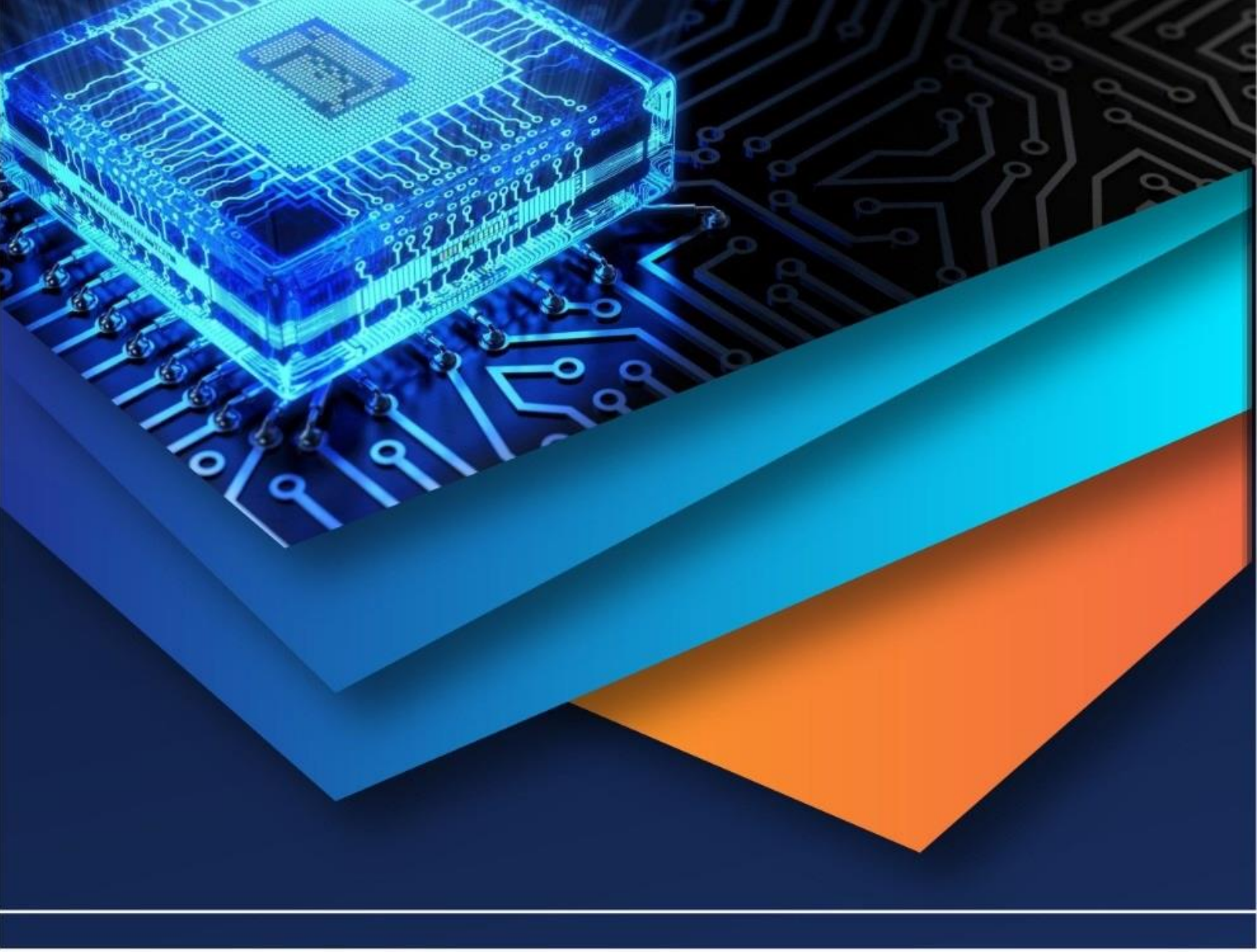
Future of this project is vast as there so much scope for innovation and improvements

*1)* This can be turn into a full-blown locking system as it is effective enough and cheap
*2)* We can also introduce IoT mechanism into this, by which we can control the lock via a dedicated software /app
*3)* This can also be turned into a wireless system

## REFERENCES

[1] IEEE – The world's largest technical professional organization dedicated to advancing technology for the benefit of humanity.
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Inspired from HAVEN locking system

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