Under graduate Arduino based Project
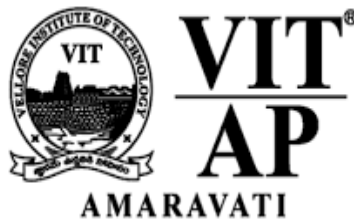
Smart Locker

Under Guidance of:

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1. INTRODUCTION

Security is a major concern in our day to day life, and digital locks have become an important part of these security systems. There are many types of security systems available to secure our place. Some examples are PIR based security system, RFID based security system, Digital Lock System, bio-matrix systems, Electronics Code lock [1]. In this project we build a **Secret Knock Detecting Door Lock using Arduino** which can detect the pattern of the knocks at the door, and will only open the lock if the knocking pattern matches with the correct pattern.

1.1   Motivation

Security is necessary to protect our life and assets. Ensuring safety of peoples and their valuable things is very important for the prevention of illegal possession by somebody else [1]. Hence, this project mainly focus on door lock using gate security, to avoid theft and protecting valuable assets.

Now a days, even using mechanical locks, crime like robbery happens due to the fact that such locks are easily broken. So, there is a need to invent other kind of locks which are secure and cannot be easily broken. We introduce Smart knock pattern door lock as there are different kinds of digital door locks, automatic password based door locks [2], software based door locks etc., which can be widely used in houses, offices, banks etc.

2. COMPONENTS REQUIRED

- Arduino Uno
- Push Button
- Buzzer
- 1 MΩ Resistor
- Power
- Connecting wires
- Box
- Servo Motor

3. CIRCUIT DIAGRAM AND DESCRIPTION
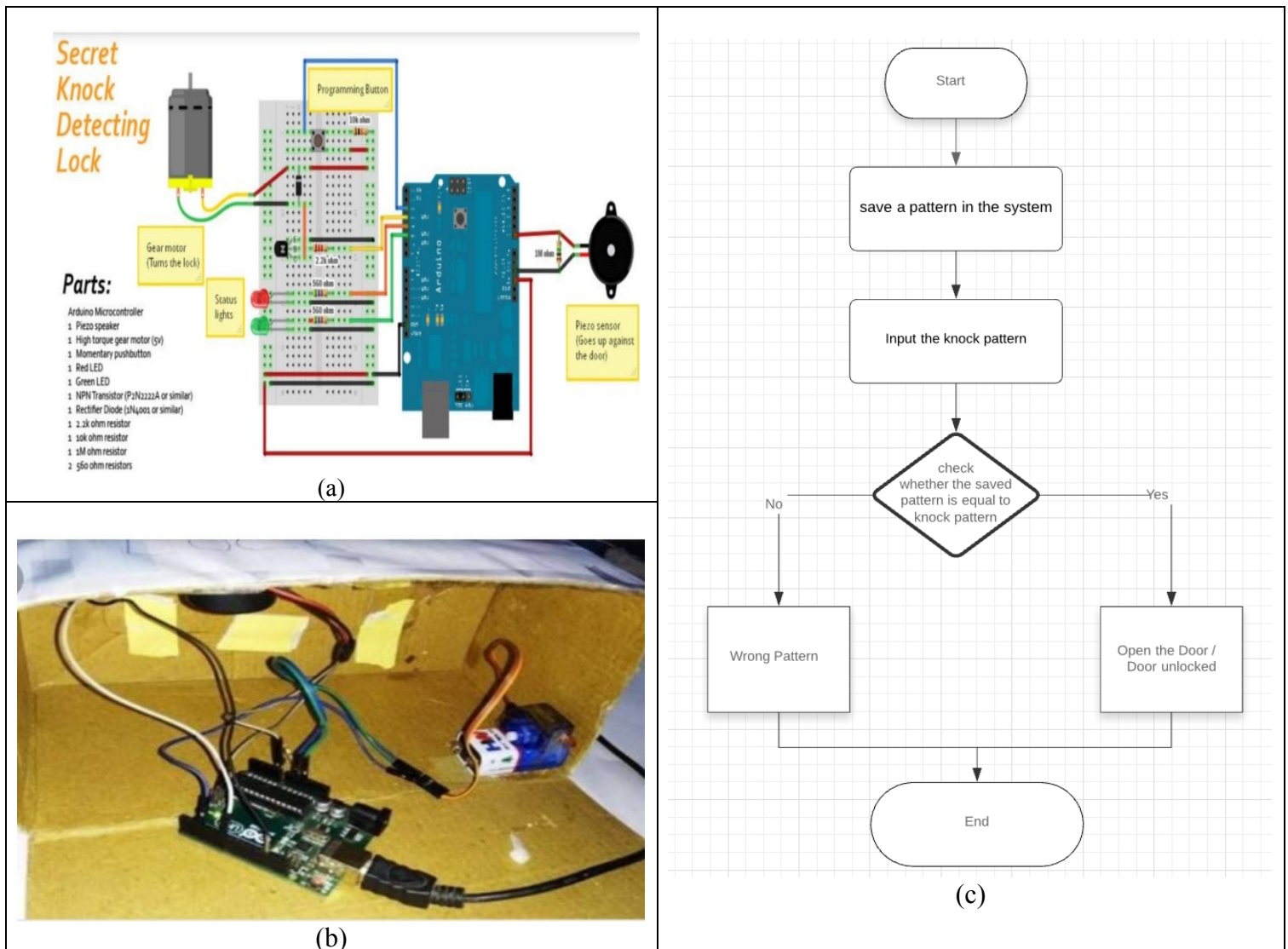

(a)

(b)

(c)

Figure 1 : (a) Circuit schematic (b) Flow chart and (c) Overall assembled system

The explanation of the circuit shown in Figure 1 is the following:

Arduino: Its control the complete processes like taking password from Buzzer/Sensor, comparing patterns, driving Servo for open and close the gate and save the pattern to Arduino [3].

Buzzer: It is connected to the analog pin A0 of Arduino with respect to ground and with a 1MΩ resistance between A0 and ground. A Buzzer (Piezo Sensor) senses the knock input pattern for the system. Here, a push button permit to take input from the sensor and saves into the Arduino. The system is designed

by taking idea from Morse code pattern but not exactly similar with that.

Driving Servo: It is connected to the PWM pin D3 of Arduino, and used to open and close the gate.

The circuit diagram of this **Knocking Pattern Detector** is very simple which contains Arduino for controlling whole process of the project, push button, buzzer, and Servo Motor. Arduino controls the complete processes like taking password form Buzzer or Sensor, comparing patterns, driving Servo to open and close the gate, and storing the knock pattern. The push button is directly connected to the pin D7 of Arduino with respect to ground. And a **buzzer** is connected at the analog pin A0 of Arduino with respect to the ground and a 1 MΩ resistance between A0 and ground. A **servo motor** is connected to the PWM pin D3 of the Arduino. A cardboard box is used for demonstration the overall working.

4. WORKING OF SMART LOCKER

Working of Knock based Smart Lock Project [5] is simple. First, we have to save a pattern into the system. For this we have to press and hold push button until we knock 6 times. Here in this project, we have used 6 knocks. After six knocks, Arduino find the knock pattern and save that into the memory. Now after saving the input pattern, press and immediately released the push button for taking input from the sensor to Arduino to open the lock. Now we have to knock 6 times. After it, Arduino decodes it and compares with saved pattern. If a match occurs then Arduino open the gate by driving servo motor.

We have used a card board box for demonstration. To take input we knock on the board after pressing push button. Here we have knocked by keeping a time period in mind that is 500ms. This 500ms is because we have fixed it in code and input pattern is depending upon it. This 500ms time period will define the input was 1 or 0. When we knock it, Arduino starts monitoring the time of the first knock to second knock and put that in an array. Here in this system, we are taking 6 knocks. It means we will get 5 time periods.

Now we check the time period one by one. First, we check time period between first knock and second knock if the time difference between these less the 500ms then it will be 0 and if greater than 500ms it will be 1 and it will be saved into a variable. Now after it, we check time period between second knock and third knock and so on.

Finally, we will get 5 digit output in 0 and 1 format (binary).

5. APPLICATION OF THE PROJECT

1. It is useful for the security purpose in house, bank etc. By using this digital lock we can used to store many valuable things like money, gold etc., [6].
2. This simple circuit can be used at residential places to ensure better safety.
3. It can be used at organizations to ensure authorized access to highly secured places with minimal cost.

6. WORKING PLAN

Timeline (Week)	1 – 4 Aug.	1st Sept.	2nd Sept.	3rd Sept.	4th Sept.	1st Oct.	2nd Oct.	3rd Oct.	4th Oct.	1st Nov.
Delivery										■
Overall Outcome									■	
Testing							■	■		
Connections							■			
Coding					■	■	■			
Hardware analysis				■	■					
Problem identify		■	■							
Literature survey	■	■								

7. SOFTWARE CODE

```
#include<EEPROM.h>
#include<Servo.h>
#define patternLenth 5
#define patternInputTime 10000
#define sensitivity 80
#define margin 100
#define sw 7
#define servoPin 3
#define openGate 0
#define closeGate 180
```

```
long slot[patternLenth+1];
int pattern[patternLenth];
int flag=0;
int acceptFlag=0;
int knok;
Servo myServo;
void setup()
{
  pinMode(sw, INPUT_PULLUP);
  myServo.attach(servoPin);
  myServo.write(180);
  Serial.begin(9600);
}
void loop()
{
  int i=0;
  if(digitalRead(sw) == LOW)
  {
    Serial.println("Start");
    delay(1000);
    long stt= millis();
    while(millis()<(stt+patternInputTime))
    {
     int temp=analogRead(A0);
     if(temp>sensitivity && flag==0 && i<=patternLenth)
     {
        delay(10);
        flag=1;
        slot[i++]=millis()-stt;
        //Serial.println(slot[i-1] - stt);
        if(i>patternLenth)
        break;
     }
      else if(temp == 0)
     flag=0;
    }

    long stp=millis();
    Serial.println("Stop");
   // Serial.println(stp-stt);
```

```
for(int i=0;i<patternLenth;i++)
{
  knok=1;
  if(slot[i+1]-slot[i] <500 )
    pattern[i]=0;
  else
    pattern[i]=1;
  Serial.println(pattern[i]);
}
  if(digitalRead(sw) == 0)
{
  for(int i=0;i<patternLenth;i++)
    EEPROM.write(i,pattern[i]);
  while(digitalRead(sw) == 0);
}
 1. else
{
  if(knok == 1)
  {
    for(int i=0;i<patternLenth;i++)
    {
      if(pattern[i] == EEPROM.read(i))
      {
        Serial.println(acceptFlag++);
      }
        else
      {
         Serial.println("Break");
         break;
      }
    }
  }
  Serial.println(acceptFlag);
  if(acceptFlag >=  patternLenth-1)
  {
    Serial.println(" Accepted");
    myServo.write(openGate);
    delay(5000);
    myServo.write(closeGate);
  }
```

```
      else
         Serial.println("Rejected");
   }
   for(int i=0;i<patternLenth;i++)
   {
      pattern[i]=0;
      slot[i]=0;
   }
   slot[i]=0;
   acceptFlag=0;
  }
}
```

8. REFERENCES

[1] https://circuitdigest.com/microcontroller-projects/secret-knock-pattern-detecting-door-lock-arduino

[2] http://workshopweekend.net/arduino/projects/secret_door_knocker

[3] https://www.slideshare.net/mobile/cdwijayarathna/knock-detecting-door-lock-research-paper

[4] https://www.academia.edu/36679117/Security_System_Based_on_Knock- Pattern Using Arduino and GSM Communication

[5] https://www.google.com/amp/s/www.pinterest.com/amp/pin/467600373801887138/

[6] http://oaji.net/articles/2017/1992-1517568797.pdf