College of Computer Sciences and Information Technology

King Faisal University

CE 322 - Embedded System

Course Project

Simple Security lock System

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I. Project Description / Abstract

This project presents a simple electronic lock with 4 digits password this can be used for door locking or a safe locking , else ... , this project represents how does electronic lock works simply by giving a secure algorithm and clear steps and (LCD) to show the correct and incorrect enter and a (Buzzer) to give the user a an alarm when the check is done .

II. Introduction

• Motivation: With rising security concerns, there is a need for simple, cost-effective lock mechanisms.

• Problem Statement: How to ensure the lock to work effectively and continuously

• Proposed Solution: With the perfect (Arduino Uno) code and correct connections , you can get 90% project success at least and achieve the business goal of this project

III. Objectives

• To get expected outcomes from the project like (security . Simplicity and clarity)

• Get to understand (Arduino Uno) in small projects so the future big projects becomes easier to work with .

• Trigger an alert (LED/buzzer) after the input of the password.

• To get the business benefits out of this project so we can come with beneficial ideas that can be turned into .
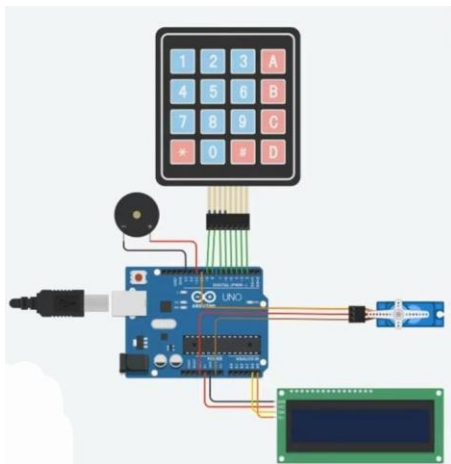
IV. System Architecture

The system consists of the following components:

-Arduino - UNO

-Jumpers

-Keypad

-Servo-motor

-LCD

-Buzzer

These components are connected such that when a change in the sensor's readings is detected by Arduino, it activates the lock mechanism.V. Design and Implementation

Hardware Design

Software Design

The Arduino is programmed using simple conditional logic. When the password is entered by the user it will check then give a pass sign if correct and LCD welcome if correct and if not then it will show otherwise .

Integration

#include <Servo.h>

```
#include <LiquidCrystal_I2C.h>

#include <Keypad.h>

#include <Password.h>


#define buzzer 11


Servo servo;

LiquidCrystal_I2C lcd(0x27, 16, 2);


String newPasswordString; //hold the new password

char newPassword[6]; //charater string of newPasswordString

byte a = 5;

bool value = true;


Password password = Password("0123"); //Enter your password


byte maxPasswordLength = 6;

byte currentPasswordLength = 0;

const byte ROWS = 4; // Four rows

const byte COLS = 4; // Four columns


char keys[ROWS][COLS] = {
 {'D', 'C', 'B', 'A'},
 {'#', '9', '6', '3'},
 {'0', '8', '5', '2'},
 {'*', '7', '4', '1'},
```

```
  };


  byte rowPins[ROWS] = {2, 3, 4, 5};

  byte colPins[COLS] = {6, 7, 8, 9};


  Keypad keypad = Keypad( makeKeymap(keys), rowPins, colPins, ROWS, COLS );


  void setup() {
   Serial.begin(9600);
   pinMode(buzzer, OUTPUT);
   servo.attach(10);
   servo.write(50);
   lcd.init();
   lcd.backlight();
   lcd.setCursor(3, 0);
   lcd.print("WELCOME TO");
   lcd.setCursor(0, 1);
   lcd.print("DOOR LOCK SYSTEM");
   delay(3000);
   lcd.clear();
  }


  void loop() {
   lcd.setCursor(1, 0);
   lcd.print("ENTER PASSWORD");
```

```
    char key = keypad.getKey();
   if (key != NO_KEY) {
    delay(60);
    if (key == 'C') {
     resetPassword();
    } else if (key == 'D') {
     if (value == true) {
      doorlocked();
      value = false;
     } else if (value == false) {
      dooropen();
      value = true;
     }
    } else {
     processNumberKey(key);
    }
   }
  }

  void processNumberKey(char key) {
   lcd.setCursor(a, 1);
   lcd.print("*");
   a++;
   if (a == 11) {
    a = 5;
   }
```

```
  currentPasswordLength++;

  password.append(key);


  if (currentPasswordLength == maxPasswordLength) {

   doorlocked();

   dooropen();

  }

}


void dooropen() {

 if (password.evaluate()) {

  digitalWrite(buzzer, HIGH);

  delay(300);

  digitalWrite(buzzer, LOW);

  servo.write(50);

  delay(100);

  lcd.setCursor(0, 0);

  lcd.print("CORRECT PASSWORD");

  lcd.setCursor(0, 1);

  lcd.print("DOOR OPENED");

  delay(2000);

  lcd.clear();

  a = 5;

 } else {

  digitalWrite(buzzer, HIGH);

  delay(200);
```

```
  digitalWrite(buzzer, LOW);

  delay(200);

  digitalWrite(buzzer, HIGH);

  delay(200);

  digitalWrite(buzzer, LOW);

  delay(200);

  digitalWrite(buzzer, HIGH);

  delay(200);

  digitalWrite(buzzer, LOW);

  delay(200);

  lcd.setCursor(0, 0);

  lcd.print("WRONG PASSWORD!");

  lcd.setCursor(0, 1);

  lcd.print("PLEASE TRY AGAIN");

  delay(2000);

  lcd.clear();

  a = 5;

 }

 resetPassword();

}


void resetPassword() {

 password.reset();

 currentPasswordLength = 0;

 lcd.clear();

 a = 5;
```

```
    }

void doorlocked() {
 if (password.evaluate()) {
  digitalWrite(buzzer, HIGH);
  delay(300);
  digitalWrite(buzzer, LOW);
  servo.write(110);
  delay(100);
  lcd.setCursor(0, 0);
  lcd.print("CORRECT PASSWORD");
  lcd.setCursor(2, 1);
  lcd.print("DOOR LOCKED");
  delay(2000);
  lcd.clear();
  a = 5;
 } else {
  digitalWrite(buzzer, HIGH);
  delay(200);
  digitalWrite(buzzer, LOW);
  delay(200);
  digitalWrite(buzzer, HIGH);
  delay(200);
  digitalWrite(buzzer, LOW);
  delay(200);
  digitalWrite(buzzer, HIGH);
```

```
  delay(200);

  digitalWrite(buzzer, LOW);

  delay(200);

  lcd.setCursor(0, 0);

  lcd.print("WRONG PASSWORD!");

  lcd.setCursor(0, 1);

  lcd.print("PLEASE TRY AGAIN");

  delay(2000);

  lcd.clear();

  a = 5;

 }

 resetPassword();

}
```

VI. Results and Discussion

The project successfully triggered an alert using an Buzzer or LCD. It met all primary
objectives and demonstrated how low-cost electronic lock can be repurposed for simple
security systems.

VII. Conclusion

This project successfully implements a secure door locking system using Arduino. By
integrating components such as a keypad, servo motor, and password-based access control,
the system ensures that only authorized users can unlock the door. It demonstrates the
practical use of microcontrollers in enhancing home and office security, and it lays the
groundwork for more advanced systems incorporating features like RFID, biometric
sensors, or IoT connectivity.