Course Number: EENG 403 – W01

Lab Title: Project #1

Security System

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Description

      The goal of this project is to employ what you have learned about Arduino and your knowledge of designing and developing a standalone security system by taking advantage of the servo, stepper motor, and the matrix keyboard provided in your equipment kit.

Code

//Adding Libraries to the code
```
#include <Keypad.h>
#include <LiquidCrystal.h>
#include <Servo.h>
#include <Stepper.h>

LiquidCrystal lcd (7,8,10,11,12,13); //adding pins to the LCD display

const int Revolution = 500; //the revolution of the stepper motor for both directions

const byte ROWS = 4; //Enable 4 rows on the keypad
const byte COLS = 4; //Enable 4 columns on the keypad
```

//Adding characters on the rows and columns section for the keypad
```
char keys[ROWS][COLS] = {
  {'1','2','3', 'A'}, //filled out row 1(1,2,3, A)
  {'4','5','6', 'B'}, //filled out row (4,5,6, B)
  {'7','8','9', 'C'}, //filled out row 3 (7,8,9,C)
  {'*','0','#', 'D'}, //filled out row (*,0,#,D)
};

byte rowPins[ROWS] = {53,51,49,47}; //connect to the row pinouts of the keypad
byte colPins[COLS] = {45,43,41,39}; //connect to the column pinouts of the keypad
```

//Create variables for the keypad on the row, columns, column pins, and row pins
```
Keypad keypad = Keypad( makeKeymap(keys), rowPins, colPins, ROWS, COLS );
```

//servo motor

```
Servo myservo; //create a variable for the servo motor
```

```
//define servo pin
#define servoPin 52

//create a variable to store servo position
int angle = 0; //create a variable for the angle of servo motor

Stepper stepper(Revolution, 29,25,27,23); //pins for the stepper motor

void setup() {
  Serial.begin(9600); //counts the serial monitor by the amount of times
  lcd.begin(16, 2); //sets up the LCD 16x2
  lcd.print(" Security System "); //prints out security system on the LCD display
  lcd.setCursor(0, 1); //the statement is in column 1
  lcd.print(" ON "); //prints the statement to ON when turning on the security system
  delay(3000); //delays the two statements by 3 seconds
  lcd.clear(); //clears the two statements after 3 seconds
  myservo.attach(servoPin); //attach the servo pin onto the servo motor
  stepper.setSpeed(70); //speed of the stepper motor in both directions

}

void loop () {

  lcd.clear(); //clears the two statements after 3 seconds
  lcd.setCursor(0,0); //sets the cursor at position (0,0)
  lcd.print("Enter Password"); //prints out "enter password" on the LCD display
  myservo.write(0); //no angle on the servo motor is turning
  char num = keypad.getKey(); //create a character variable for the keypad
  Serial.println(num); //prints out the digit that is assigned in the keypad

//while loop on pressing an assigned key digit on the keypad
  while (num == NO_KEY)
  {
    num = keypad.getKey();
  }

//if statement on pressing an assigned digit on the keypad
if (num == '2') {

  lcd.clear(); //clears the two statements after 3 seconds
  lcd.setCursor(0,0); //sets the cursor at position (0,0)
```

```
lcd.print("Access Granted"); //gives access granted after pressing the correct digit
delay(2000); //delays by 2 seconds
lcd.clear(); //clears the statement after 2 seconds
lcd.print("Unlocking"); //prints out "unlocking" on the LCD display
delay(2000); //delays by 2 seconds
myservo.write(90); //turn the servo motor at 90 degrees when unlocking the door
stepper.step(Revolution); //turn the step revolution from an assigned integer
delay(5000); //delays by 5 seconds
lcd.clear(); //clear the display after 5 seconds

lcd.setCursor(0,0); //sets the cursor at position (0,0)
lcd.print("Closing"); //closes the security system
delay(1000); //delays at 1 second
stepper.step(-500); //the stepper motor goes back to 500 rpm


}

//if key does not equal password, deny access
else {

lcd.clear(); //clears the display from the previous statement
lcd.setCursor(0,0); //sets the cursor at position (0,0)
lcd.print("Access Denied"); //prints a statement "Access denied" if pressing the wrong digit
delay (1000); //delays the statement for 1 second

}

}
```
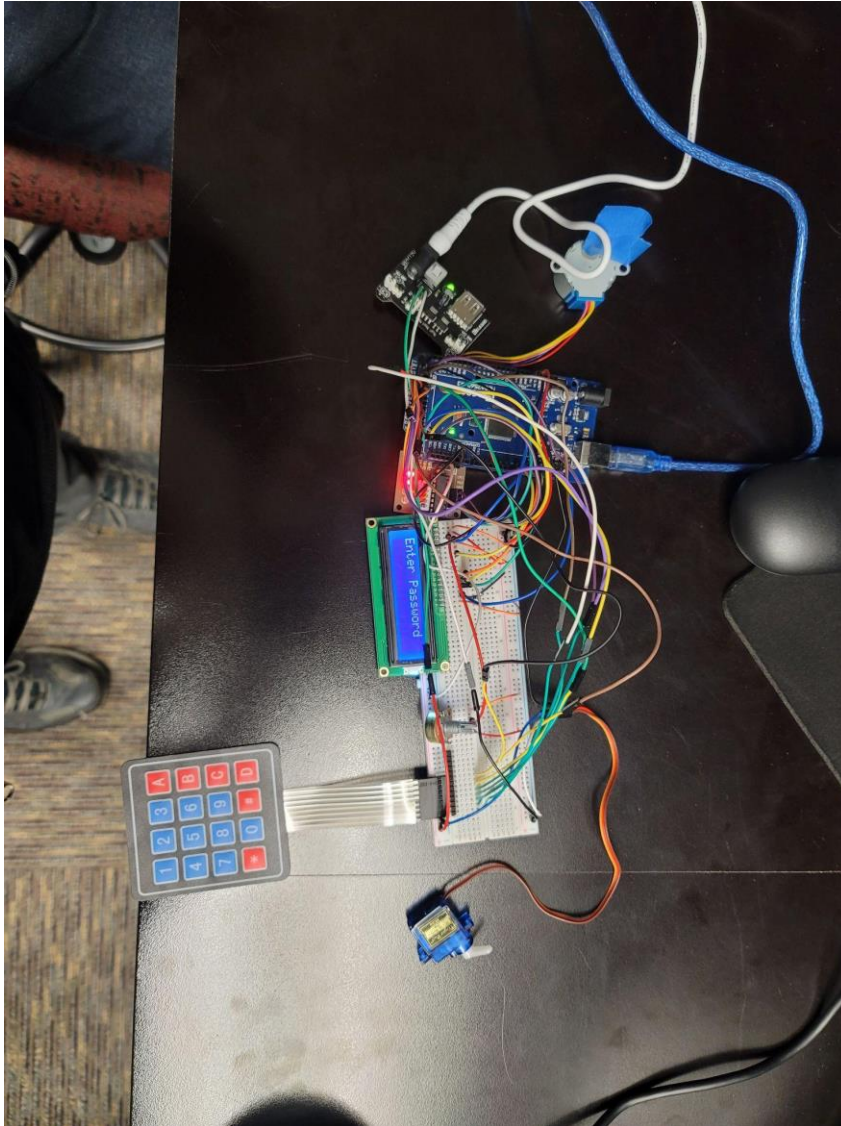
The image above is the security system project. In the project, there is a set number that will grant you access and will unlock the locks, which are the motors so that you can enter a building. In the project, the security system will display the system and then ask to enter a password. The access code is "2" if any value that is not "2" is entered the security system will say access denied but if entered correctly it will say access granted. Next, the servo motor will turn 90 degrees clockwise then the step motor will turn 90 degrees clockwise. After 10 minutes the security system will lock itself by the step motor turning counterclockwise 90 degrees then

the servo motor turning 90 degrees counterclockwise. In the video we shorten the time because it would take too long to video the security system locking itself. After the security system finishes locking itself, the system will ask for the password.

<u>Discussion/Conclusion</u>

The design is confirmed as expected because we checked and verified the parts using the code that we came up with. It was our first time building an actual project that occurs in a real-world environment. The security system that we built showed how we could be able to use our lab assignments and combine them to make an actual prototype that we use in the real world. The security system is used in all facilities that want to keep the building safe. As we built the circuit, it took a while to wire them. Same with the code, we had to brainstorm which part of the code would work by certain sections such as unlocking the door using the servo and stepper motors, and make sure we had to add a delay on each section to make it function properly. Overall, this was a good project. We hope that we can use this as a template for making other projects when working in the real industry.