

تطبيقات ميكاترونك -1-

Lecture No. 7

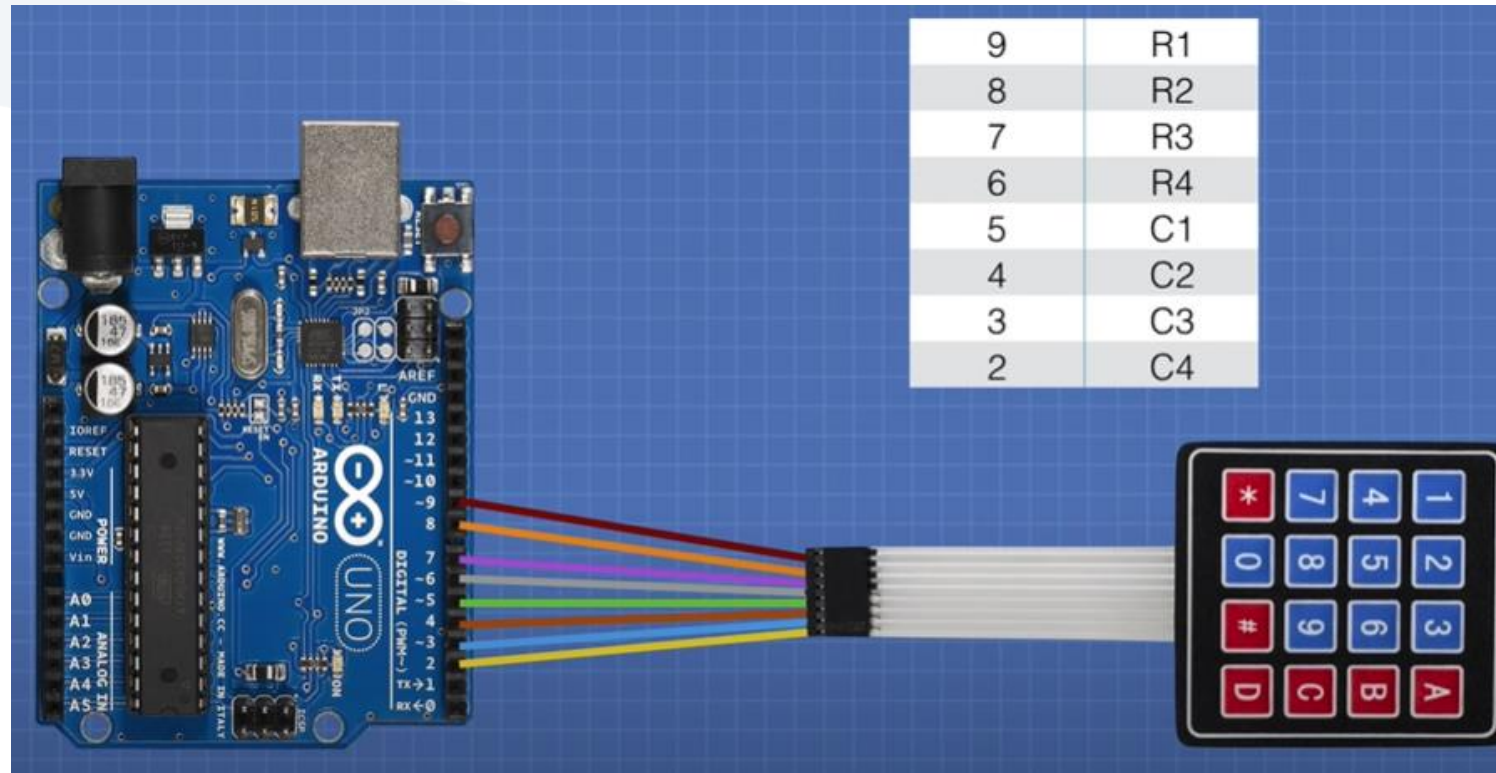
- LCD and KEYPAD with Arduino
- i2c

روبوت و أنظمة ذكية - سنة ثالثة

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Ph.D. Degree in Mechatronics
Engineering

2022

Using Keypads with Arduino

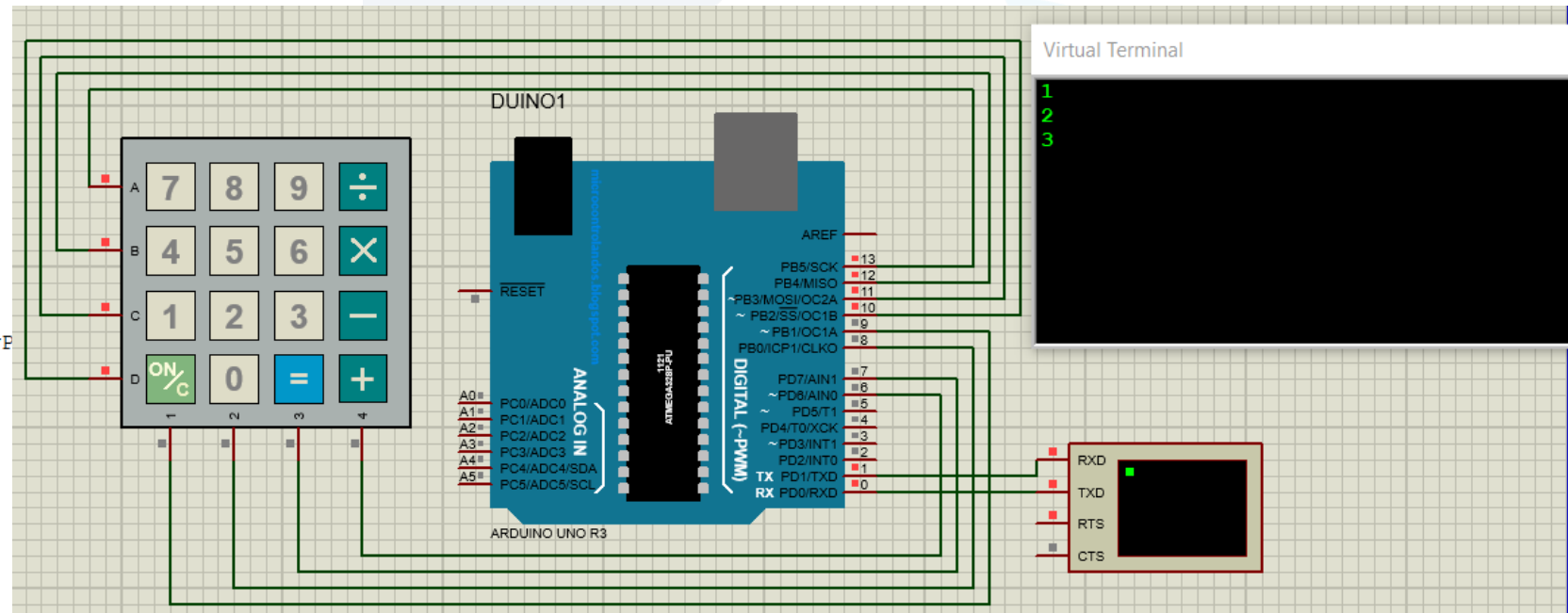


The Loop is very simple. We use the *getKey* method of the keypad library to get a key value when it detects a keypress. Then we simply print that to the serial monitor.

```

11 // Include the Keypad library
12 #include <Keypad.h>
13
14 // Constants for row and column sizes
15 const byte ROWS = 4;
16 const byte COLS = 4;
17
18 // Array to represent keys on keypad
19 char hexaKeys[ROWS][COLS] = {
20 //{'1', '2', '3', 'A'},
21 //{'4', '5', '6', 'B'},
22 //{'7', '8', '9', 'C'},
23 //{'*', '0', '#', 'D'}
24
25 {'7', '8', '9', '/'},
26 {'4', '5', '6', 'x'},
27 {'1', '2', '3', '-'},
28 {'*', '0', '#', '+'}
29 };
30
31 // Connections to Arduino
32 byte rowPins[ROWS] = {13, 12, 11, 10};
33 byte colPins[COLS] = {9, 8, 7, 6};
34
35 // Create keypad object
36 Keypad customKeypad = Keypad(makeKeymap(hexaKeys), rowPins, colPins);
37
38 void setup() {
39 // Setup serial monitor
40 Serial.begin(9600);
41 }
42
43 void loop() {
44 // Get key value if pressed
45 char customKey = customKeypad.getKey();
46 //Serial.print(customKey);
47 //Serial.println(customKey);
48 if (customKey) {
49 // Print key value to serial monitor
50 Serial.println(customKey);
51 }
52 }

```

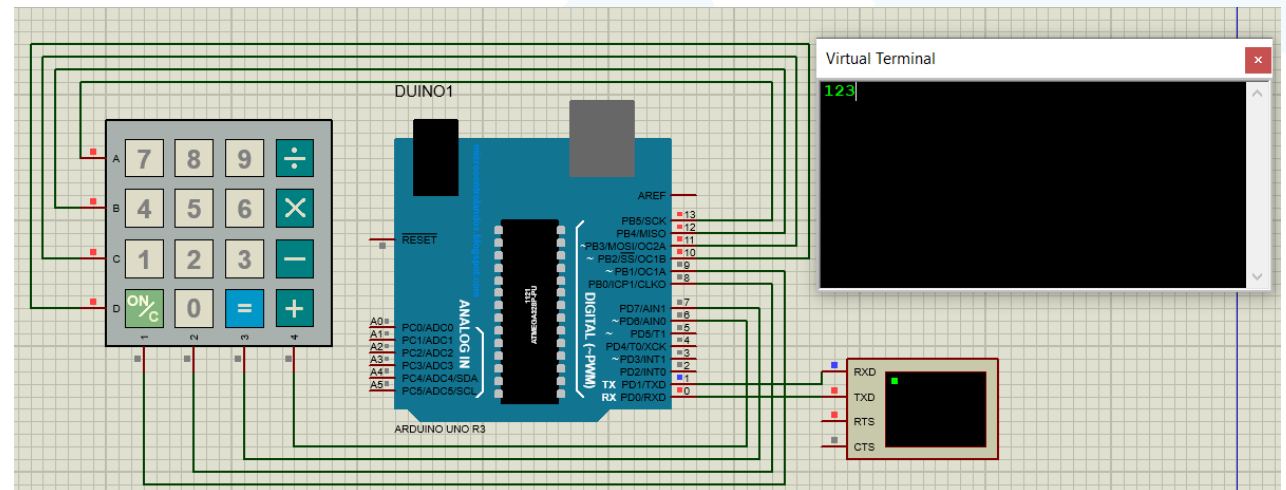


```

1  #include <Keypad.h>
2
3  const byte ROWS = 4; //four rows
4  const byte COLS = 4; //four columns
5  char keys[ROWS][COLS] = {
6  {'7','8','9','/'},
7  {'4','5','6','x'},
8  {'1','2','3','-'},
9  {'*','0','#','+'}
10 };
11 byte rowPins[ROWS] = {13, 12, 11, 10}; //connect to the row pinouts of the keypad
12 byte colPins[COLS] = {9, 8, 7, 6}; //connect to the column pinouts of the keypad
13
14 Keypad keypad = Keypad( makeKeymap(keys), rowPins, colPins, ROWS, COLS );
15
16 int KeyCheck = 0;
17
18 void setup()
19 {
20   Serial.begin(9600);
21 }
22
23
24 void loop()
25 {
26   char key = keypad.getKey();
27   Serial.print(key);
28 }

```

The Loop is very simple. We use the getKey method of the keypad library to get a key value when it detects a keypress. Then we simply print that to the serial monitor.

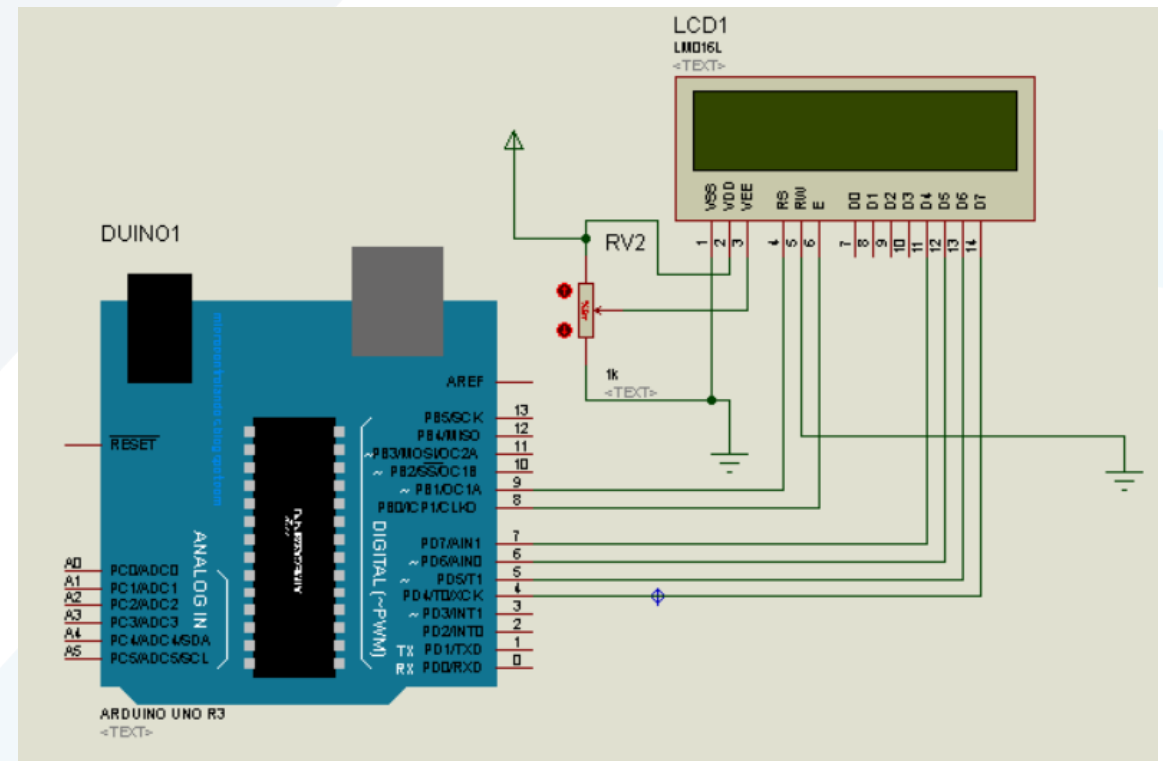


```

1  #include <LiquidCrystal.h>
2
3  #define rs 9
4  #define en 8
5  #define d4 7
6  #define d5 6
7  #define d6 5
8  #define d7 4
9  // initialize the library with the numbers of the interface pins
10 LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
11 //LiquidCrystal lcd(9, 8, 7, 6, 5, 4);
12
13 void setup() {
14 // set up the LCD's number of columns and rows:
15 lcd.begin(16, 2);
16
17 // Print a message to the LCD.
18 lcd.print("mechatronics");
19
20 lcd.setCursor(0,1);
21 lcd.print("start");
22 delay(5000);
23 lcd.clear();
24 }
25
26 void loop() {
27 lcd.setCursor(3,1);
28 lcd.print("Seconds");
29 lcd.setCursor(0, 1);
30 // print the number of seconds since reset:
31 lcd.print(millis()/1000);
32 }
33

```

Connect LCD TO Arduino using LiquidCrystal library



The PCF8574/74A provides general-purpose remote I/O expansion via the two-wire bidirectional I2C-bus (serial clock (SCL), serial data (SDA)).

ADDRESS REFERENCE

INPUTS			I ² C-BUS SLAVE ADDRESS
A2	A1	A0	
L	L	L	32 (decimal), 20 (hexadecimal)
L	L	H	33 (decimal), 21 (hexadecimal)
L	H	L	34 (decimal), 22 (hexadecimal)
L	H	H	35 (decimal), 23 (hexadecimal)
H	L	L	36 (decimal), 24 (hexadecimal)
H	L	H	37 (decimal), 25 (hexadecimal)
H	H	L	38 (decimal), 26 (hexadecimal)
H	H	H	39 (decimal), 27 (hexadecimal)

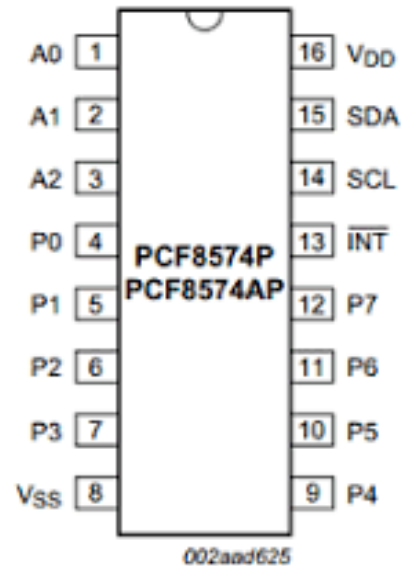
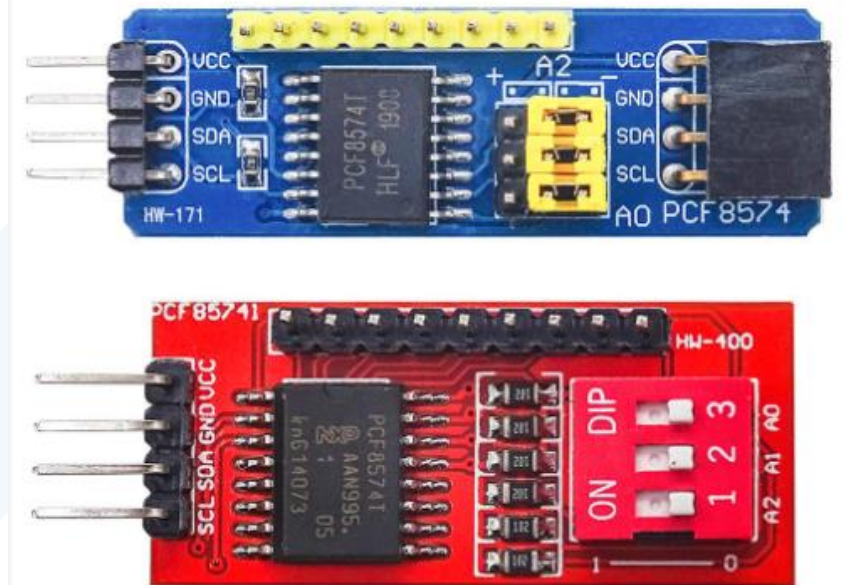


Fig 3. Pin configuration for DIP16



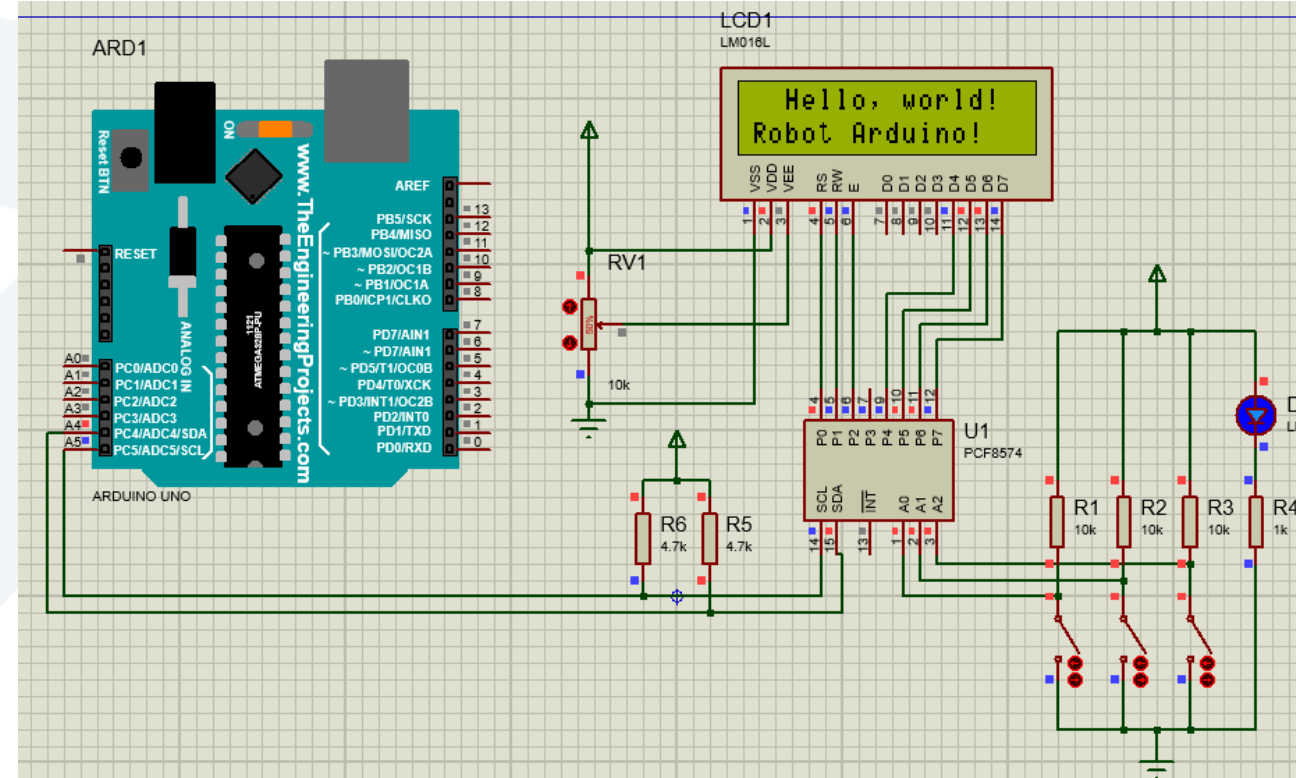
PCF8574 or MCP23008

Connect LCD TO Arduino using i2c

```

1  #include <Wire.h>
2  #include <LiquidCrystal_I2C.h>
3
4  LiquidCrystal_I2C lcd(0x27,16,2);
5  // set the LCD address to 0x27 for a 16 chars and 2 line display
6
7  void setup()
8  {
9      lcd.init();                // initialize the lcd
10     lcd.init();
11     // Print a message to the LCD.
12     //lcd.backlight();
13 }
14
15
16 void loop()
17 {
18     lcd.setCursor(2,0); // THIRD POSITION(2) IN THE FIRST LINE(0)
19     lcd.print("Hello, world!");
20     lcd.setCursor(0,1); // FIRST POSITION(0) IN THE SECOND LINE(1)
21     lcd.print("Robot Arduino!");
22 }
23

```

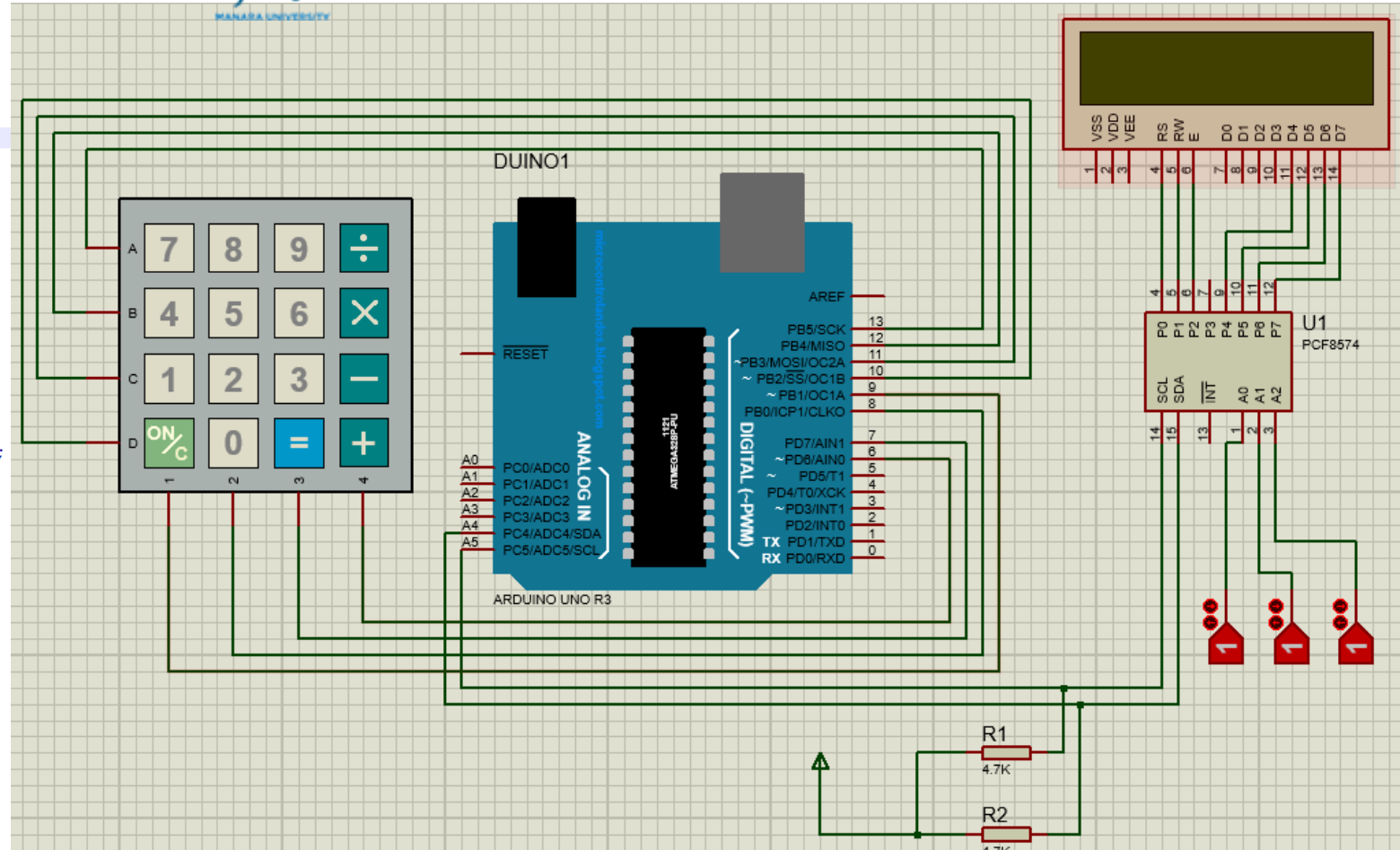


use an LCD display instead of the serial monitor to read keypress values.

```

1 // Include Arduino Wire library for I2C
2 #include <Wire.h>
3 // Include LCD display library for I2C
4 #include <LiquidCrystal_I2C.h>
5 // Include Keypad library
6 #include <Keypad.h>
7 // Constants for row and column sizes
8 const byte ROWS = 4;
9 const byte COLS = 4;
10 // Array to represent keys on keypad
11 char hexaKeys[ROWS][COLS] = {
12   {'7','8','9','/'},
13   {'4','5','6','x'},
14   {'1','2','3','-'},
15   {'*','0','#','+'}
16 };
17 // Connections to Arduino
18 byte rowPins[ROWS] = {13, 12, 11, 10};
19 byte colPins[COLS] = {9, 8, 7, 6};
20
21 // Create keypad object
22 Keypad customKeypad = Keypad(makeKeymap(hexaKeys), rowPins, colPins, ROWS, COLS);
23 // Create LCD object
24 LiquidCrystal_I2C lcd(0x27, 16, 2);
25
26 void setup() {
27   // Setup LCD with backlight and initialize
28   lcd.backlight();
29   lcd.init();
30 }
31
32 void loop() {
33   // Get key value if pressed
34   char customKey = customKeypad.getKey();
35
36   if (customKey) {
37     // Clear LCD display and print character
38     lcd.clear();
39     lcd.setCursor(0, 0);
40     lcd.print(customKey);
41   }
42 }
43

```




```

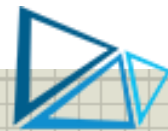
1 // Include Arduino Wire library for I2C
2 #include <Wire.h>
3 // Include LCD display library for I2C
4 #include <LiquidCrystal_I2C.h>
5 // Include Keypad library
6 #include <Keypad.h>
7 // Length of password + 1 for null character
8 #define Password_Length 8
9 // Character to hold password input
10 char Data[Password_Length];
11 // Password
12 char Master[Password_Length] = "0123456";
13 // Pin connected to lock relay input
14 int lockOutput = 0;
15 // Counter for character entries
16 byte data_count = 0;
17 // Character to hold key input
18 char customKey;
19 // Constants for row and column sizes
20 const byte ROWS = 4;
21 const byte COLS = 4;
22 // Array to represent keys on keypad
23 char hexaKeys[ROWS][COLS] = {
24     {'7', '8', '9', '/'},
25     {'4', '5', '6', 'x'},
26     {'1', '2', '3', '-'},
27     {'*', '0', '#', '+'}
28 };
29 // Connections to Arduino
30 byte rowPins[ROWS] = {13, 12, 11, 10};
31 byte colPins[COLS] = {9, 8, 7, 6};
32 // Create keypad object
33 Keypad customKeypad = Keypad(makeKeymap(hexaKeys), rowPins, colPins, ROWS, COLS);
34 // Create LCD object
35 LiquidCrystal_I2C lcd(0x27, 16, 2);
36 void setup() {
37     // Setup LCD with backlight and initialize
38     lcd.backlight();
39     lcd.init();
40     // Set lockOutput as an OUTPUT pin
41     pinMode(lockOutput, OUTPUT);
42 }

```

```

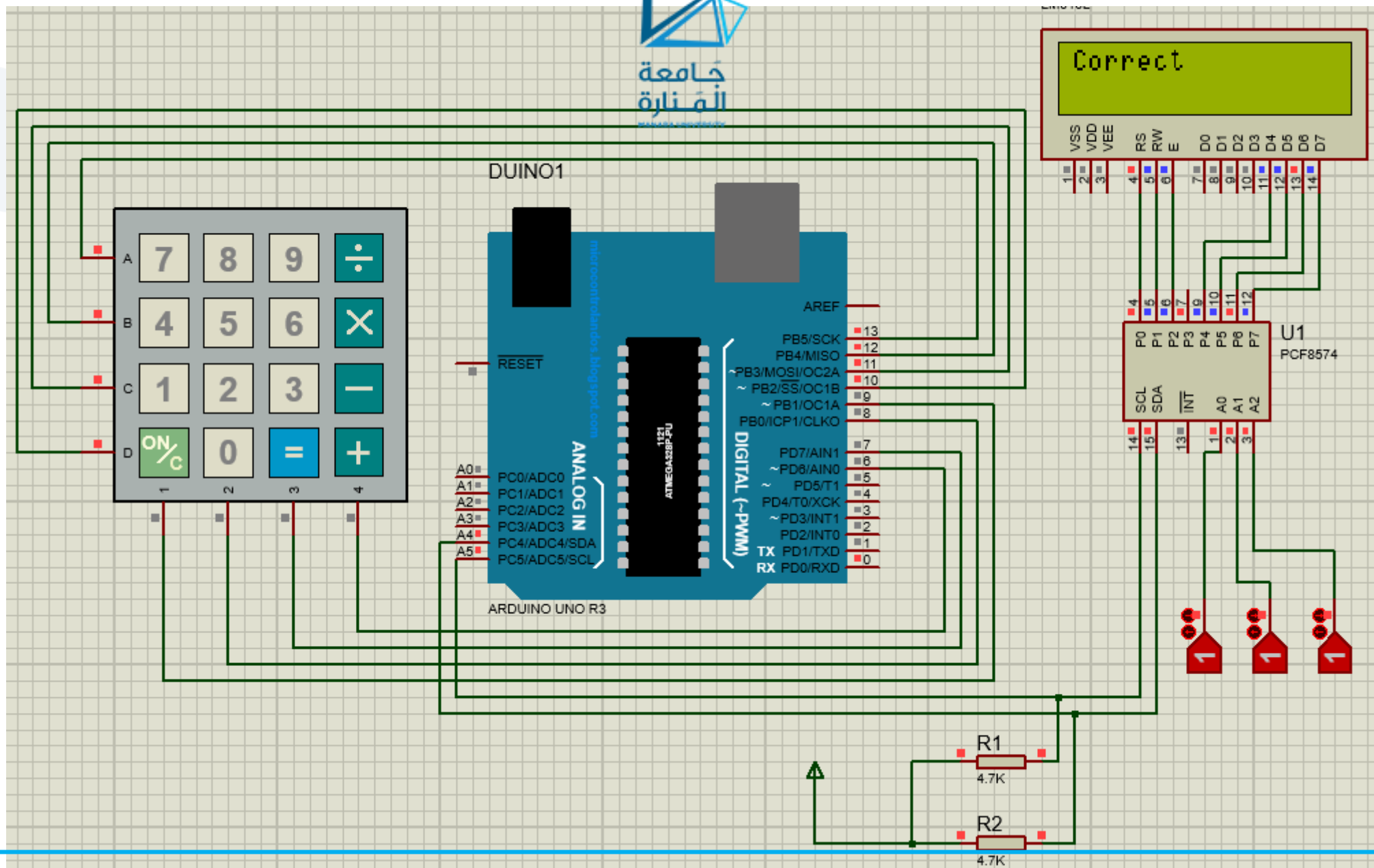
44 void loop()
45 {
46     // Initialize LCD and print
47     lcd.setCursor(0, 0);
48     lcd.print("Enter Password:");
49     // Look for keypress
50     customKey = customKeypad.getKey();
51     if (customKey) {
52         // Enter keypress into array and increment counter
53         Data[data_count] = customKey;
54         lcd.setCursor(data_count, 1);
55         lcd.print(Data[data_count]);
56         data_count++;
57     }
58     // See if we have reached the password length
59     if (data_count == Password_Length - 1) {
60         lcd.clear();
61         if (!strcmp(Data, Master)) {
62             // Password is correct
63             lcd.print("Correct");
64             // Turn on relay for 5 seconds
65             digitalWrite(lockOutput, HIGH);
66             delay(5000);
67             digitalWrite(lockOutput, LOW);
68         }
69         else {
70             // Password is incorrect
71             lcd.print("Incorrect");
72             delay(1000);
73         }
74         // Clear data and LCD display
75         lcd.clear();
76         clearData();
77     }
78 }
79
80 void clearData() {
81     // Go through array and clear data
82     while (data_count != 0) {
83         Data[data_count--] = 0;
84     }
85     return;
86 }

```



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