IT407: Technologies for Internet of Things
Lab Assignment 1

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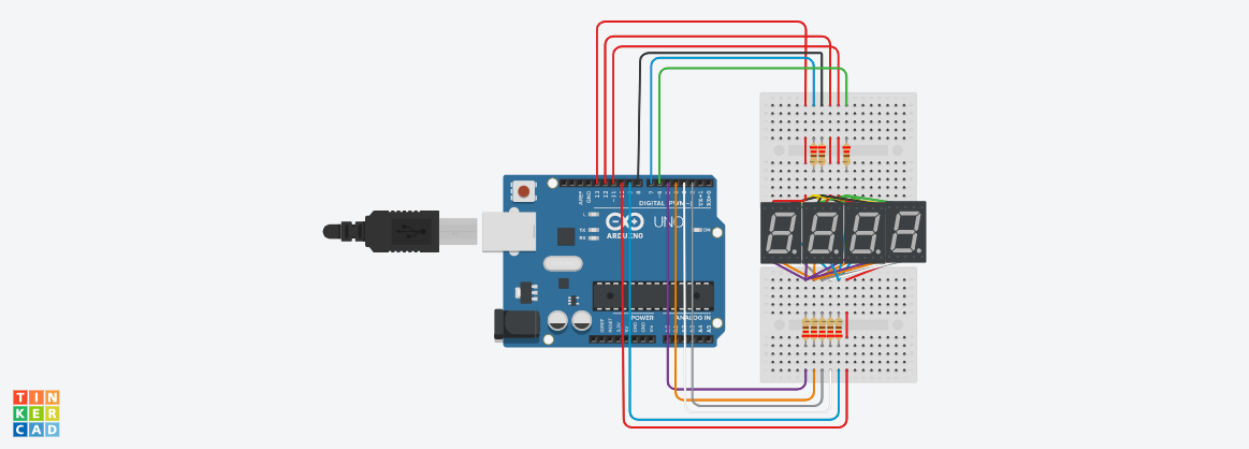
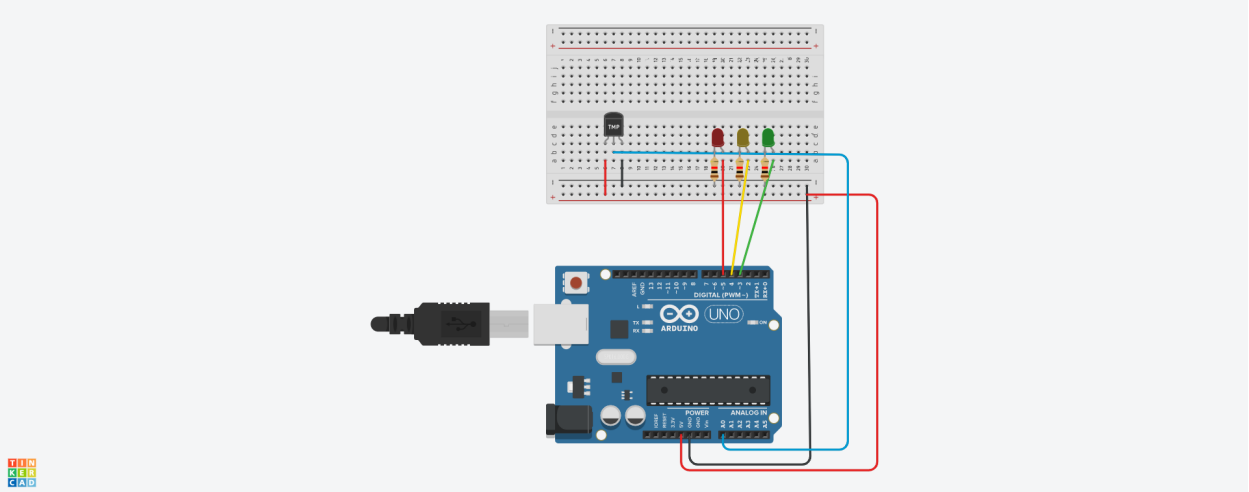
1. Interfacing 4-Digit 7-Segment Display
   https://www.tinkercad.com/things/0FMWgd4Dzia

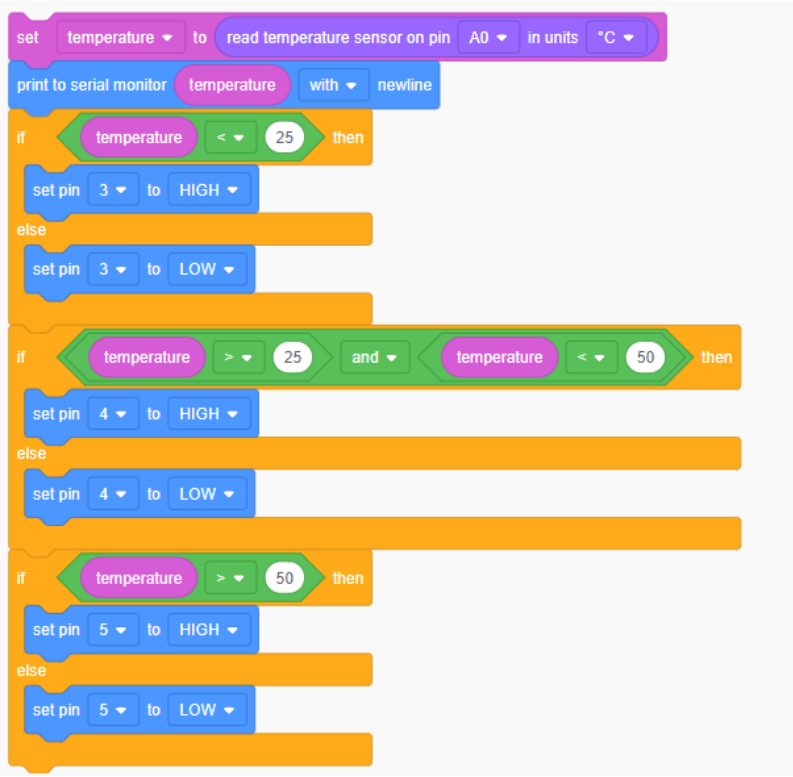


```
const byte pinsForSegment[8] = {9, 8, 7, 6, 2, 3, 4, 5};
const byte pinsOfPower[4] = {10, 11, 12, 13};
const byte lengthOfSegment = sizeof(pinsForSegment) / sizeof(byte);
const byte lengthOfPower = sizeof(pinsOfPower) / sizeof(byte);
const unsigned int segmentsArr[8] = {
    // middle
    1 << 0,
    // top left
    1 << 1,
    // top
    1 << 2,
    // top right
    1 << 3,
    // dot
    1 << 4,
    // bottom right
    1 << 5,
    // bottom
    1 << 6,
    // bottom left
    1 << 7};
```

```
const unsigned int digits[10] = {
    // 0
    (segmentsArr[1] | segmentsArr[2] | segmentsArr[3] | segmentsArr[5] | segmentsArr[6] | segmentsArr[7]),
    // 1
    (segmentsArr[3] | segmentsArr[5]),
    // 2
    (segmentsArr[0] | segmentsArr[2] | segmentsArr[3] | segmentsArr[6] | segmentsArr[7]),
    // 3
    (segmentsArr[0] | segmentsArr[2] | segmentsArr[3] | segmentsArr[5] | segmentsArr[6]),
    // 4
    (segmentsArr[0] | segmentsArr[1] | segmentsArr[3] | segmentsArr[5]),
    // 5
    (segmentsArr[0] | segmentsArr[1] | segmentsArr[2] | segmentsArr[5] | segmentsArr[6]),
    // 6
    (segmentsArr[0] | segmentsArr[1] | segmentsArr[2] | segmentsArr[5] | segmentsArr[6] | segmentsArr[7]),
    // 7
    (segmentsArr[2] | segmentsArr[3] | segmentsArr[5]),
    // 8
    (segmentsArr[0] | segmentsArr[1] | segmentsArr[2] | segmentsArr[3] | segmentsArr[5] | segmentsArr[6] | segmentsArr[7]),
    // 9
    (segmentsArr[0] | segmentsArr[1] | segmentsArr[2] | segmentsArr[3] | segmentsArr[5] | segmentsArr[6])};
unsigned int x = 0;

void setup()
{
    byte length;
    for (byte i = 0; i < lengthOfPower; i++)
    {
        pinMode(pinsOfPower[i], OUTPUT);
        digitalWrite(pinsOfPower[i], LOW);
    }
    for (byte i = 0; i < lengthOfSegment; i++)
    {
        pinMode(pinsForSegment[i], OUTPUT);
        digitalWrite(pinsForSegment[i], HIGH);
    }
}

void loop()
{
    x %= 10000;
    for (byte k = 0; k < lengthOfPower; k++)
    {
        for (byte j = 0; j < (100 / lengthOfPower); j++)
        {
            unsigned int y = 1;
            for (byte i = 0; i < lengthOfPower; i++)
            {
                y *= 10;
                setLED(pinsOfPower[i], digits[(x / (y / 10)) % 10] | ((k == i) ? segmentsArr[4] : 0));
            }
            delay(2);
        }
    }
    x++;
}
void setLED(byte powerPin, unsigned int segmentValue, bool enabled)
{
    digitalWrite(powerPin, enabled ? HIGH : LOW);
    for (byte i = 0; i < lengthOfSegment; i++)
    {
        if ((segmentValue & segmentsArr[i]) > 0)
        {
            digitalWrite(pinsForSegment[i], enabled ? LOW : HIGH);
        }
    }
    delay(1);
}

void setLED(byte powerPin, unsigned int segmentValue)
{
    setLED(powerPin, segmentValue, true);
    setLED(powerPin, segmentValue, false);
}
```

2. Temperature Monitoring System
   https://www.tinkercad.com/things/dL5T3MoDiZV

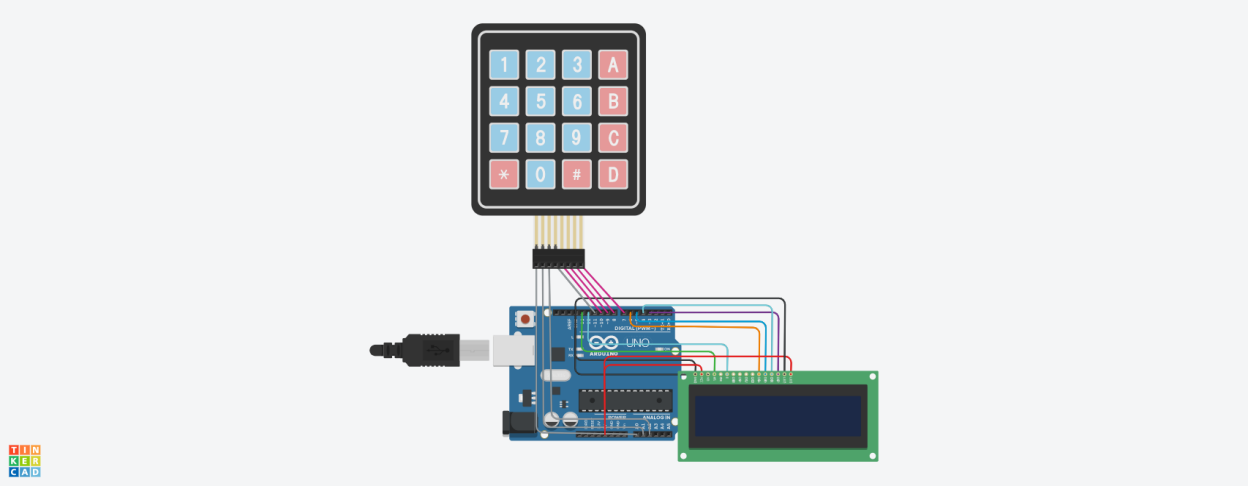





```
int temperature = 0;

void setup()
{
  pinMode(A0, INPUT);
  Serial.begin(9600);

  pinMode(3, OUTPUT);
  pinMode(4, OUTPUT);
  pinMode(5, OUTPUT);
}
```

```
void loop()
{
  temperature = -40 + 0.488155 * (analogRead(A0) - 20);
  Serial.println(temperature);
  if (temperature < 25) {
    digitalWrite(3, HIGH);
  } else {
    digitalWrite(3, LOW);
  }
  if (temperature > 25 && temperature < 50) {
    digitalWrite(4, HIGH);
  } else {
    digitalWrite(4, LOW);
  }
  if (temperature > 50) {
    analogWrite(5, 1);
  } else {
    analogWrite(5, 0);
  }
  delay(10); // Delay a little bit to improve simulation performance
}
```

3. Print Keypad Value on LCD
   https://www.tinkercad.com/things/lB40wQyDejW



```
#include <Keypad.h>

#include <LiquidCrystal.h>

LiquidCrystal lcd(13, 12, 6, 5, 4, 3);
const byte rows = 4;
const byte cols = 4;

char keymap[rows][cols] =
{
  {'1', '2', '3', 'A'},
  {'4', '5', '6', 'B'},
  {'7', '8', '9', 'C'},
  {'*', '0', '#', 'D'},
};

byte rowPins[rows] = {A0, A1, A2, 11};
byte colPins[cols] = {10, 9, 8, 7};
int LCDRow = 0;

Keypad keypad = Keypad(makeKeymap(keymap), rowPins, colPins, rows, cols);
void setup()
{
  Serial.begin(9600);
  lcd.begin(16, 2);
  lcd.setCursor(LCDRow, 0);
}

void loop()
{
  char keypress = keypad.getKey();
  if(keypress)
  {
    lcd.print(keypress);
    Serial.println(keypress);
    lcd.setCursor(++LCDRow, 0);
  }
}
```