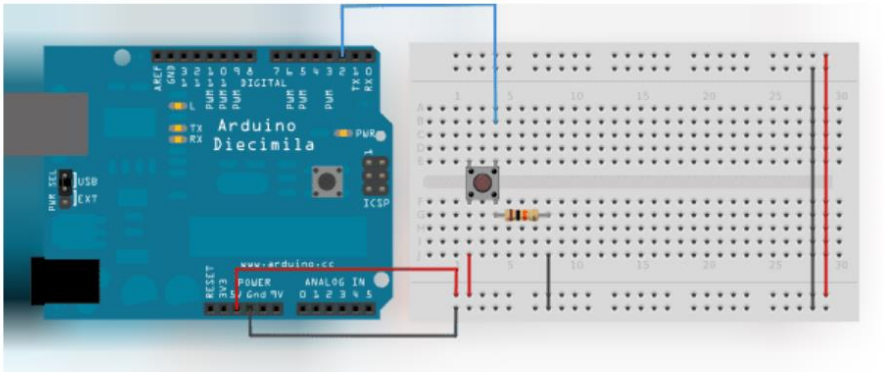
5.1 Programming and Interfacing of switches, keys, sensors with Ardunio Uno board.

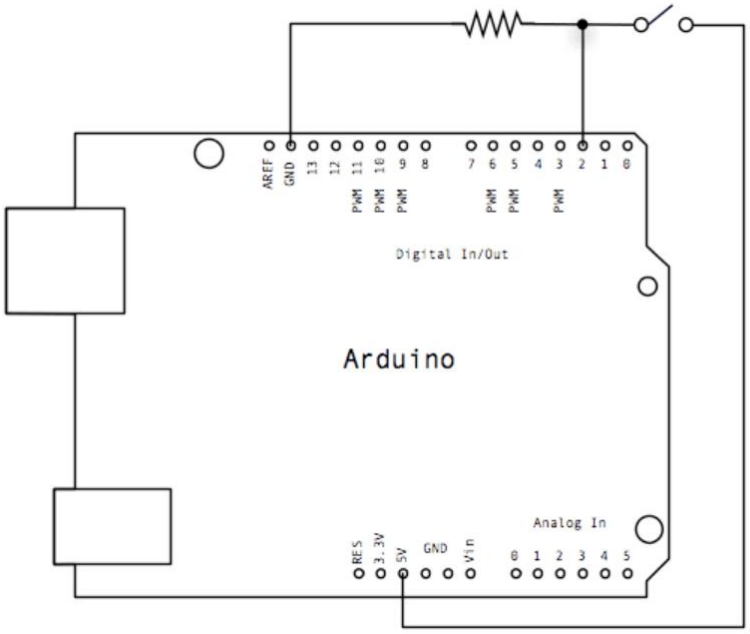
5.2 Programming and Interfacing of LED, 7-Segment, Relays with Ardunio Uno board.

5.3 Programming and Interfacing of Matrix keyboard, multiplex 7-Segment display, LCD with Ardunio Uno board.

5.4 Programming and Interfacing of stepper motor, DC motor with Ardunio Uno board.

Pushbuttons or switches connect two points in a circuit when you press them. This example turns on the built-in LED on pin 13 when you press the button.





When the pushbutton is open (unpressed) there is no connection between the two legs of the pushbutton, so the pin is connected to ground (through the pull-down resistor) and we read a LOW. When the button is closed (pressed), it makes a connection between its two legs, connecting the pin to 5 volts, so that we read a HIGH.

If it is wiredt the opposite way, with a pull up resistor keeping the input HIGH, and going LOW when the button is pressed. If so, the behavior of the sketch will be reversed, with the LED normally on and turning off when the button is pressed.

If the connections are disconnected from all the digital I/O pin, then the LED may blink erratically. This is because the input is "floating" - that is, it will randomly return either HIGH or LOW. That's why a pull-up or pull-down resistor is needed in the circuit.

Programming :

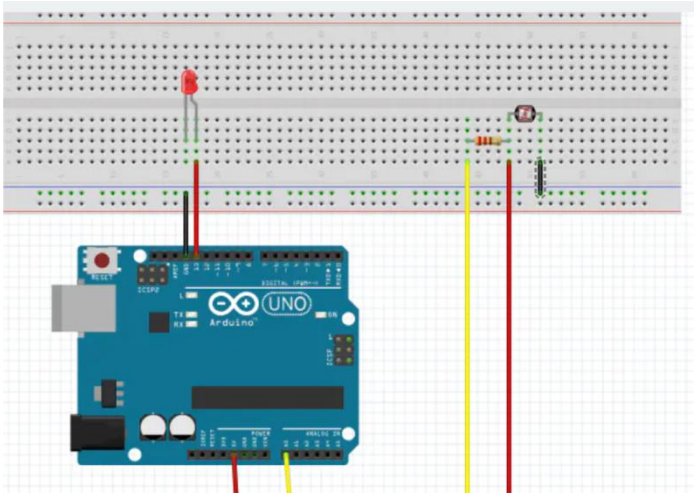
```
/*

  Turns on and off a light emitting diode(LED) connected to digital pin 13,
  when pressing a pushbutton attached to pin 2.


  The circuit:
  - LED attached from pin 13 to ground
  - pushbutton attached to pin 2 from +5V
  - 10K resistor attached to pin 2 from ground
  - Note: on most Arduinos there is already an LED on the board    attached to pin 13.
  */
// constants won't change. They're used here to set pin numbers:
const int buttonPin = 2;     // the number of the pushbutton pin
const int ledPin =  13;      // the number of the LED pin
// variables will change:
int buttonState = 0;         // variable for reading the pushbutton status
void setup() {
  // initialize the LED pin as an output:
  pinMode(ledPin, OUTPUT);
  // initialize the pushbutton pin as an input:
  pinMode(buttonPin, INPUT);
}
void loop() {
  // read the state of the pushbutton value:
  buttonState = digitalRead(buttonPin);

  // check if the pushbutton is pressed. If it is, the buttonState is HIGH:
  if (buttonState == HIGH) {
    // turn LED on:
    digitalWrite(ledPin, HIGH);
  } else {
    // turn LED off:
    digitalWrite(ledPin, LOW);
  }
}
```

Intefacing of sensor with arduino



Sensors are widely used in almost every field.

There are different type of sensors which can record different type of data. All sensors work differently e.g. light sensors, ultrasonic sensor, gas sensor, humidity sensors etc.

Although all sensors work differently but when it come to interfacing these sensors with a micro controller (Arduino Uno in our case) the process is same.

Sensor record the physical data by changing the voltage at their output pin in response to different physical condition.

Consider a light sensor (LDR). When it's in a dark environment the output voltage is low but when we place it in a brighter environment it's output voltage increases.

Now, this change in voltage is noted by micro controller and it can programmed to respond accordingly.

Consider LDR as a sensor for interfacing with Arduino Uno.

Connections

Arduino Uno has a set of Analog input pins which can are used to take analog input signals from a sensor.

There are two types of signals:

1. Digital Signals: These signals have only two values i.e. 1 or 0 (on or off).
2. Analog Signals: These signals have values in a range. In the case of Arduino it scales the value in the range from 0 to 255.

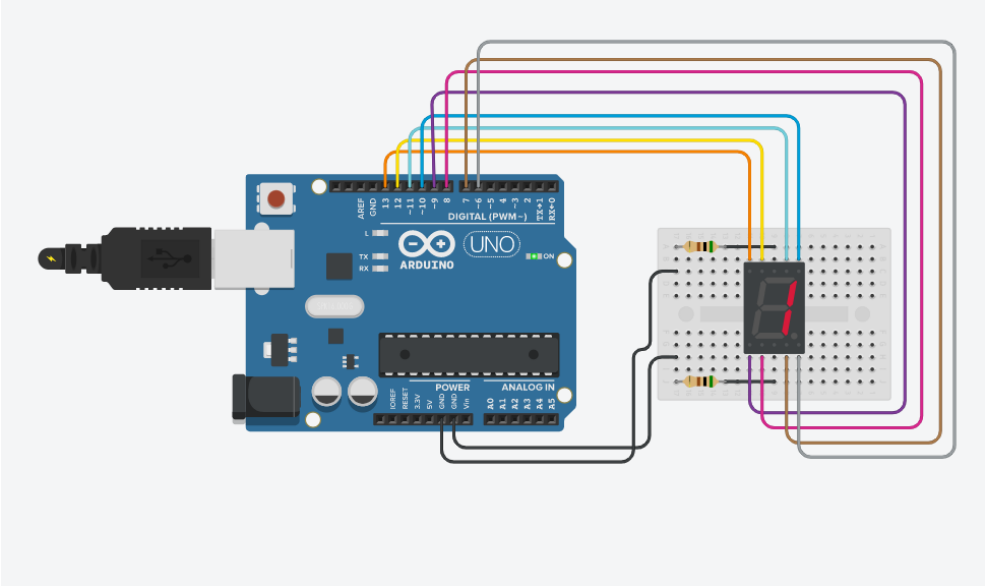
Connect sensor LDR with A0 pin of the Arduino Uno.
Control an LED on the basis of the sensor data.
Connect the LED to D13 (digital pin 13) of Arduino UNO.
LED is connected to pin 13 which has an inbuilt resistor. So don't need to connect an external resistor but for pin other than pin 13, connect an external resistor to protect you LED.
So sensors simply records the data and sends it to then Arduino Uno which generates signals to control the LED.

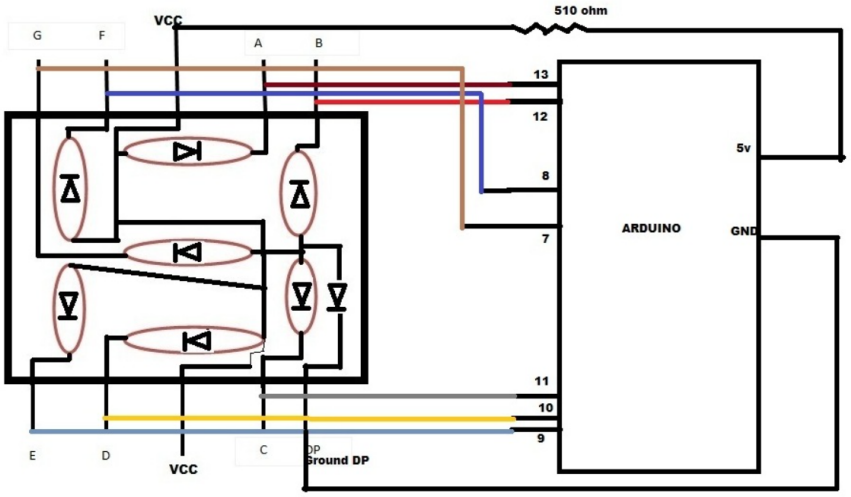
Programming :

First, we initialize an integer variable to store the data sent by the sensor.

```
int sensor1Value = 0;
void setup()
{
// Declare the ledPin13 as an OUTPUT:
pinMode(13, OUTPUT);
}
void loop() {
// analogRead(A0) Reads the value from the sensor connected at A0 and storesitinsensorValue
sensor1Value = analogRead(A0);
// now we setup a condition and check the value of sensor
if(sensor1Value <200)
{
//If the value is less than 200 then turn the LEDs on
digitalWrite(13, HIGH);
delay(500);
}
else
//If the value is greater than or equal to 200 then turn LEDs off.
{
digitalWrite(13, LOW);
delay(500);
}
}
```

Interfacing of seven segment with Arduino





Programming :

```
unsigned const int A = 13;
unsigned const int B = 12;
unsigned const int C = 11;
unsigned const int D = 10;
unsigned const int E = 9;
unsigned const int F = 8;
unsigned const int G = 7;
unsigned const int H = 6;


void setup(void)
{
  pinMode(A, OUTPUT);
  pinMode(B, OUTPUT);
  pinMode(C, OUTPUT);
  pinMode(D, OUTPUT);
  pinMode(E, OUTPUT);
  pinMode(F, OUTPUT);
  pinMode(G, OUTPUT);
  pinMode(H, OUTPUT);
}

//My Functions

void zero(void) {
  digitalWrite(A, LOW);
  digitalWrite(B, HIGH);
  digitalWrite(C, HIGH);
  digitalWrite(D, HIGH);
  digitalWrite(E, HIGH);
  digitalWrite(F, HIGH);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}

void one(void) {
  digitalWrite(A, LOW);
  digitalWrite(B, LOW);
```

```
  digitalWrite(C, LOW);
  digitalWrite(D, HIGH);
  digitalWrite(E, LOW);
  digitalWrite(F, LOW);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}

void two(void) {
  digitalWrite(A, HIGH);
  digitalWrite(B, LOW);
  digitalWrite(C, HIGH);
  digitalWrite(D, HIGH);
  digitalWrite(E, HIGH);
  digitalWrite(F, HIGH);
  digitalWrite(G, LOW);
  digitalWrite(H, LOW);
}

void three(void) {
  digitalWrite(A, HIGH);
  digitalWrite(B, LOW);
  digitalWrite(C, HIGH);
  digitalWrite(D, HIGH);
  digitalWrite(E, LOW);
  digitalWrite(F, HIGH);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}

void four(void) {
  digitalWrite(A, HIGH);
  digitalWrite(B, HIGH);
  digitalWrite(C, LOW);
  digitalWrite(D, HIGH);
  digitalWrite(E, LOW);
  digitalWrite(F, LOW);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}
```

```
void five(void) {
  digitalWrite(A, HIGH);
  digitalWrite(B, HIGH);
  digitalWrite(C, HIGH);
  digitalWrite(D, LOW);
  digitalWrite(E, LOW);
  digitalWrite(F, HIGH);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}

void six(void) {
  digitalWrite(A, HIGH);
  digitalWrite(B, HIGH);
  digitalWrite(C, HIGH);
  digitalWrite(D, LOW);
  digitalWrite(E, HIGH);
  digitalWrite(F, HIGH);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}

void seven(void) {
  digitalWrite(A, LOW);
  digitalWrite(B, LOW);
  digitalWrite(C, HIGH);
  digitalWrite(D, HIGH);
  digitalWrite(E, LOW);
  digitalWrite(F, LOW);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}

void eight(void) {
  digitalWrite(A, HIGH);
  digitalWrite(B, HIGH);
  digitalWrite(C, HIGH);
  digitalWrite(D, HIGH);
  digitalWrite(E, HIGH);
```

```
  digitalWrite(F, HIGH);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}

void nine(void) {
  digitalWrite(A, HIGH);
  digitalWrite(B, HIGH);
  digitalWrite(C, HIGH);
  digitalWrite(D, HIGH);
  digitalWrite(E, LOW);
  digitalWrite(F, HIGH);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}

// Start
void loop(void)
{
  zero();
  delay(1000);

  one();
  delay(1000);

  two();
  delay(1000);

  three();
  delay(1000);

  four();
  delay(1000);

  five();
  delay(1000);

  six();
  delay(1000);
```

```
  seven();
  delay(1000);

  eight();
  delay(1000);

  nine();
  delay(1000);
}



unsigned const int A = 13;
unsigned const int B = 12;
unsigned const int C = 11;
unsigned const int D = 10;
unsigned const int E = 9;
unsigned const int F = 8;
unsigned const int G = 7;
unsigned const int H = 6;


void setup(void)
{
  pinMode(A, OUTPUT);
  pinMode(B, OUTPUT);
  pinMode(C, OUTPUT);
  pinMode(D, OUTPUT);
  pinMode(E, OUTPUT);
  pinMode(F, OUTPUT);
  pinMode(G, OUTPUT);
  pinMode(H, OUTPUT);
}

//My Functions

void zero(void) {
  digitalWrite(A, LOW);
  digitalWrite(B, HIGH);
```

```
  digitalWrite(C, HIGH);
  digitalWrite(D, HIGH);
  digitalWrite(E, HIGH);
  digitalWrite(F, HIGH);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}

void one(void) {
  digitalWrite(A, LOW);
  digitalWrite(B, LOW);
  digitalWrite(C, LOW);
  digitalWrite(D, HIGH);
  digitalWrite(E, LOW);
  digitalWrite(F, LOW);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}

void two(void) {
  digitalWrite(A, HIGH);
  digitalWrite(B, LOW);
  digitalWrite(C, HIGH);
  digitalWrite(D, HIGH);
  digitalWrite(E, HIGH);
  digitalWrite(F, HIGH);
  digitalWrite(G, LOW);
  digitalWrite(H, LOW);
}

void three(void) {
  digitalWrite(A, HIGH);
  digitalWrite(B, LOW);
  digitalWrite(C, HIGH);
  digitalWrite(D, HIGH);
  digitalWrite(E, LOW);
  digitalWrite(F, HIGH);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}
```

```
void four(void) {
  digitalWrite(A, HIGH);
  digitalWrite(B, HIGH);
  digitalWrite(C, LOW);
  digitalWrite(D, HIGH);
  digitalWrite(E, LOW);
  digitalWrite(F, LOW);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}

void five(void) {
  digitalWrite(A, HIGH);
  digitalWrite(B, HIGH);
  digitalWrite(C, HIGH);
  digitalWrite(D, LOW);
  digitalWrite(E, LOW);
  digitalWrite(F, HIGH);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}

void six(void) {
  digitalWrite(A, HIGH);
  digitalWrite(B, HIGH);
  digitalWrite(C, HIGH);
  digitalWrite(D, LOW);
  digitalWrite(E, HIGH);
  digitalWrite(F, HIGH);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}

void seven(void) {
  digitalWrite(A, LOW);
  digitalWrite(B, LOW);
  digitalWrite(C, HIGH);
  digitalWrite(D, HIGH);
  digitalWrite(E, LOW);
```

```
  digitalWrite(F, LOW);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}

void eight(void) {
  digitalWrite(A, HIGH);
  digitalWrite(B, HIGH);
  digitalWrite(C, HIGH);
  digitalWrite(D, HIGH);
  digitalWrite(E, HIGH);
  digitalWrite(F, HIGH);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}

void nine(void) {
  digitalWrite(A, HIGH);
  digitalWrite(B, HIGH);
  digitalWrite(C, HIGH);
  digitalWrite(D, HIGH);
  digitalWrite(E, LOW);
  digitalWrite(F, HIGH);
  digitalWrite(G, HIGH);
  digitalWrite(H, LOW);
}

// Start
void loop(void)
{
  zero();
  delay(1000);

  one();
  delay(1000);

  two();
  delay(1000);

  three();
```

```
  delay(1000);

  four();
  delay(1000);

  five();
  delay(1000);

  six();
  delay(1000);

  seven();
  delay(1000);

  eight();
  delay(1000);

  nine();
  delay(1000);
}
```