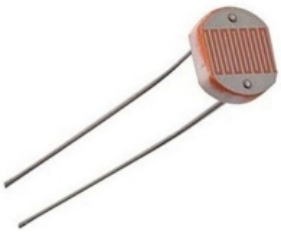
ATMEGA328/Arduino Uno – I/O Pins – INPUT SENSOR LDR
https://github.com/teaksoon/lmaewapm



LDR (Light Dependent Resistor) is a **Variable Resistor. LDR Resistance Value will change according to the brightness** that it is exposed to.

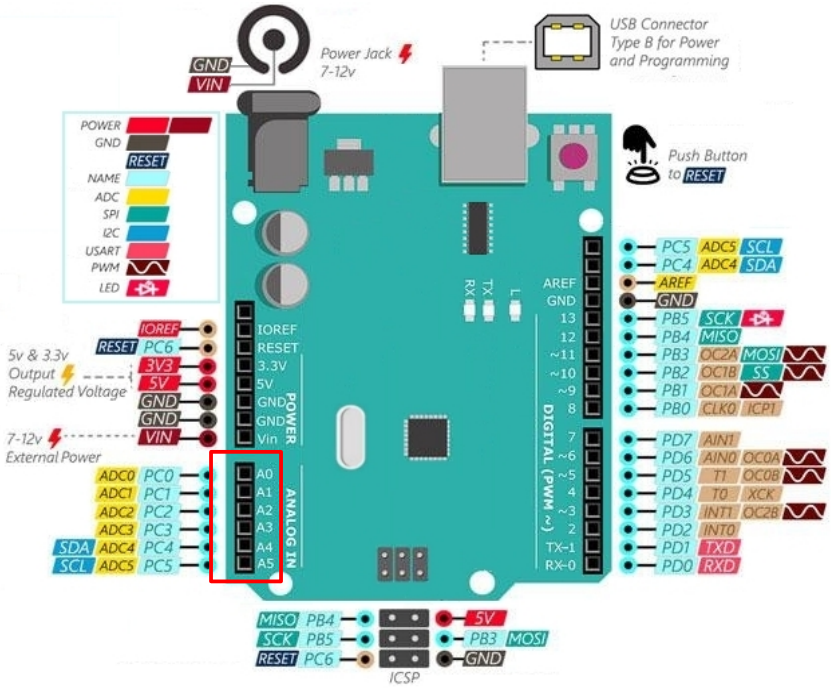
LDR Resistance Value Decrease as Brightness Increase

In our previous lesson on Resistors (2021_11_23_resistor_led), When a Resistor is combined with another Resistor, they can be used as a Voltage Divider

Since the **LDR Resistance Value change** when different brightness is exposed to it, we will also get a **"Variable Voltage"** when it is **used as a Voltage Divider with another Resistor.**

This **"Variable Voltage"** is our **Sensor Reading** which can **tell us brightness.**

Different Brightness, Different Voltage

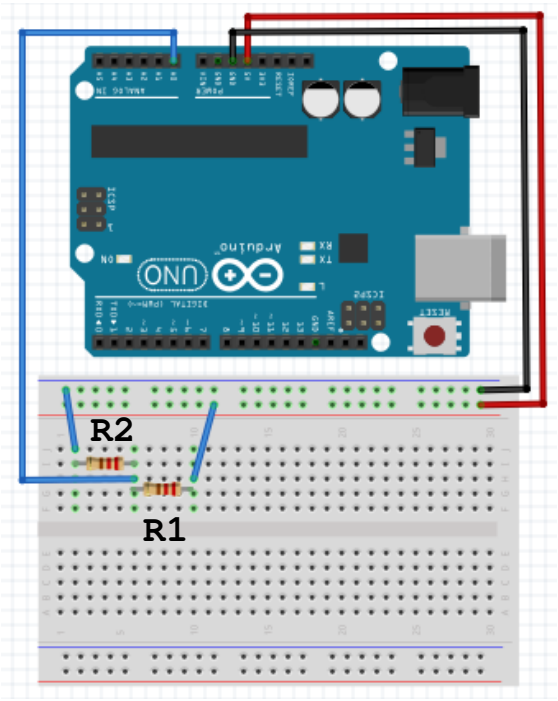


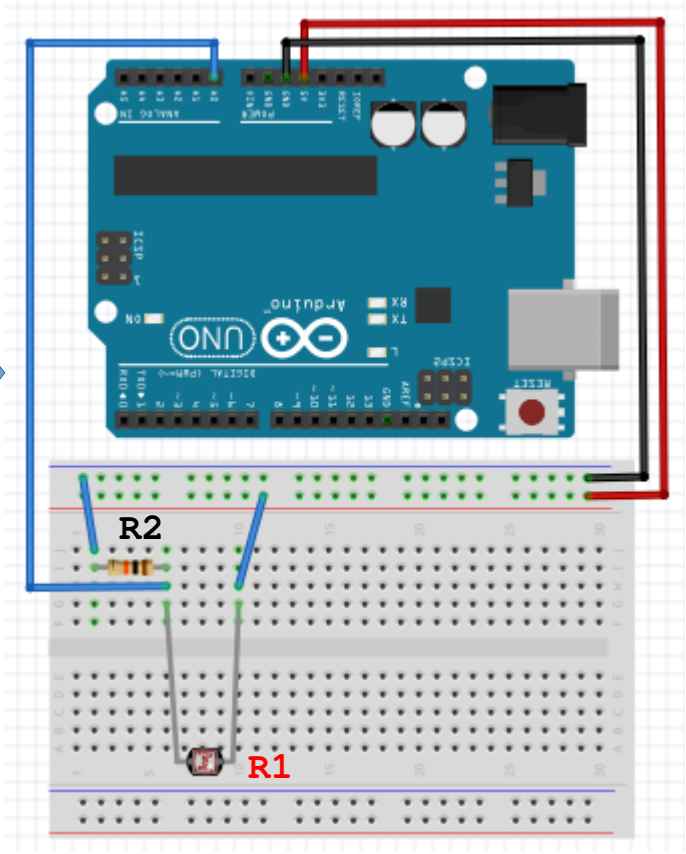
Sensors are just device that will "Supply" voltage to our INPUT I/O Pins

Digital Sensors can be connected to **any INPUT I/O Pin, digitalRead()**
- When the Digital Sensor "Supply" Less than 3V, we get a LOW reading
- When the Digital Sensor "Supply" 3V or More, we get a HIGH reading

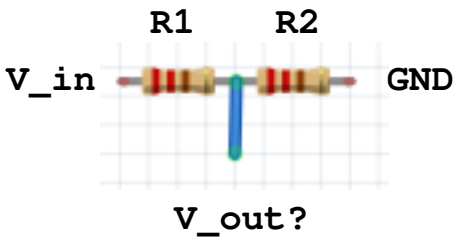
Analog Sensors can be connected to **Analog INPUT I/O Pin Only, analogRead()**
- We want the actual Voltage (ranged from 0V to 5V), where each different Voltage value has a different meaning. On the Arduino Uno Board, the Analog INPUT I/O Pins are labelled as A0,A1,A2,A3,A4 and A5

In this tutorial we are using the LDR as an Analog Sensor, most the other Sensors works about the same. You know this, you know almost all of them



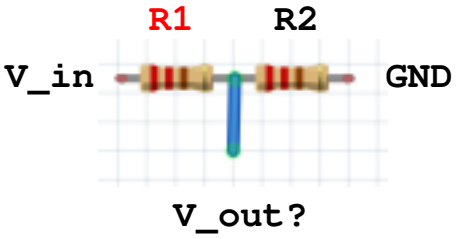


INPUT I/O Pin A0 will receive about half of 5V (Voltage Divider with 2 same value Resistor on the 5V from Arduino 5V Pin)



Voltage Divider Formula

V_out = V_in x (R2 / R1+R2)



Voltage Divider Formula

V_out = V_in x (R2 / R1+R2)

Voltage Supplied to A0(V_out)=

5 x (220 / (220 + 220))

= 2.5V

R1 is now replaced by LDR

Voltage Supplied to A0(V_out)=

5 x (10,000 / (LDR? + 10000))

= ? VOLTAGE is variable depending on the LDR Resistance Value which depends on brightness

VOLTAGE on A0 now Represents Brightness – Coming from "Brightness Sensor" made from an LDR and a Resistor

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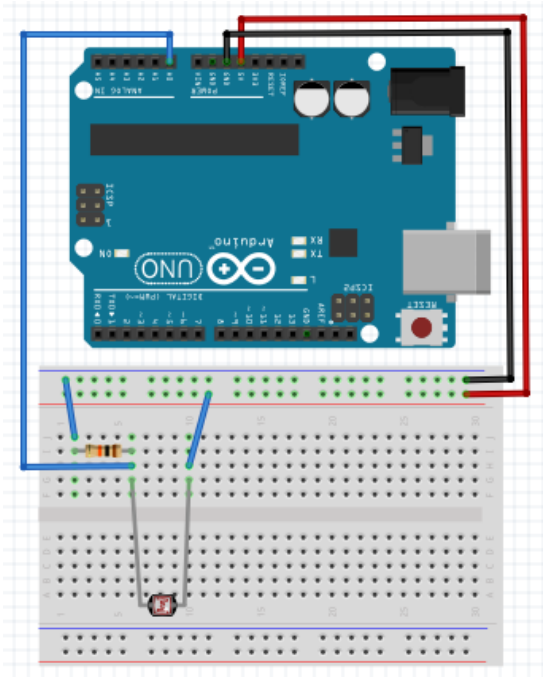

1x Computer with Arduino IDE Software
1x USB 2.0 Type A/B Data Cable
1x Arduino Uno Board
1x Solderless Breadboard
Jumper wires

1x LDR
1x 10K Ohm Resistor

Arduino Uno 5V connect to LDR
10K Resistor Connect to GND
In-Between 10K Resistor and LDR, make connection to Pin A0 (a Voltage divider circuit to Pin A0)

Program: io_pin_input_sensor_ldr)

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

void loop() {
  int pinDigital = digitalRead(A0);
  int pinAnalog  = analogRead(A0);

  Serial.print("\nINPUT I/O Pin A0: ");
  Serial.print("Digital Value=");Serial.print(pinDigital);
  Serial.print(", Analog Value=");Serial.print(pinAnalog);
  Serial.print(", Voltage=");Serial.print( (float) (pinAnalog*5)/1023,2 );
  delay(500);
}
```

Open the Serial Monitor from the Arduino IDE Software and watch the Output on the serial monitor screen. Observe the Voltage Reading. While still watching the Serial Monitor Screen do the following,

Try cover the LDR with your hands so that it is exposed to different brightness.

The different numbers that you get from Analog Value and Voltage is the different brightness detected by our homemade “Analog Brightness Sensor” (made from a LDR and a 10K Resistor)

Our ATMEGA328 micro controller now have a little bit of intelligence(AI), it can tell the brightness