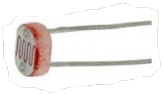
Project 14

Light Sensor

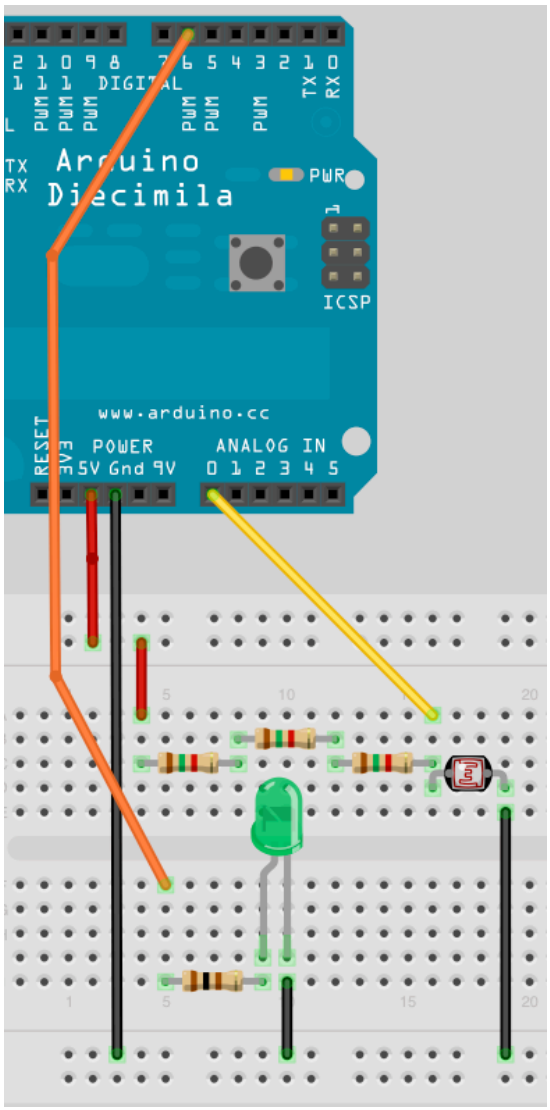
Project 14 - Light Sensor

In this project we are going to use the Light Dependent Resistor in our kit to read values from it and adjust the speed of a flashing LED.

What you will need

Light Dependent Resistor	
100Ω Resistor	
3 x 1K5Ω Resistors	
Green LED	

Connect it up



Enter the Code

Enter the code, then upload it to your Arduino. You will see the LED flashing on and off. If you cover the LDR (Light Dependent Resistor) you will see the LED flash slower. Now shine a bright light onto the LDR and you will see it flash faster.

```
//Project 14 - Light Sensor

// Pin we will connect to LED
int ledPin = 6;
// Pin connected to LDR
int ldrPin = 0;
// Value read from LDR
int lightVal = 0;

void setup()
{
	// Set both pins as outputs
	pinMode(ledPin, OUTPUT);
}

void loop()
{
	// Read in value from LDR
	lightVal = analogRead(ldrPin);
	// Turn LED on
	digitalWrite(ledPin, HIGH);
	// Delay of length lightVal
	delay(lightVal);
	// Turn LED off
	digitalWrite(ledPin, LOW);
	// Delay again
	delay(lightVal);
}
```

Project 14 - Code Overview

This code is pretty simple and you should be able to work out what it does yourself by now.

The code starts off by initialising variables related to Digital Pin 6, which the LED is connected to and Analogue Pin 0, which the LDR is connect to. We also initialise a variable called lightVal which will store the values red in from the LDR.

```
int ledPin = 6;
// Pin connected to LDR
int ldrPin = 0;
// Value read from LDR
int lightVal = 0;
```

The setup function sets the pinmode of the LED pin to output.

```
pinMode(ledPin, OUTPUT);
```

In the main loop of the program we read in analog value from Analog Pin 0 and store it in the 'lightVal' variable.

```
lightVal = analogRead(ldrPin);
```

Then the LED is turned on and off, with a delay equal to the value read in from the analog pin.

```
digitalWrite(ledPin, HIGH);
delay(lightVal);
digitalWrite(ledPin, LOW);
delay(lightVal);
```

As more light falls on the LDR the value read in from Analog Pin 0 decreases and the LED flashes faster.

Let's find out how this circuit works.

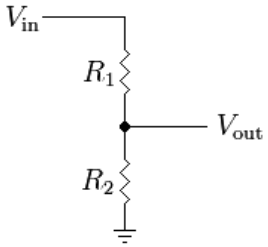
Project 14 - Hardware Overview

The only additional component used in this circuit is the LDR or Light Dependent Resistor (sometimes called a photoresistor). An LDR initially has a very high resistance. But, as light falls on it, the resistance will drop, allowing more current through.

Our LDR is connected in series with 3 x 1.5KΩ Resistors and the input into Analog Pin 0 is between these 2. This is what is known as a voltage divider. We will explain this in a second.

The 3 x 1.5K give a total resistance of 4500Ω (4.5KΩ). Resistors in series have a resistance equal to the sum of their individual resistances. In this case the value is 3 x 1500 = 4500.

A voltage divider is a circuit consisting of two resistances across a voltage supply. An output between the two resistances will give a lower voltage depending on the values of the two resistors.



The diagram on the left shows a voltage divider made up of two resistors. The value of Vout will be lower than the value of Vin.

To work out the value of Vout we use the following calculation:

$$V_{out} = \frac{R_2}{R_1 + R_2} V_{in}$$

We are providing 5 volts into the circuit so let's work out what values we will get out. Using a multimeter I have measured the resistance from the LDR in different conditions.

Conditions	Resistance
LDR Covered by Finger	8KΩ
Light in room (overcast day)	1KΩ
Held under a bright light	150Ω

So using these values of resistance, the input voltage and the calculation we listed above, the approx. output voltage can be calculated thus:

V_{in}	R_1	R_2	V_{out}
5v	4500Ω	8000Ω	3.2v
5v	4500Ω	1000Ω	0.9v
5v	4500Ω	150Ω	0.16v

As you can see, as the resistance of the LDR (R_2) decreases, the voltage out of the voltage divider decreases also, making the value read in from the Analog Pin lower and therefore decreasing the delay making the LED flash faster.

A voltage divider circuit could also be used for decreasing a voltage to a lower one if you used 2 standard resistors, rather than a resistor and an LDR (which is a variable resistor). Alternatively, you could use a potentiometer so you can adjust the voltage out by turning the knob.