Wireless Networks & Arduino

Bluetooth, Wifi, Xbee, Grove

LEDs, Servos, Steppenmotoren, Relais, Sensors (Temperatuur, Luchtvochtigheid, Alcohol, druk, etc)

4 april 2013 – NIOC, http://www.openarduino.nl; E.H. van Tol-Homan

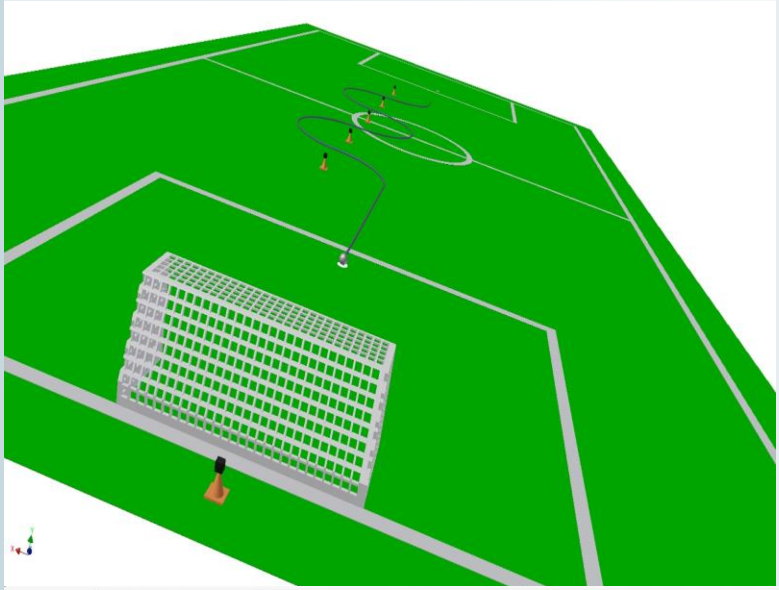
Els van Tol

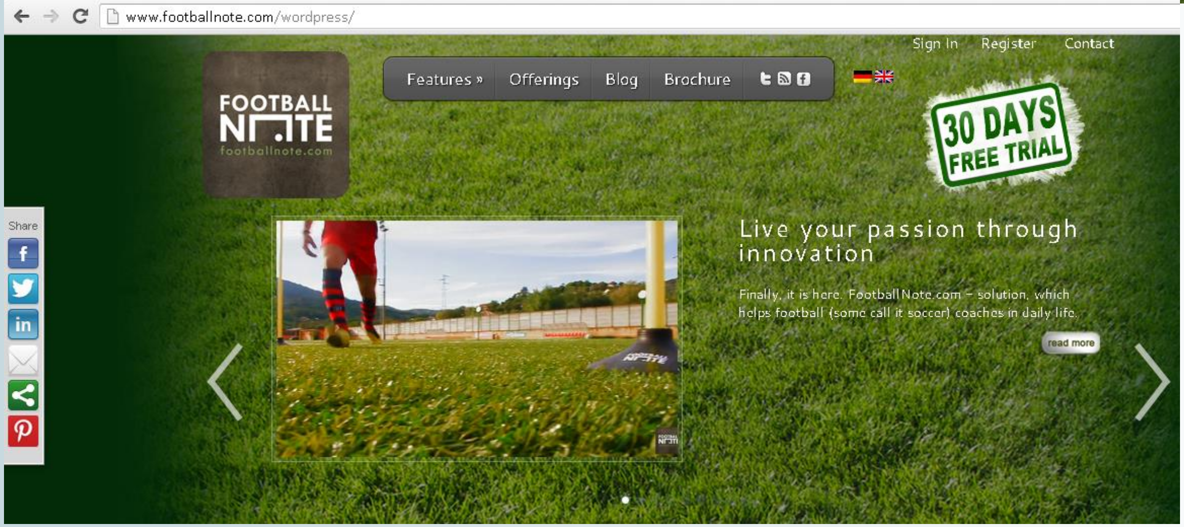
- Els.vantol@gmail.com
- Docent Informatica College Hageveld

- Afstudeerscriptie:

Wireless Sensing Networks with the Arduino

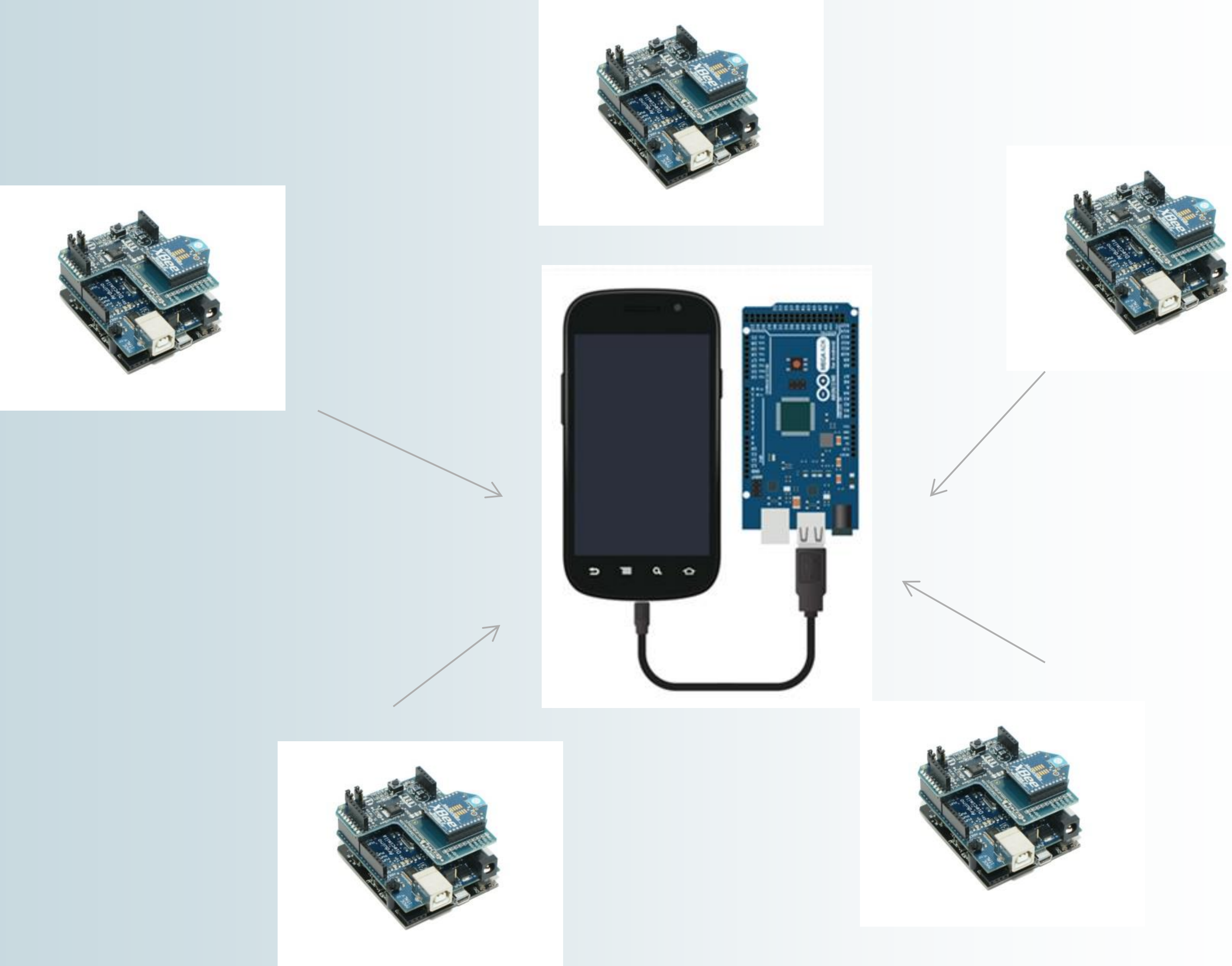
In opdracht van Oracle.



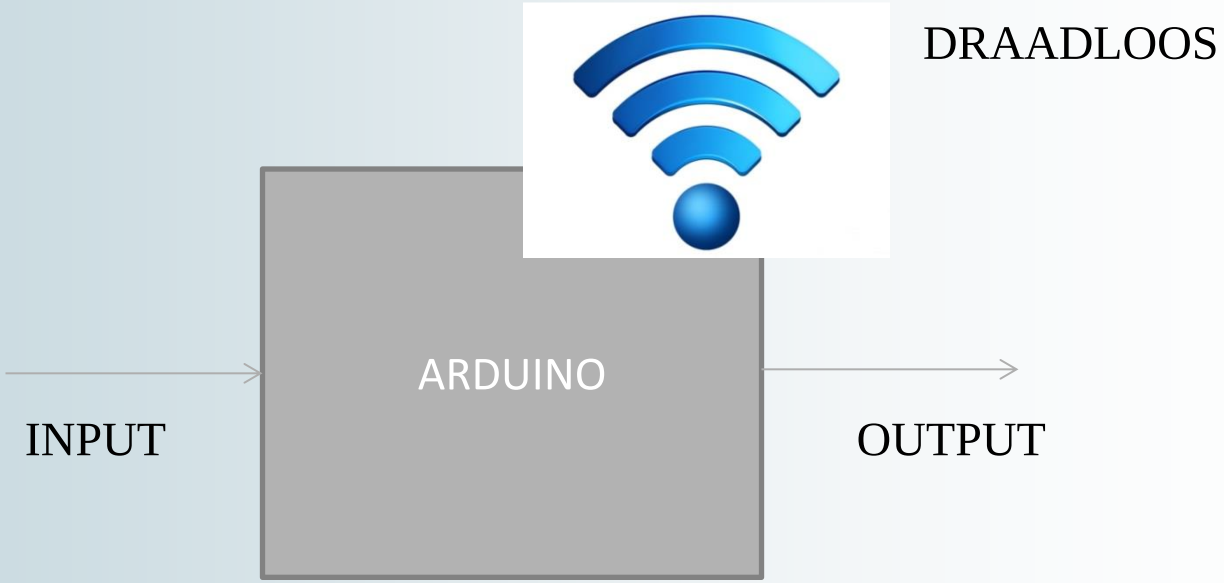


Live your passion through innovation

Finally, it is here. FootballNote.com – solution, which helps football (some call it soccer) coaches in daily life.



Onderwerpen in deze presentatie



DRAADLOOS

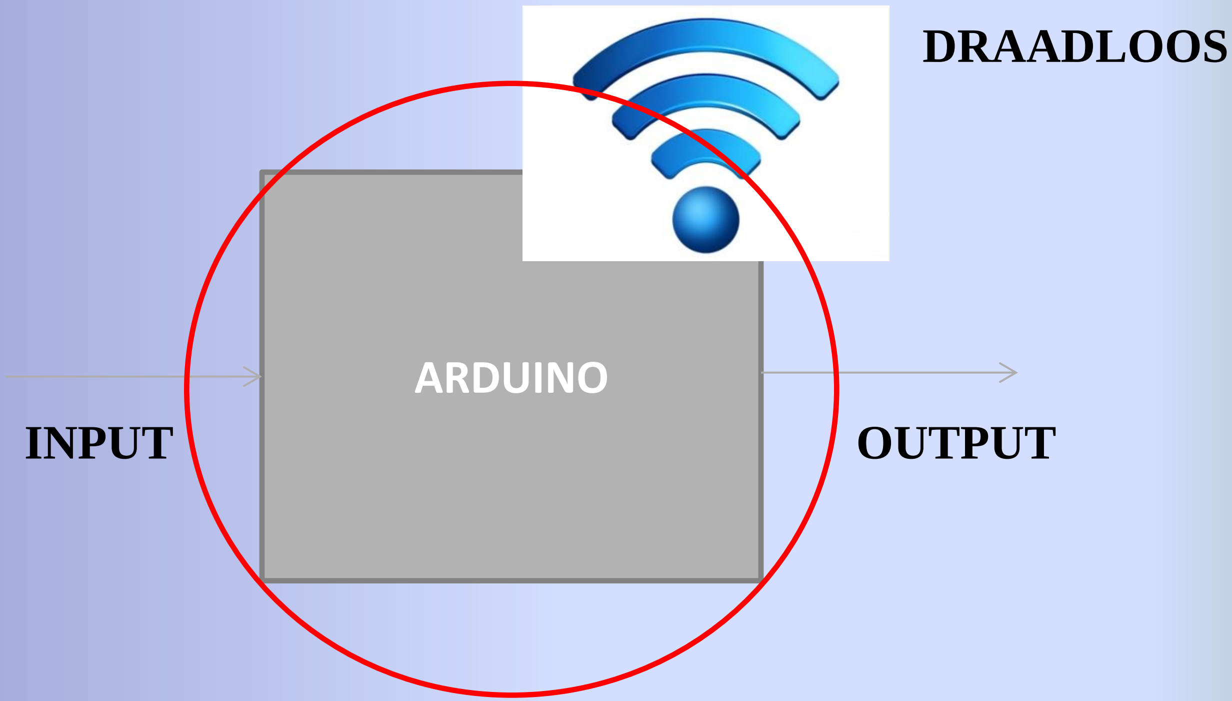
INPUT

ARDUINO

OUTPUT

Arduino

De Arduino

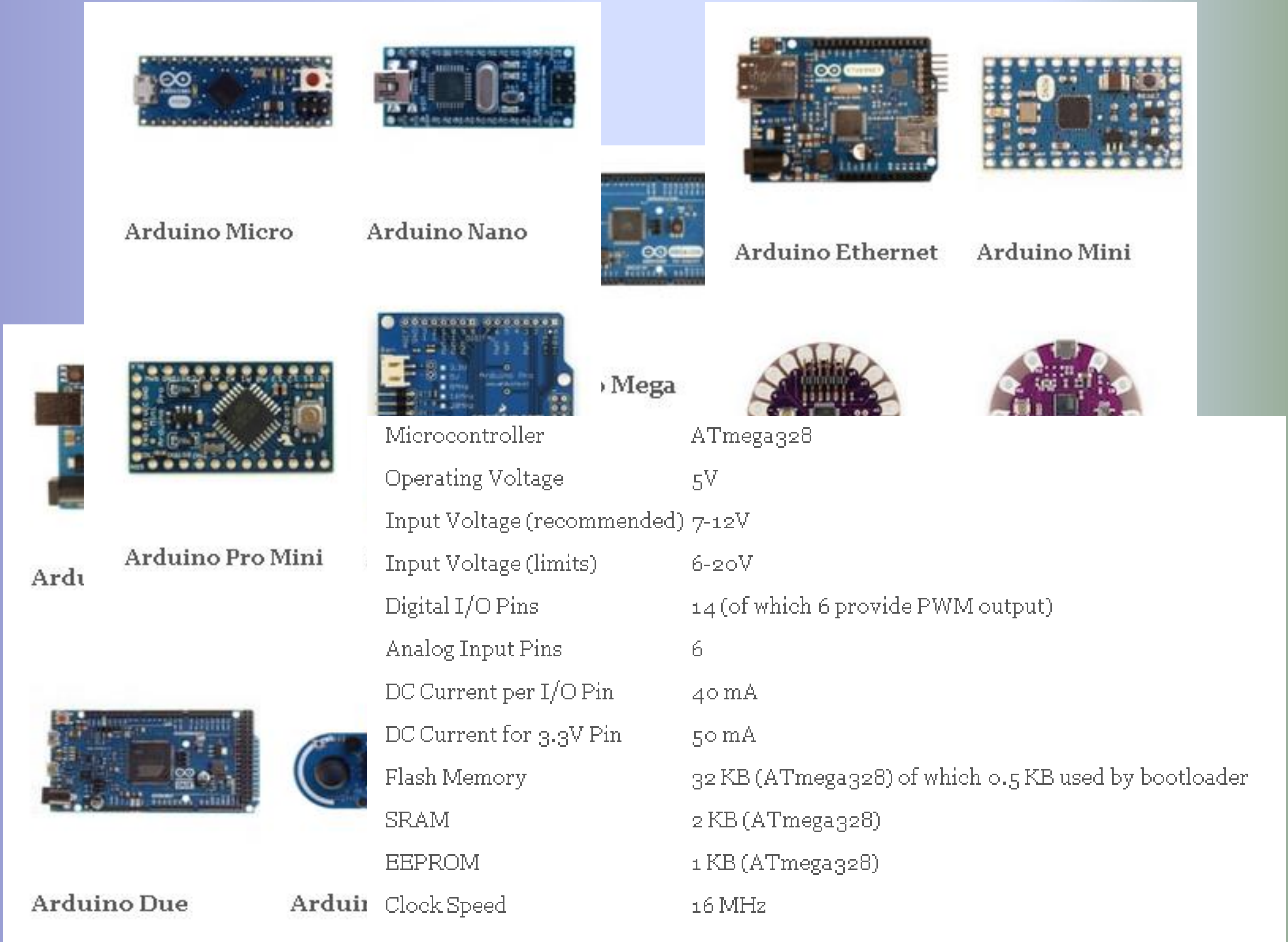


DRAADLOOS

ARDUINO

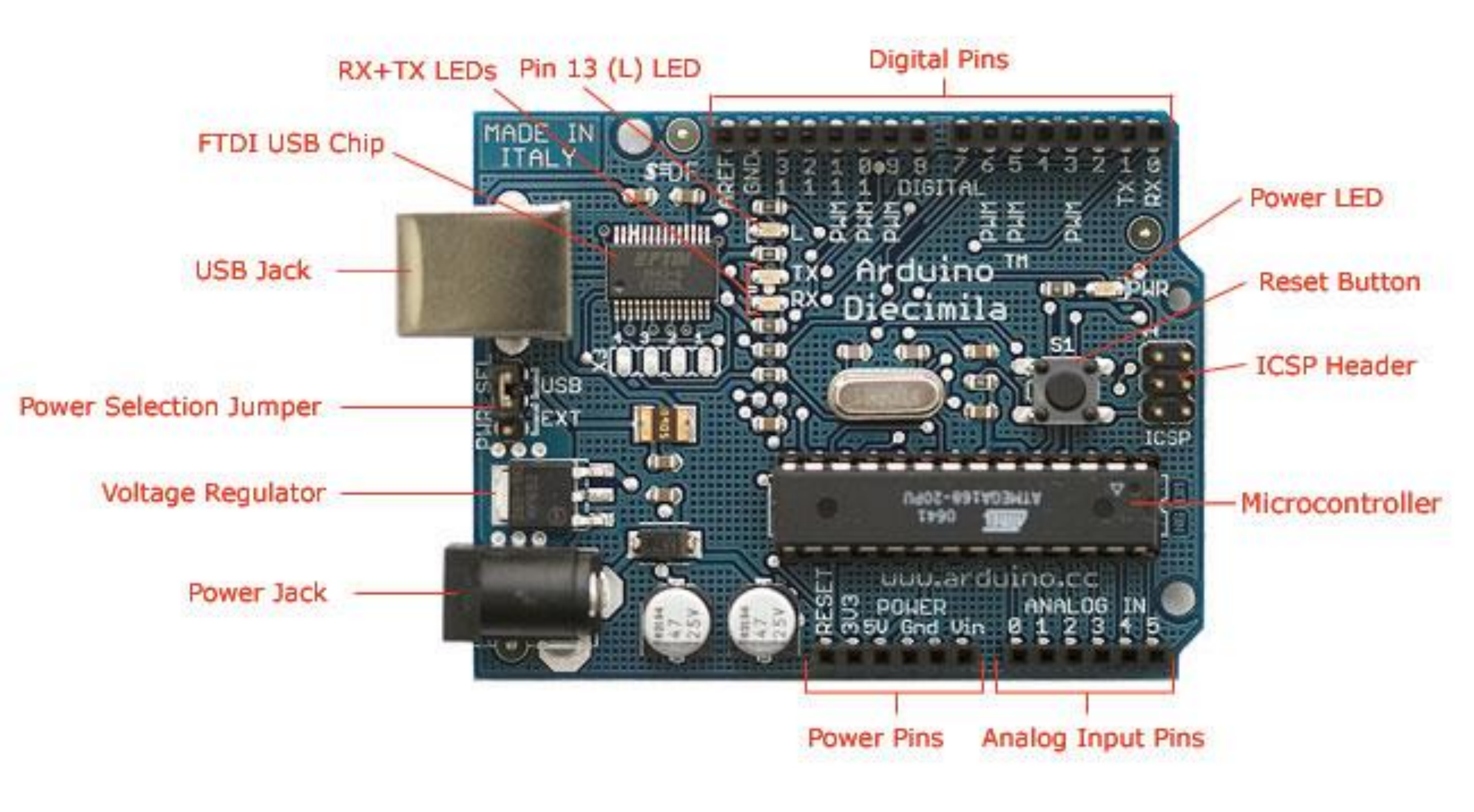
INPUT

OUTPUT



Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

Arduino



Photograph by SparkFun Electronics. Used under the Creative Commons Attribution Share-Alike 3.0 license.

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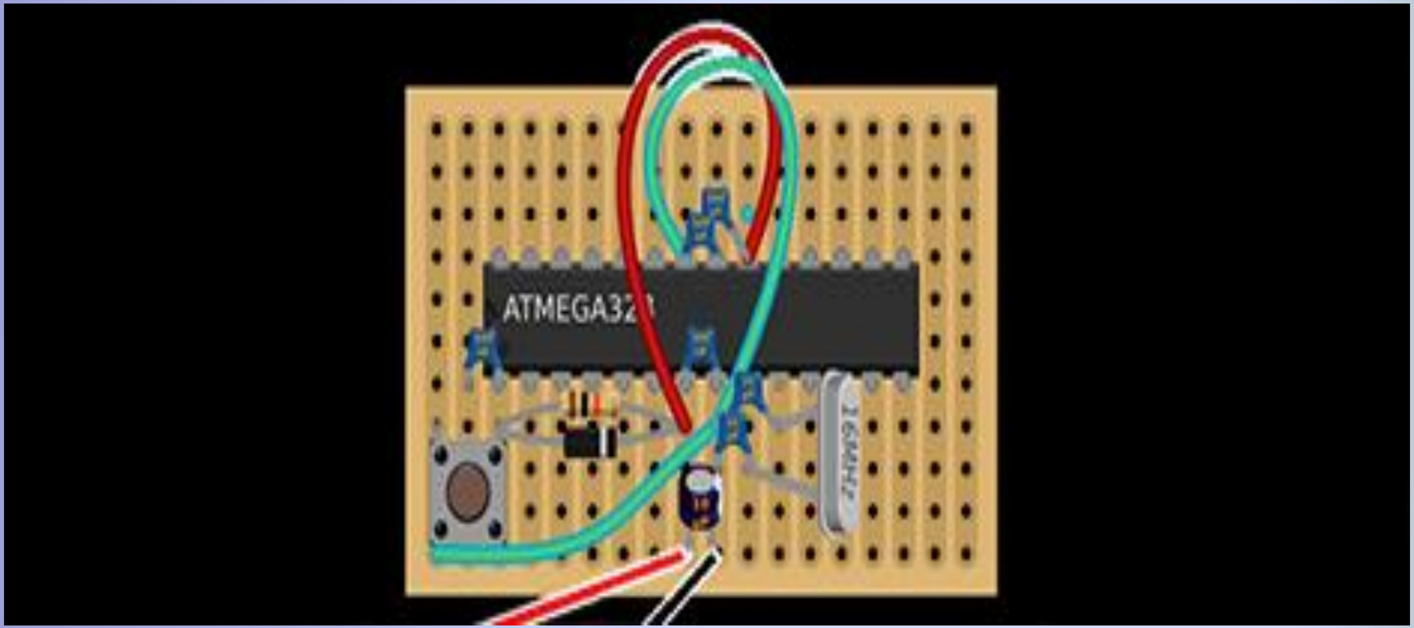

ATMEGA328
16MHz

IDE

- Arduino IDE

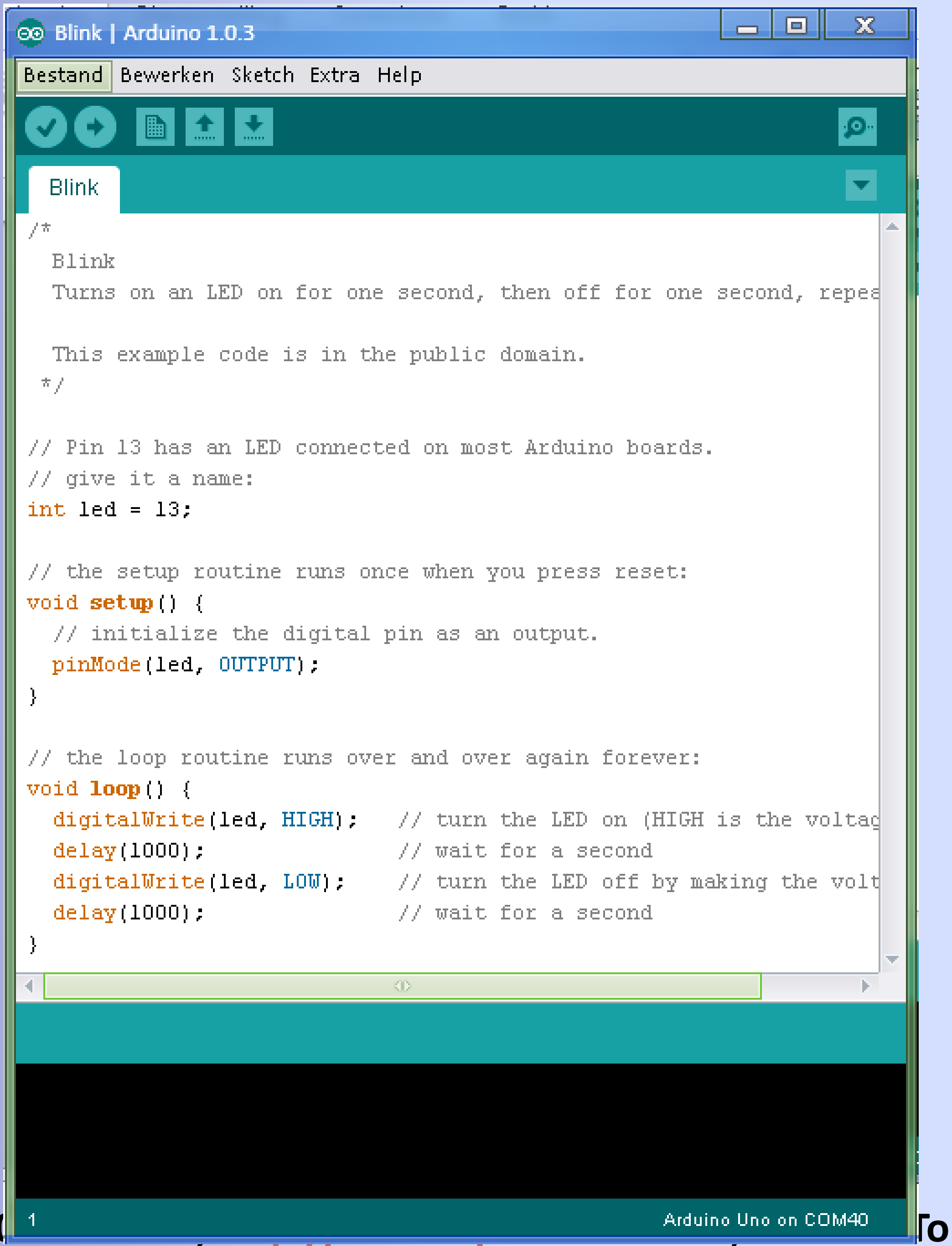
  C++

  ```
  void setup()
  {}
  void loop()
  {}
  ```

- Processing IDE

  Java

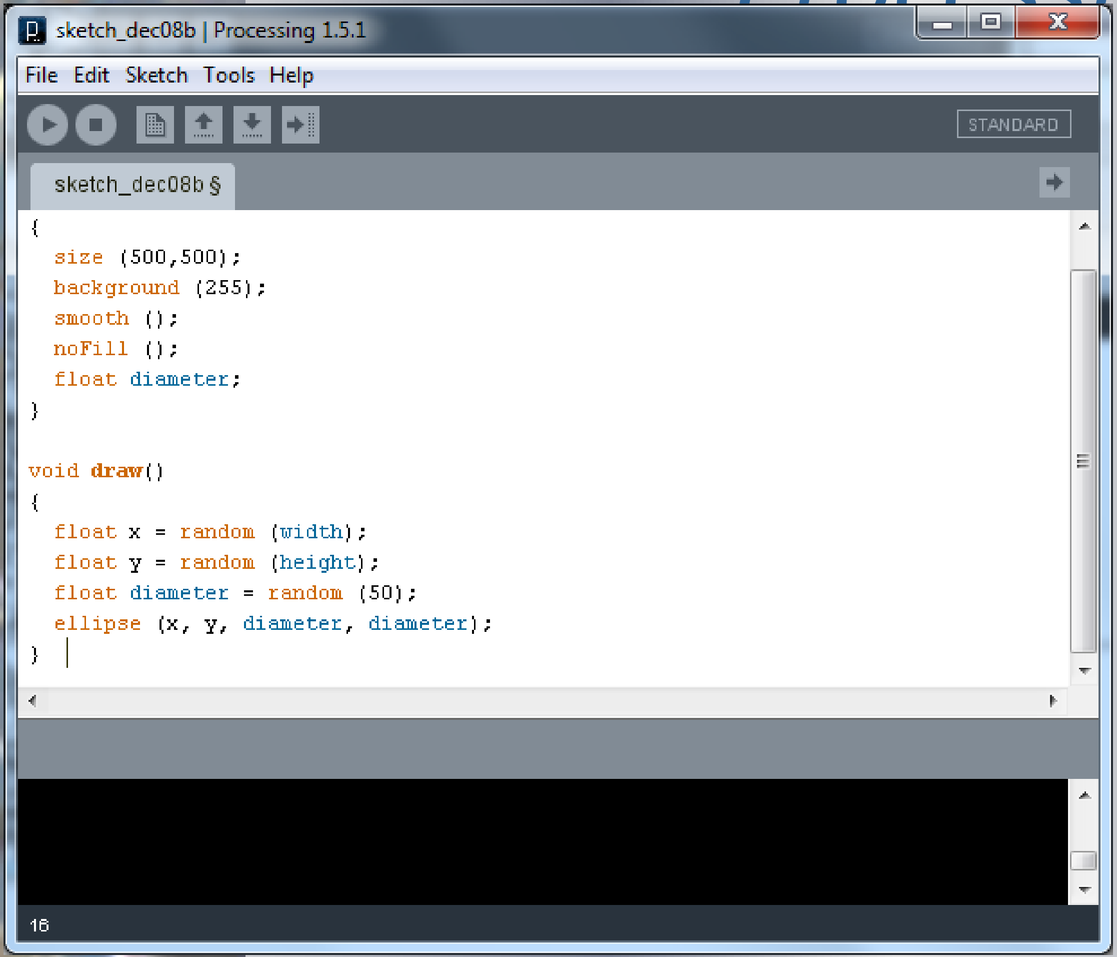
  ```
  void setup()
  {}
  void draw()
  {}
  ```



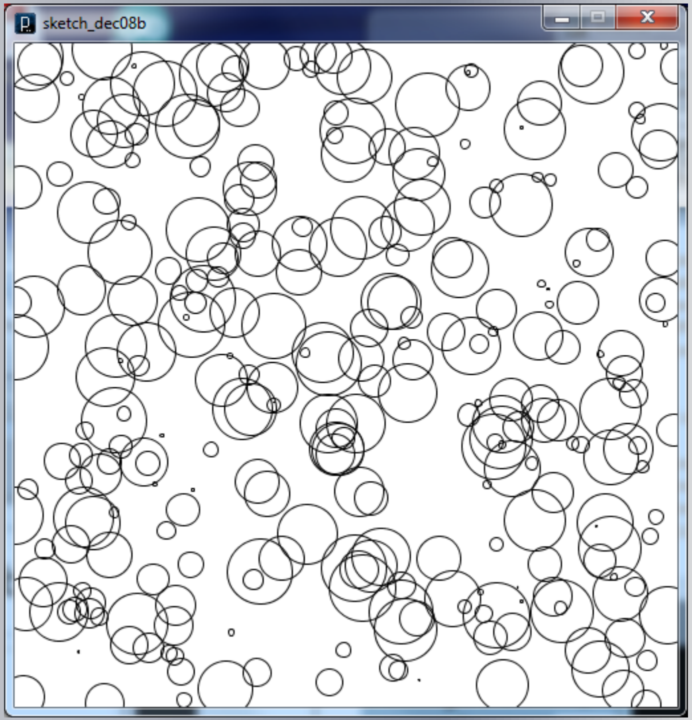
```
/*
  Blink
  Turns on an LED on for one second, then off for one second, repea

  This example code is in the public domain.
 */

// Pin 13 has an LED connected on most Arduino boards.
// give it a name:
int led = 13;

// the setup routine runs once when you press reset:
void setup() {
  // initialize the digital pin as an output.
  pinMode(led, OUTPUT);
}

// the loop routine runs over and over again forever:
void loop() {
  digitalWrite(led, HIGH);   // turn the LED on (HIGH is the voltag
  delay(1000);               // wait for a second
  digitalWrite(led, LOW);    // turn the LED off by making the volt
  delay(1000);               // wait for a second
}
```

Processing

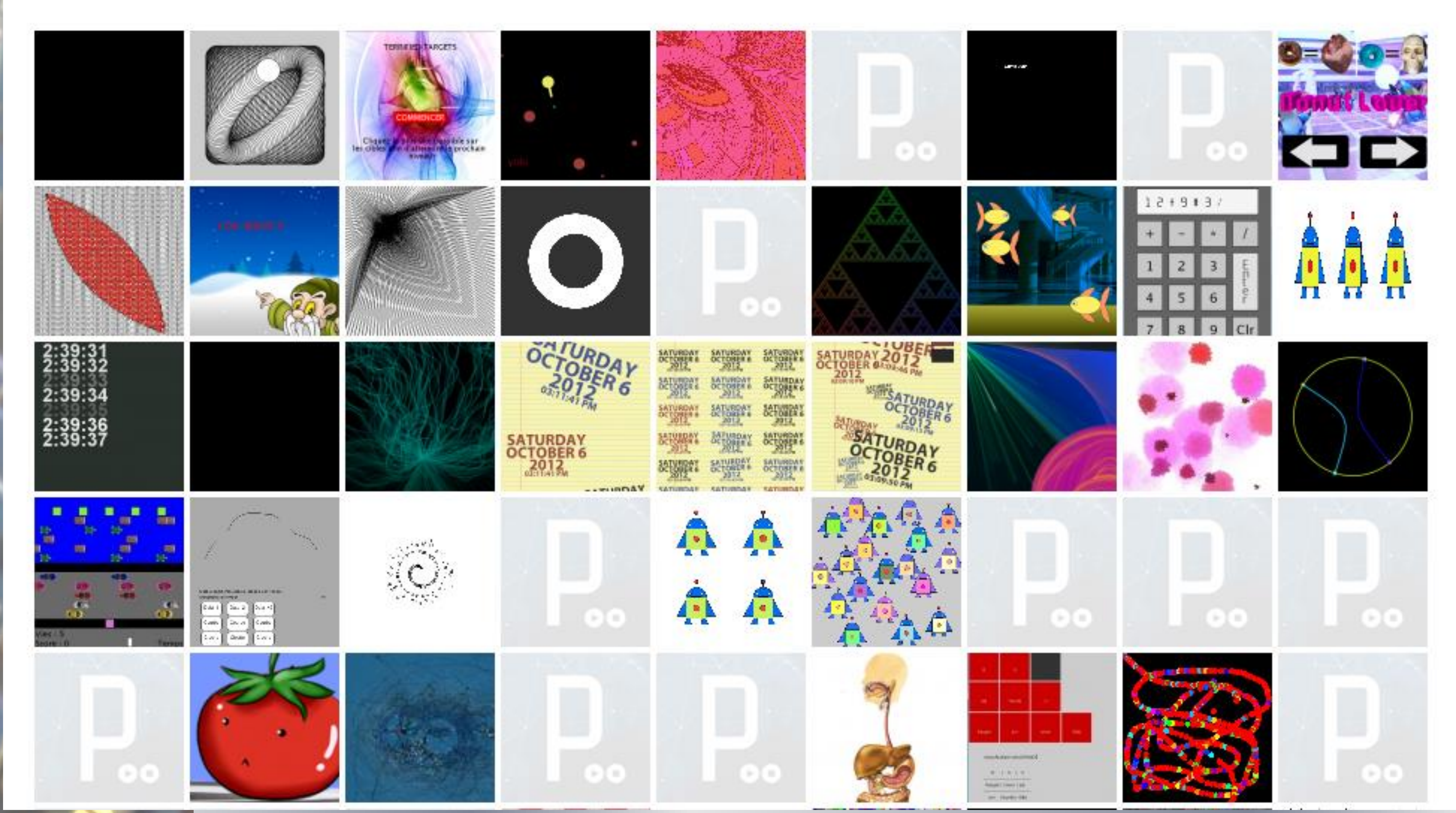
Processing IDE

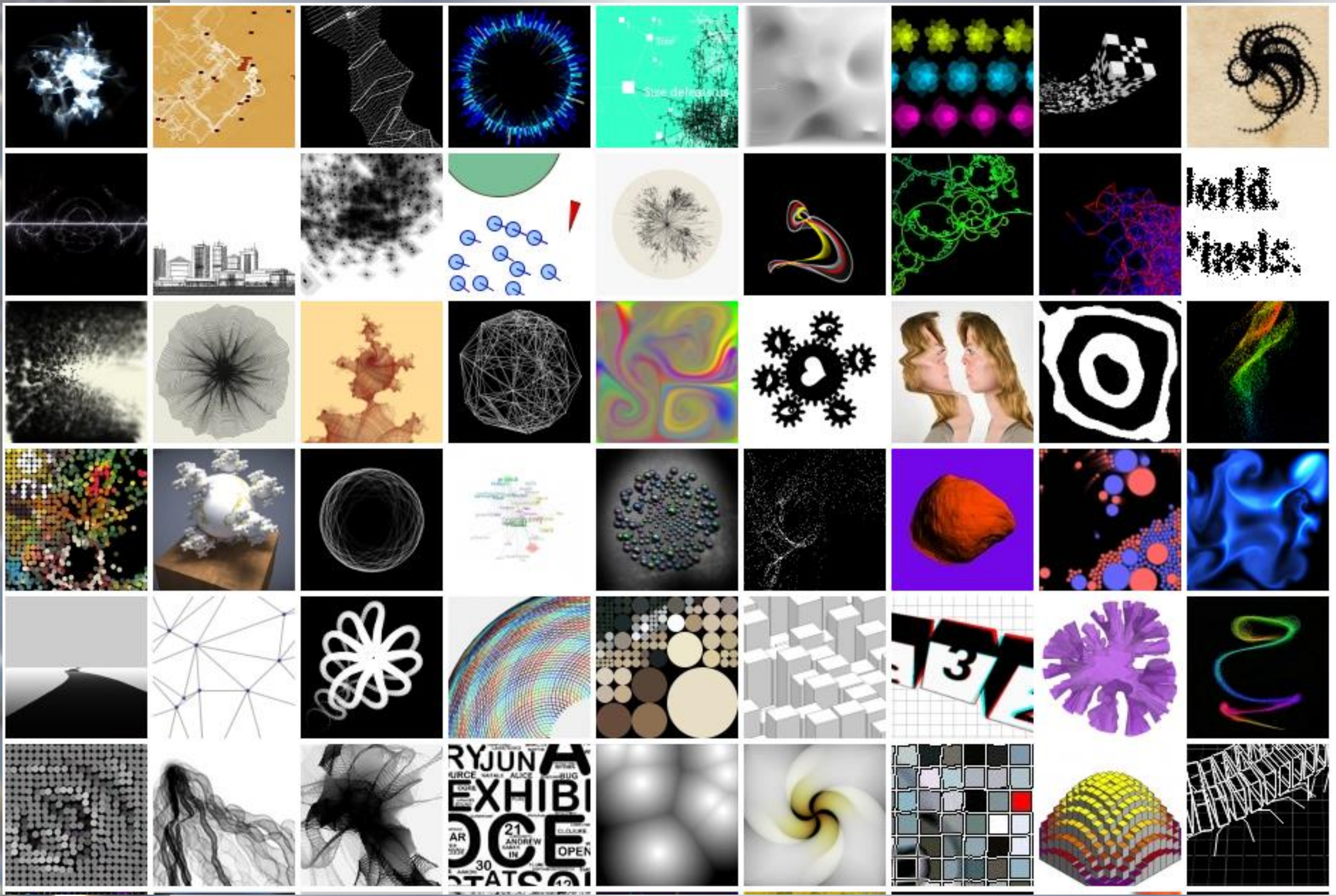


```
{
  size (500,500);
  background (255);
  smooth ();
  noFill ();
  float diameter;
}

void draw()
{
  float x = random (width);
  float y = random (height);
  float diameter = random (50);
  ellipse (x, y, diameter, diameter);
}
```



OpenProcessing.org

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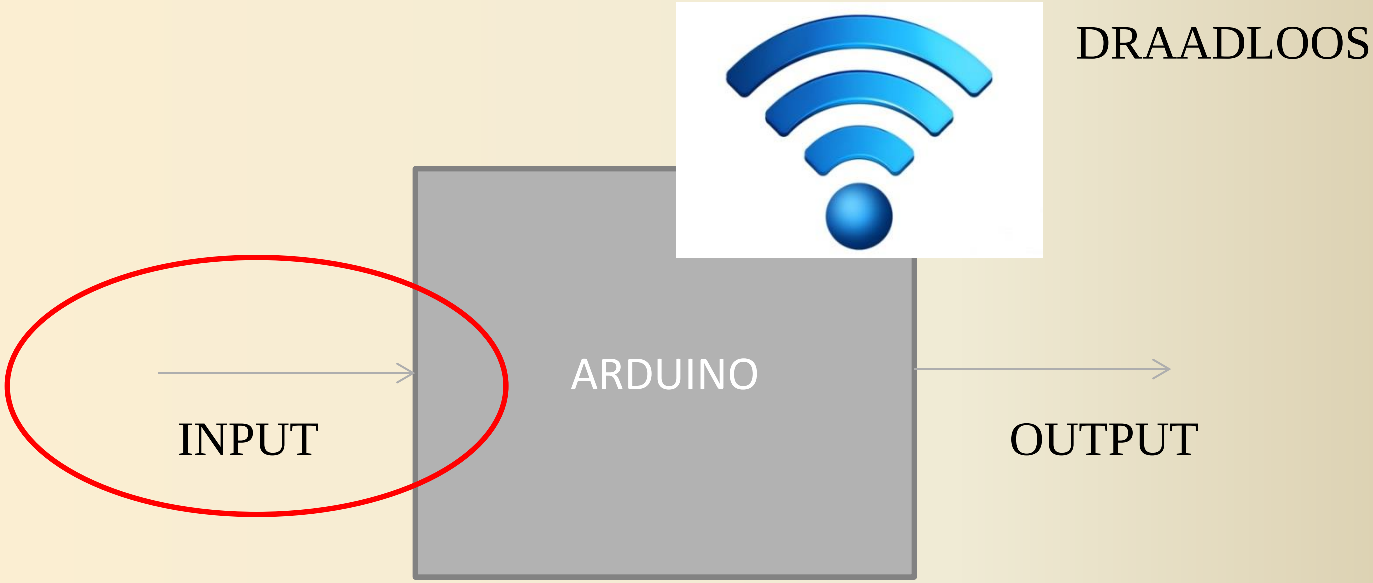
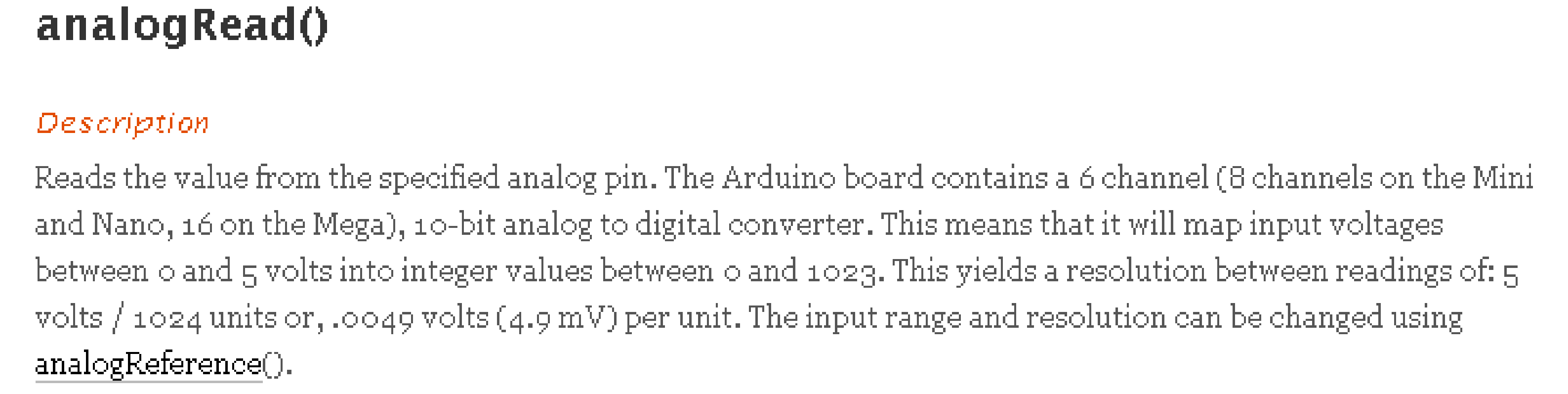
Arduino INPUT

Input



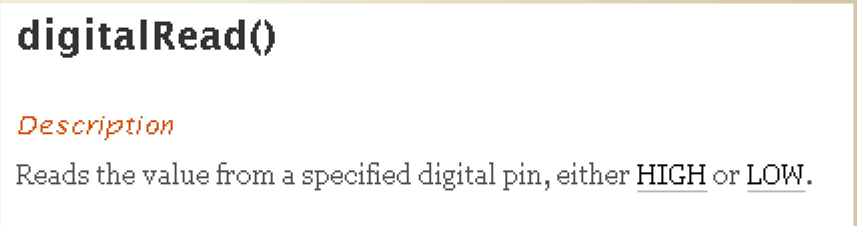
Analoog / Digitaal Input



analogRead()

Description

Reads the value from the specified analog pin. The Arduino board contains a 6 channel (8 channels on the Mini and Nano, 16 on the Mega), 10-bit analog to digital converter. This means that it will map input voltages between 0 and 5 volts into integer values between 0 and 1023. This yields a resolution between readings of: 5 volts / 1024 units or, .0049 volts (4.9 mV) per unit. The input range and resolution can be changed using analogReference().

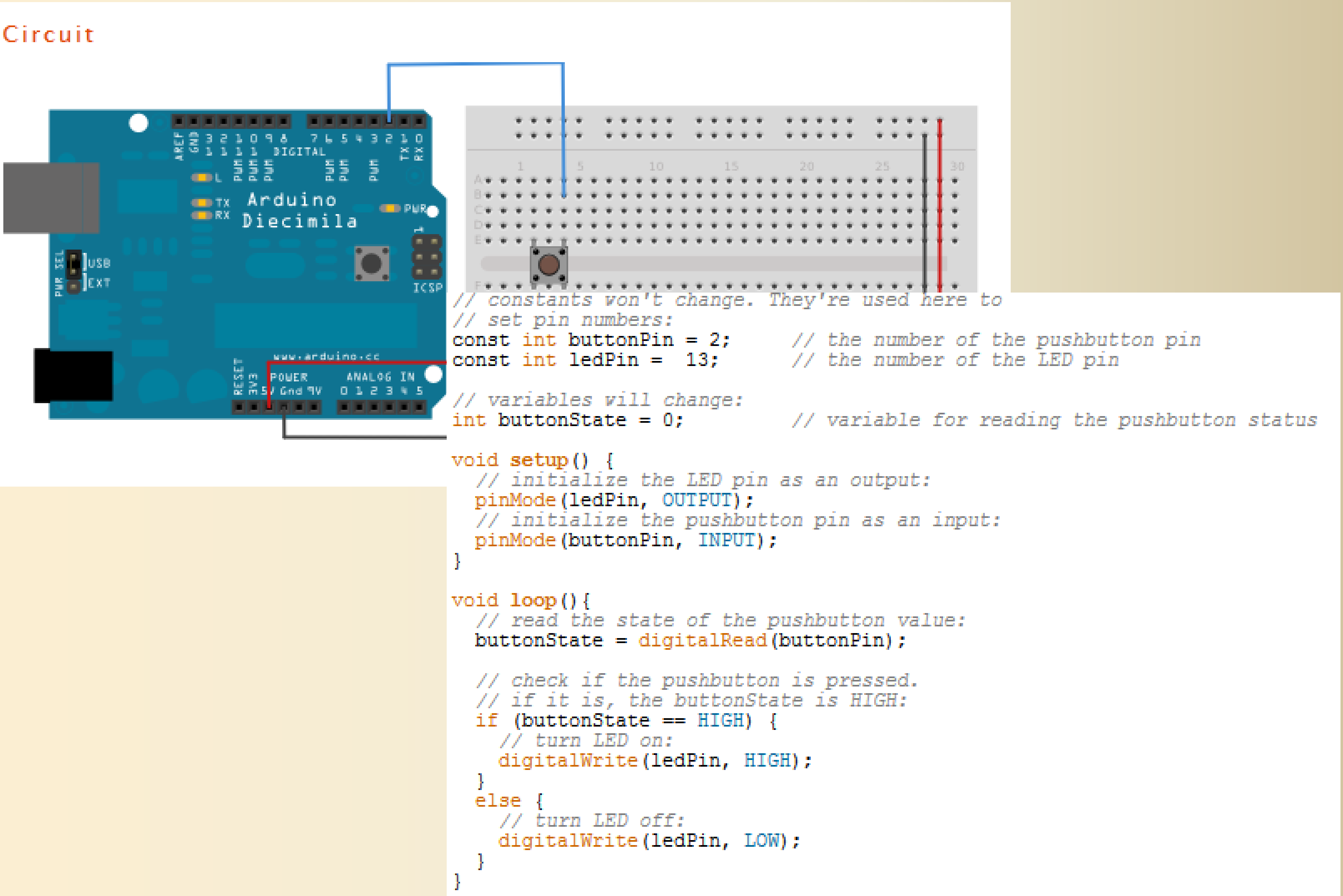


digitalRead()

Description

Reads the value from a specified digital pin, either HIGH or LOW.

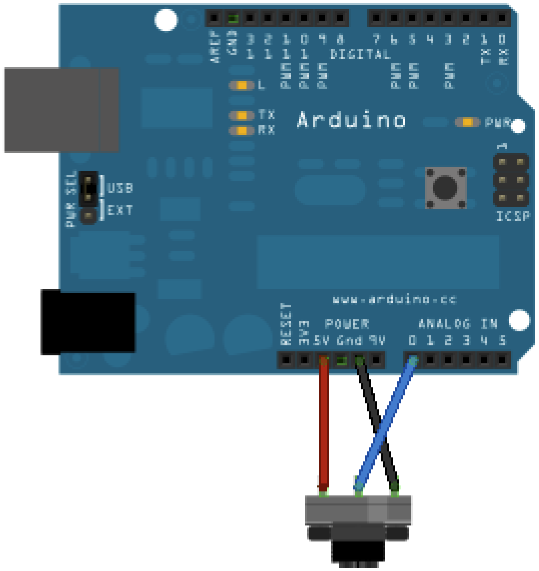
DigitalRead

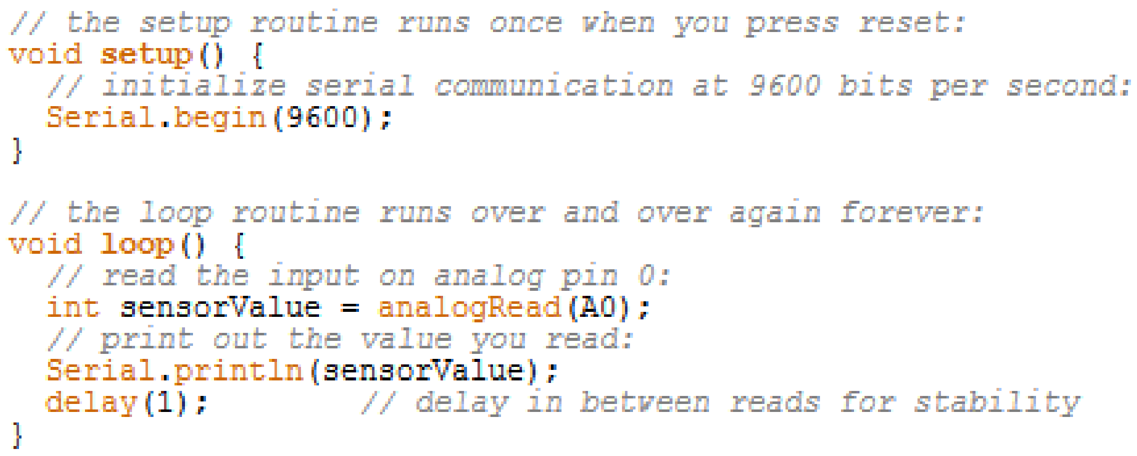


Circuit

```
// 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);
  }
}
```

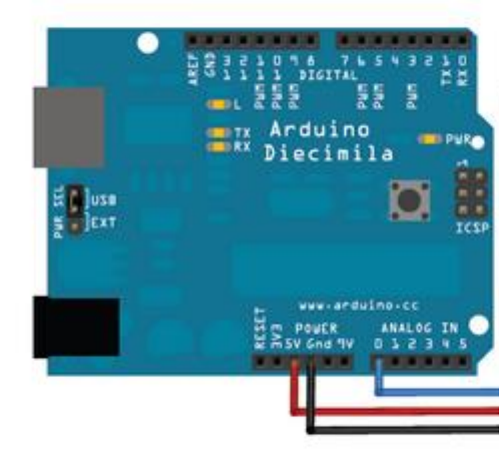
AnalogRead

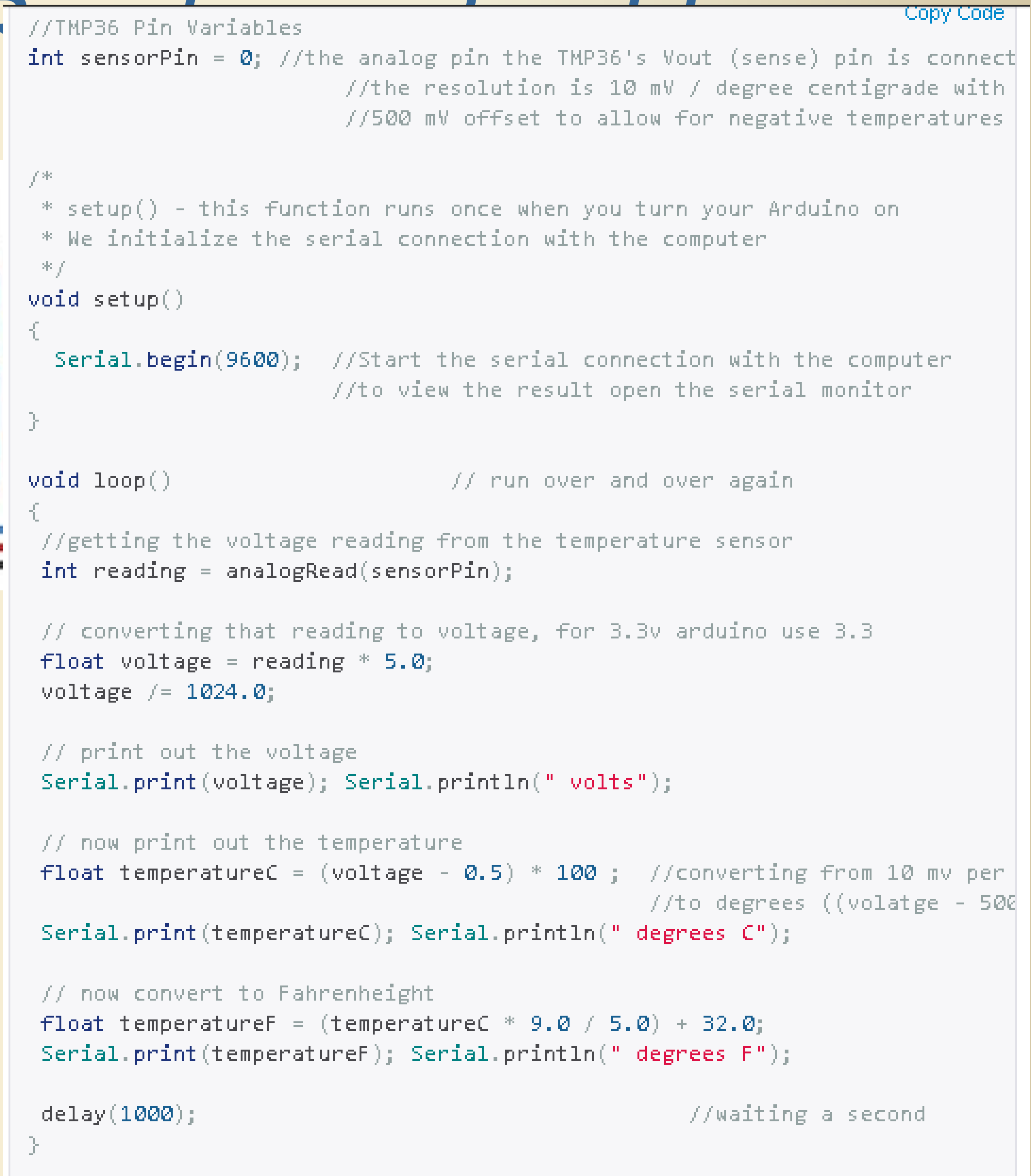




```
// the setup routine runs once when you press reset:
void setup() {
  // initialize serial communication at 9600 bits per second:
  Serial.begin(9600);
}

// the loop routine runs over and over again forever:
void loop() {
  // read the input on analog pin 0:
  int sensorValue = analogRead(A0);
  // print out the value you read:
  Serial.println(sensorValue);
  delay(1);        // delay in between reads for stability
}
```

AnalogR

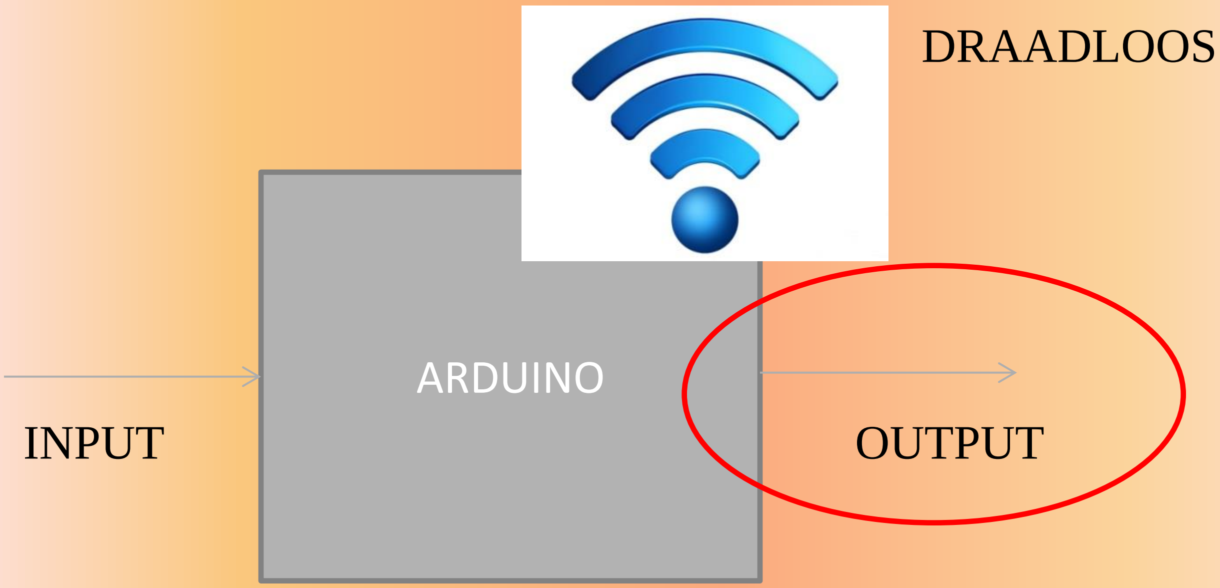




```
//TMP36 Pin Variables
int sensorPin = 0; //the analog pin the TMP36's Vout (sense) pin is connect
                        //the resolution is 10 mV / degree centigrade with
                        //500 mV offset to allow for negative temperatures

/*
 * setup() - this function runs once when you turn your Arduino on
 * We initialize the serial connection with the computer
 */
void setup()
{
  Serial.begin(9600);  //Start the serial connection with the computer
                       //to view the result open the serial monitor
}

void loop()                     // run over and over again
{
 //getting the voltage reading from the temperature sensor
 int reading = analogRead(sensorPin);

 // converting that reading to voltage, for 3.3v arduino use 3.3
 float voltage = reading * 5.0;
 voltage /= 1024.0;

 // print out the voltage
 Serial.print(voltage); Serial.println(" volts");

 // now print out the temperature
 float temperatureC = (voltage - 0.5) * 100 ;  //converting from 10 mv per
                                               //to degrees ((volatge - 500
 Serial.print(temperatureC); Serial.println(" degrees C");

 // now convert to Fahrenheight
 float temperatureF = (temperatureC * 9.0 / 5.0) + 32.0;
 Serial.print(temperatureF); Serial.println(" degrees F");

 delay(1000);                                     //waiting a second
}
```

Arduino OUTPUT

Output



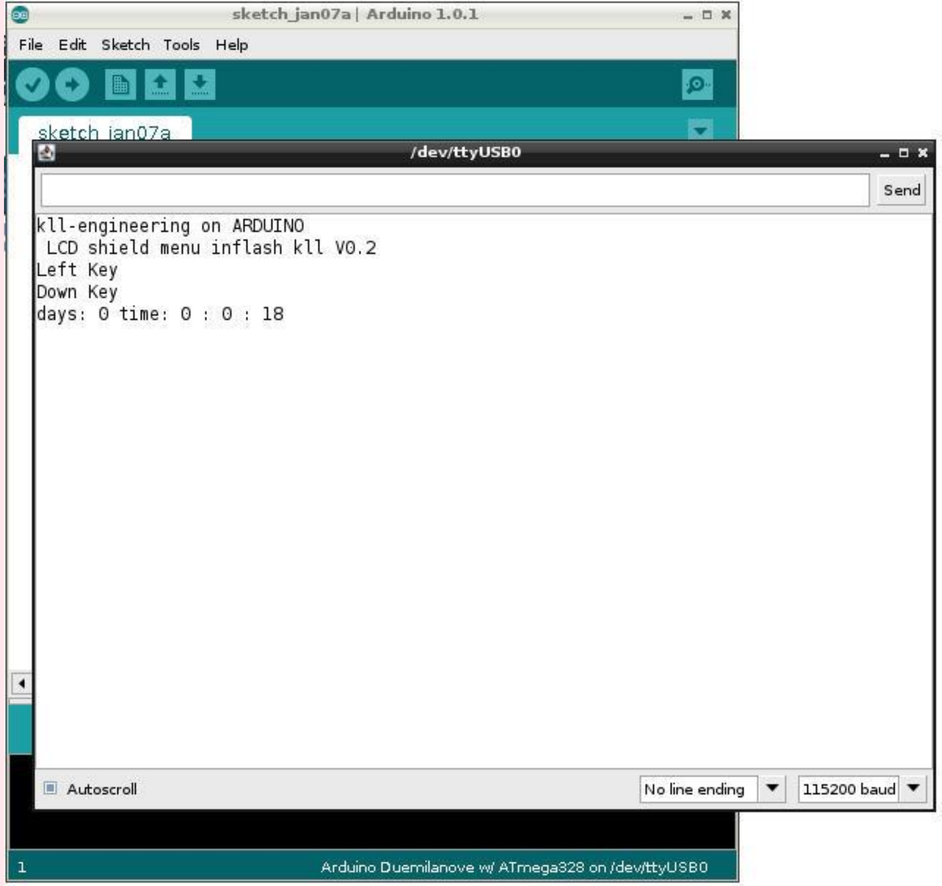
DRAADLOOS

ARDUINO

INPUT

OUTPUT

Terminal



```
kll-engineering on ARDUINO
 LCD shield menu inflash kll V0.2
Left Key
Down Key
days: 0 time: 0 : 0 : 18
```

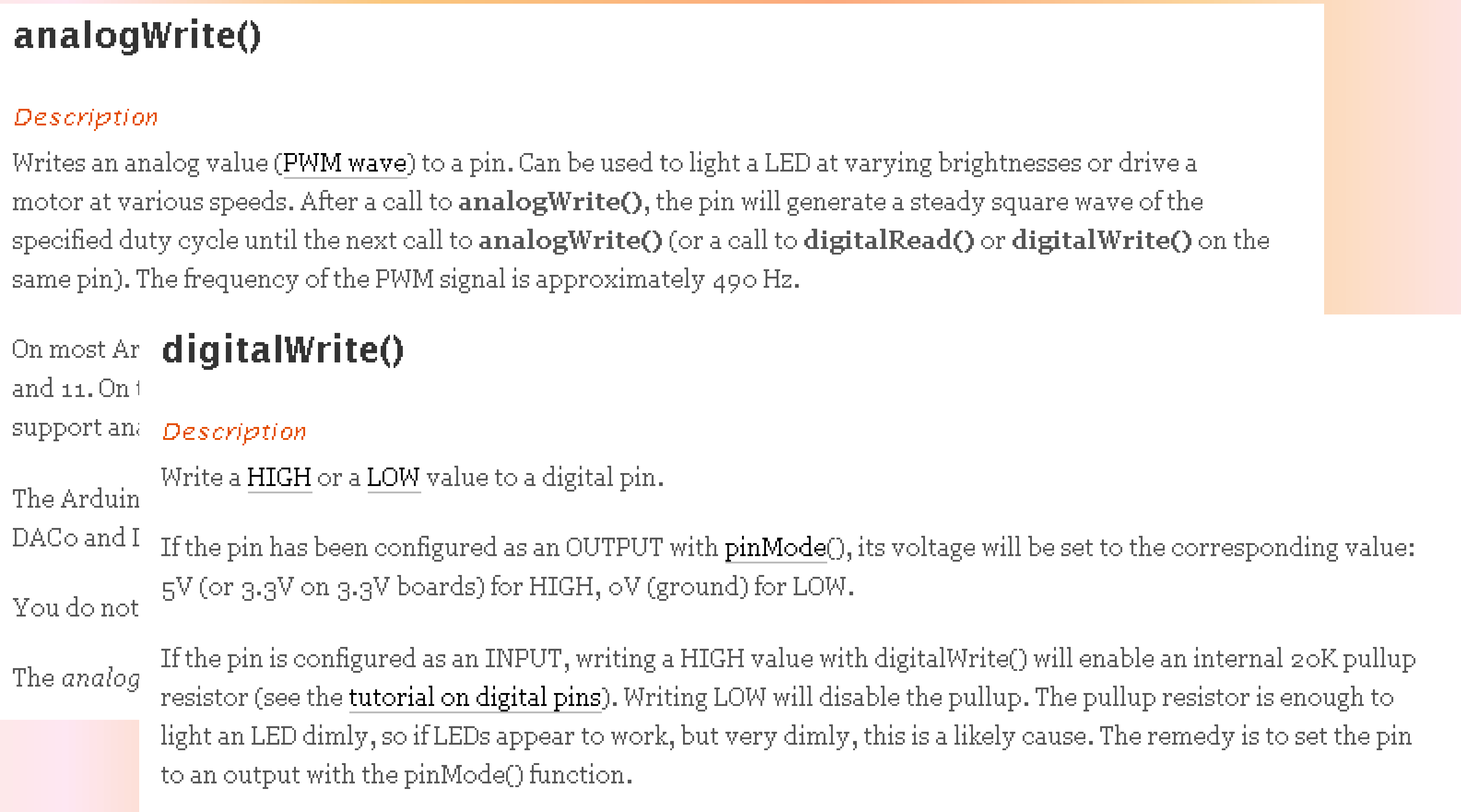
□ Autoscroll

No line ending

115200 baud

1 Arduino Duemilanove w/ ATmega328 on /dev/ttyUSB0

DigitalWrite, AnalogWrite



analogWrite()

Description

Writes an analog value (PWM wave) to a pin. Can be used to light a LED at varying brightnesses or drive a motor at various speeds. After a call to **analogWrite()**, the pin will generate a steady square wave of the specified duty cycle until the next call to **analogWrite()** (or a call to **digitalRead()** or **digitalWrite()** on the same pin). The frequency of the PWM signal is approximately 490 Hz.

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The *analog*

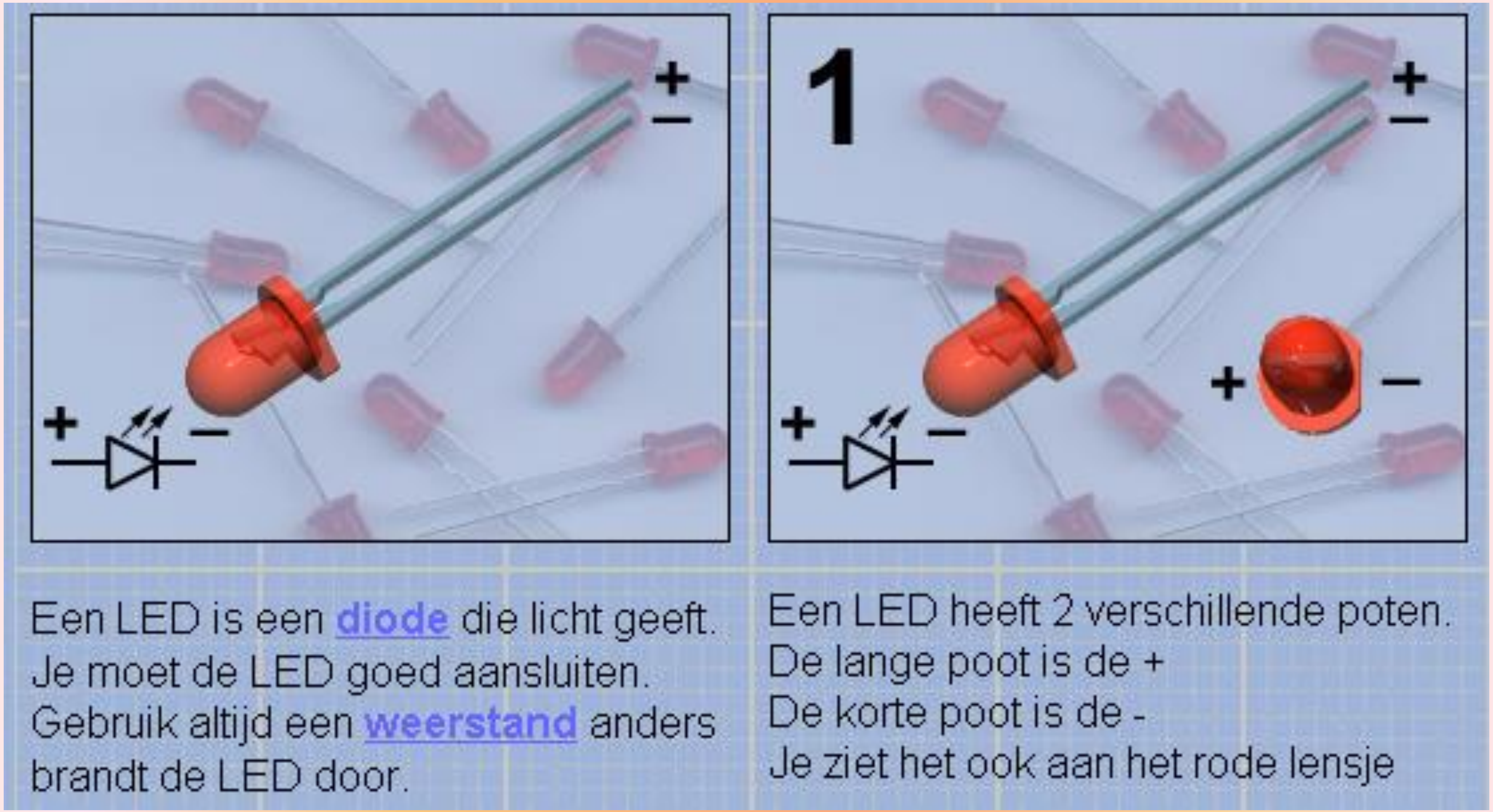
digitalWrite()

Description

Write a HIGH or a LOW value to a digital pin.

If the pin has been configured as an OUTPUT with pinMode(), its voltage will be set to the corresponding value: 5V (or 3.3V on 3.3V boards) for HIGH, 0V (ground) for LOW.

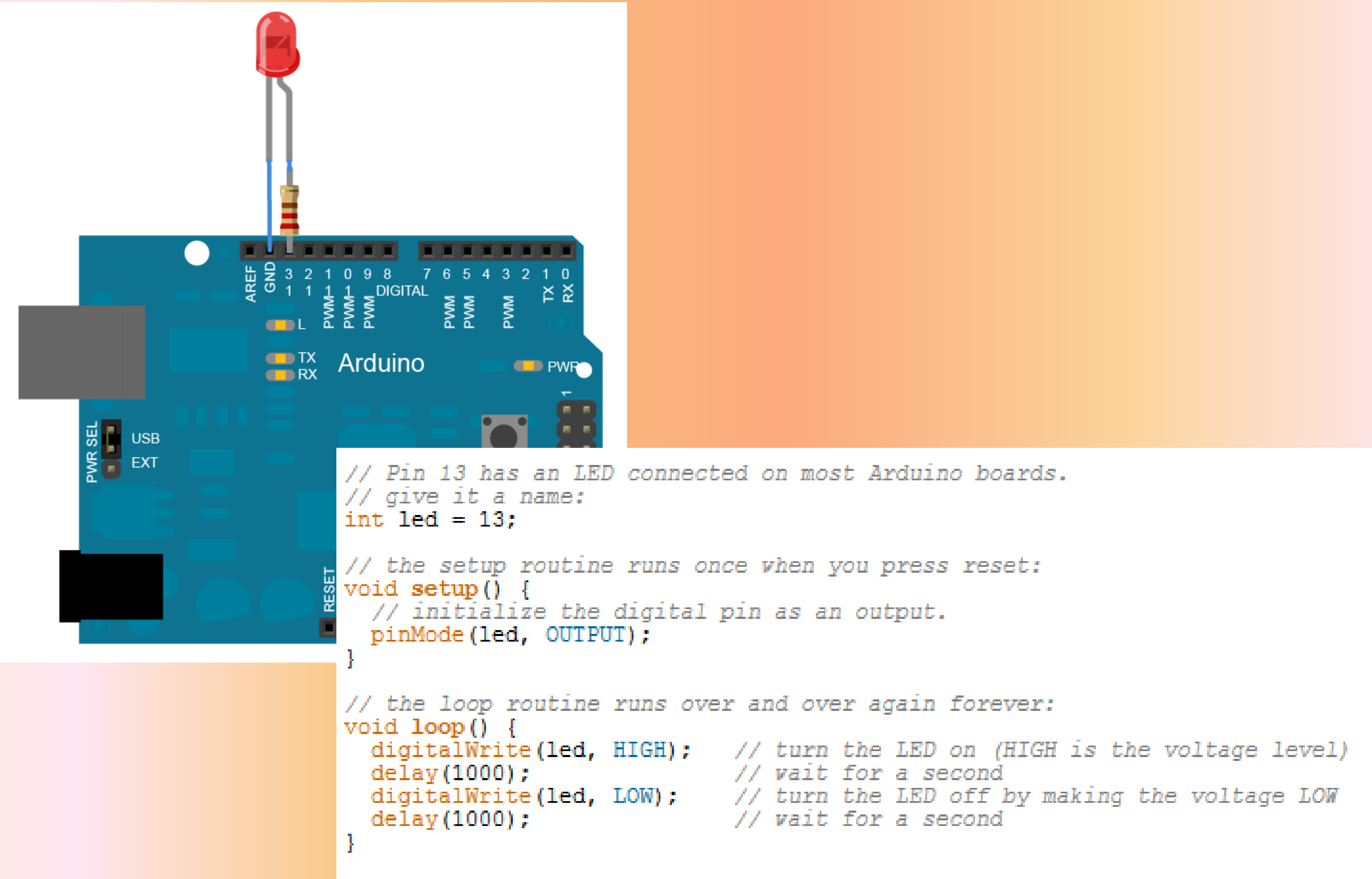
If the pin is configured as an INPUT, writing a HIGH value with digitalWrite() will enable an internal 20K pullup resistor (see the tutorial on digital pins). Writing LOW will disable the pullup. The pullup resistor is enough to light an LED dimly, so if LEDs appear to work, but very dimly, this is a likely cause. The remedy is to set the pin to an output with the pinMode() function.



Een LED is een diode die licht geeft.
Je moet de LED goed aansluiten.
Gebruik altijd een weerstand anders brandt de LED door.

Een LED heeft 2 verschillende poten.
De lange poot is de +
De korte poot is de -
Je ziet het ook aan het rode lensje

DigitalWrite



```
// Pin 13 has an LED connected on most Arduino boards.
// give it a name:
int led = 13;

// the setup routine runs once when you press reset:
void setup() {
  // initialize the digital pin as an output.
  pinMode(led, OUTPUT);
}

// the loop routine runs over and over again forever:
void loop() {
  digitalWrite(led, HIGH);   // turn the LED on (HIGH is the voltage level)
  delay(1000);               // wait for a second
  digitalWrite(led, LOW);    // turn the LED off by making the voltage LOW
  delay(1000);               // wait for a second
}
```

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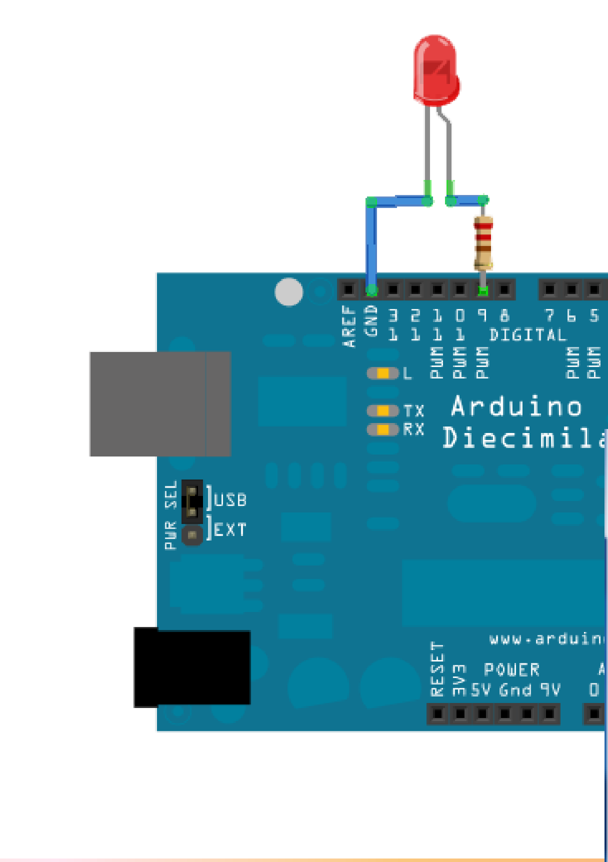
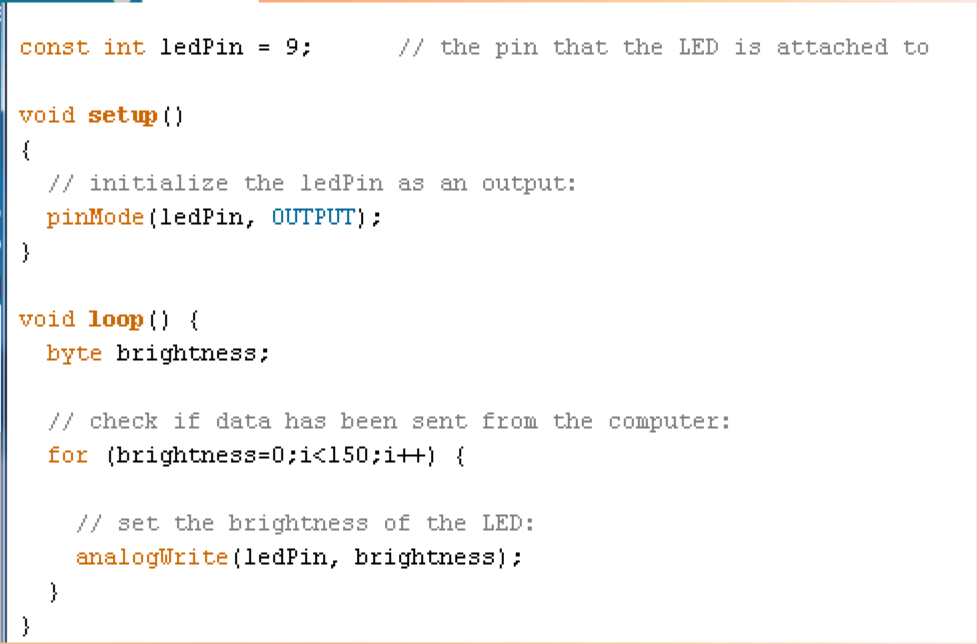
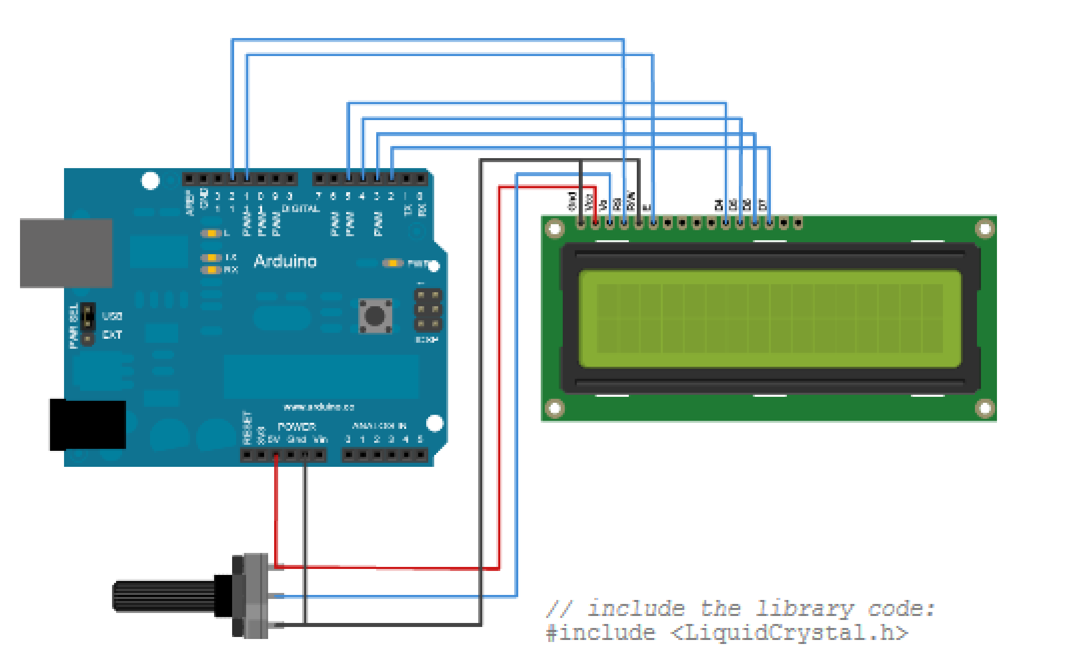
AnalogWrite

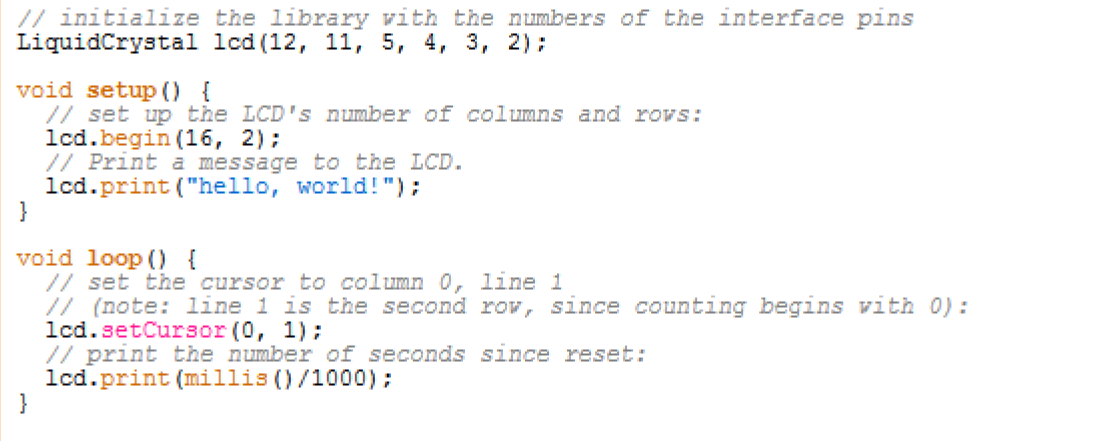




```
const int ledPin = 9;       // the pin that the LED is attached to

void setup()
{
  // initialize the ledPin as an output:
  pinMode(ledPin, OUTPUT);
}

void loop() {
  byte brightness;

  // check if data has been sent from the computer:
  for (brightness=0;i<150;i++) {

    // set the brightness of the LED:
    analogWrite(ledPin, brightness);
  }
}
```

SCHERM

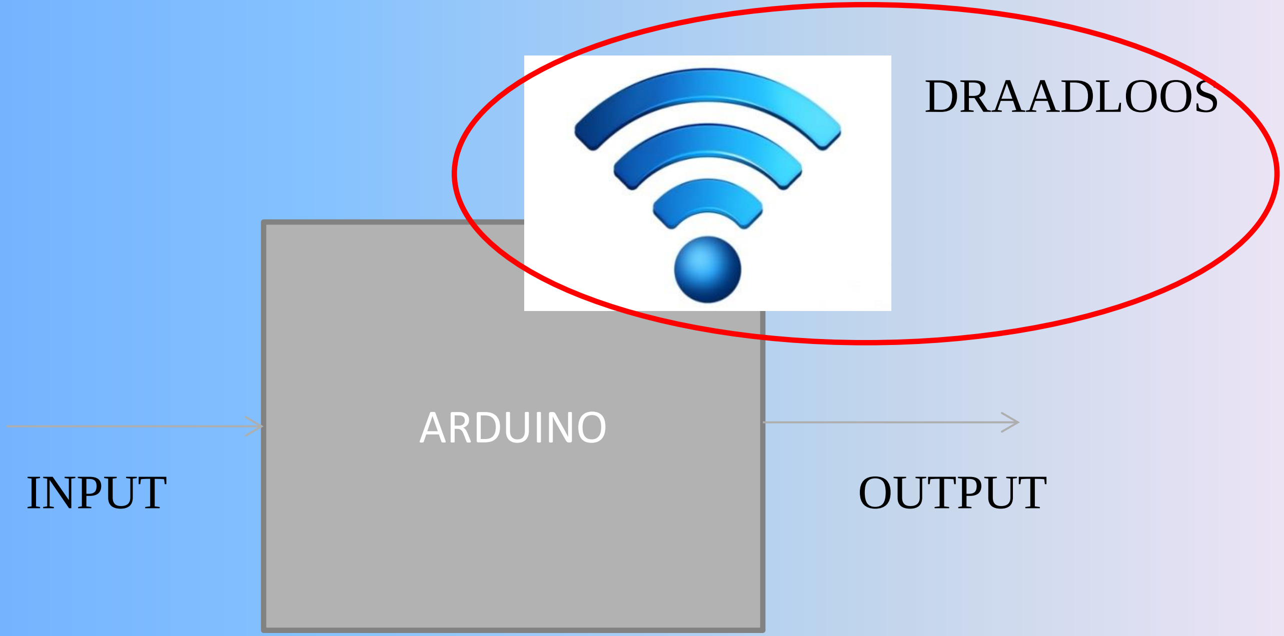




```
// include the library code:
#include <LiquidCrystal.h>

// initialize the library with the numbers of the interface pins
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

void setup() {
  // set up the LCD's number of columns and rows:
  lcd.begin(16, 2);
  // Print a message to the LCD.
  lcd.print("hello, world!");
}

void loop() {
  // set the cursor to column 0, line 1
  // (note: line 1 is the second row, since counting begins with 0):
  lcd.setCursor(0, 1);
  // print the number of seconds since reset:
  lcd.print(millis()/1000);
}
```

Arduino DRAADLOOS

Draadloos



DRAADLOOS

ARDUINO

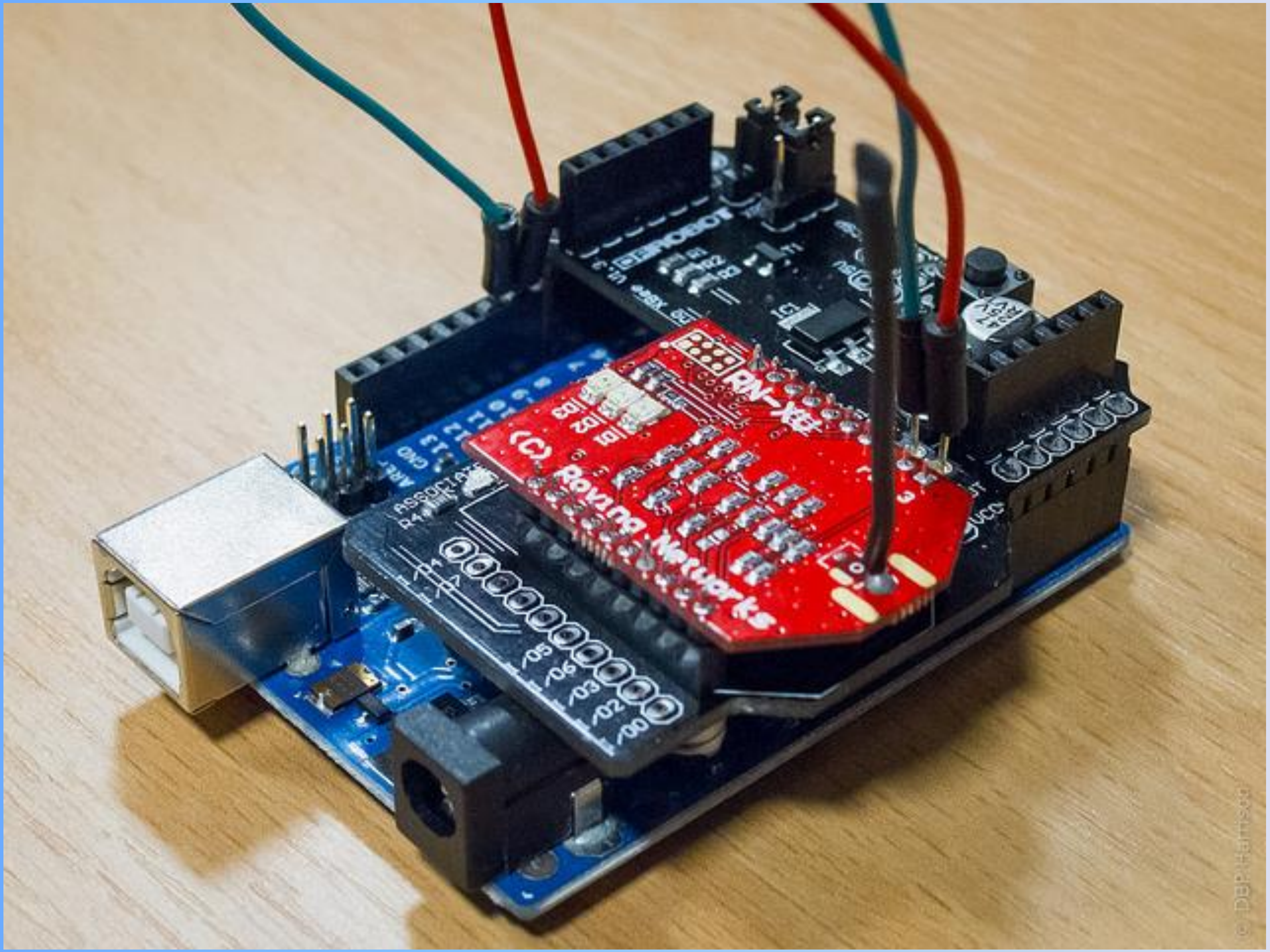
INPUT

OUTPUT

Draadloos

- Wifi
- Ethernet Shield
- Xbee
- Bluetooth
- GSM

Wifi

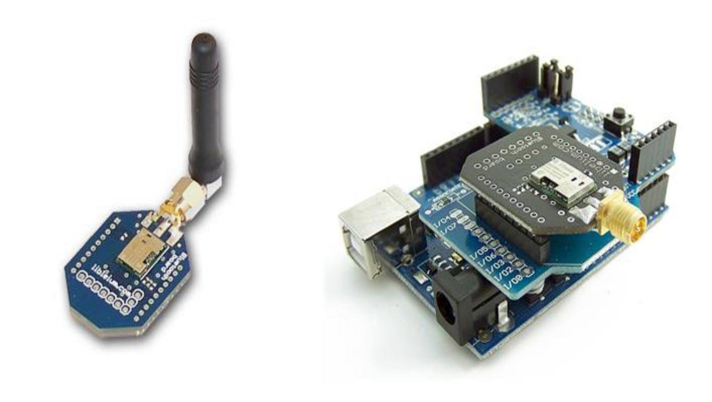


Shields

- Aangesloten op een Shield
- Wordt gebruikt voor:

  Bluetooth, Xbee, Wifi

  Let op bereik en toepassing !!



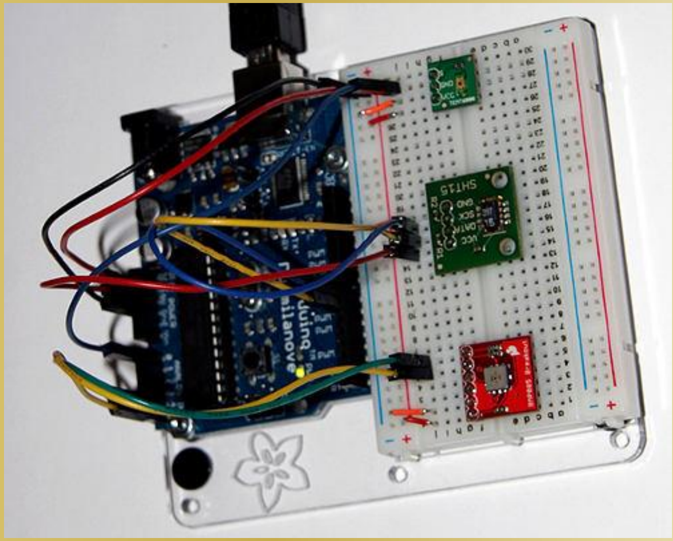
Libraries

- Voor elke functionaliteit is een aparte library.
- Problemen:
  - afhankelijk van de versie van de Arduino IDE
  - niet altijd compatible met andere libraries
  - geschreven door iedereen
  - let op: de libraries zijn niet altijd gecontroleerd

Workshop

Onderwerp 1

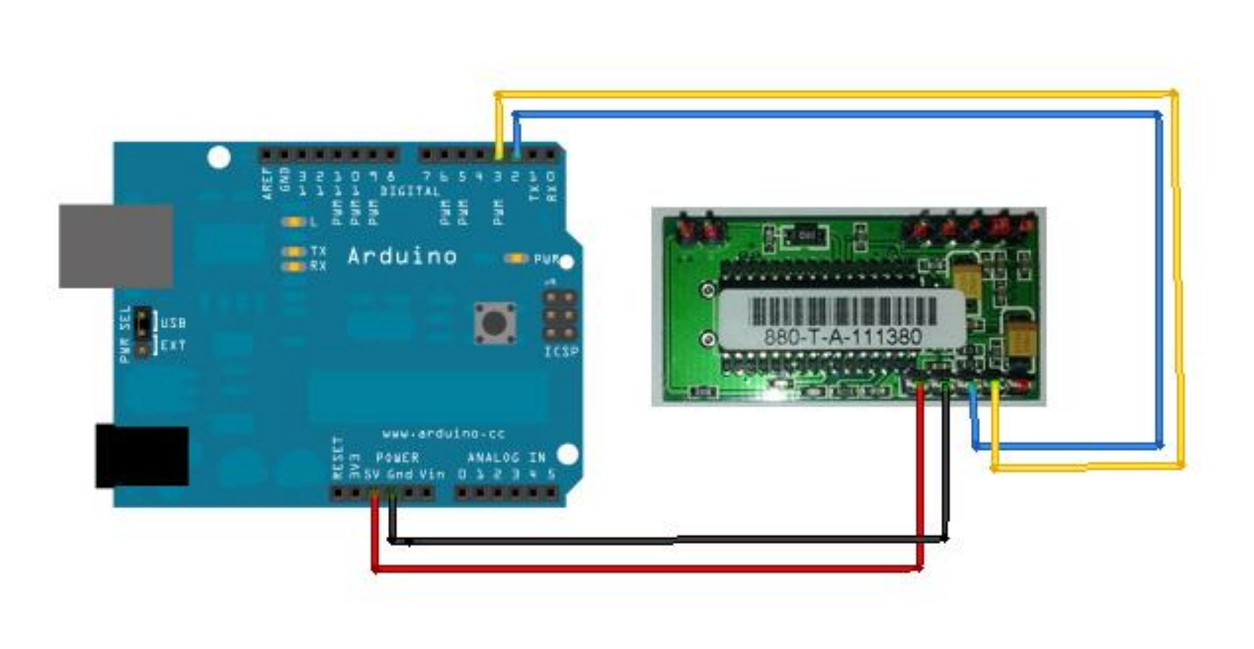
- Eigen ‘weerstation’



- Wifi

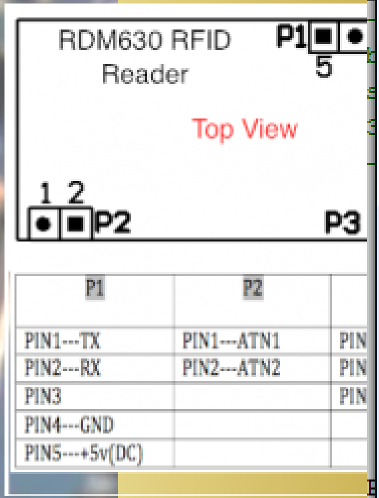
- Op het digibord wordt het zomerse weer bekeken:

Onderwerp 2: OVChipkaart 13.56Mhz

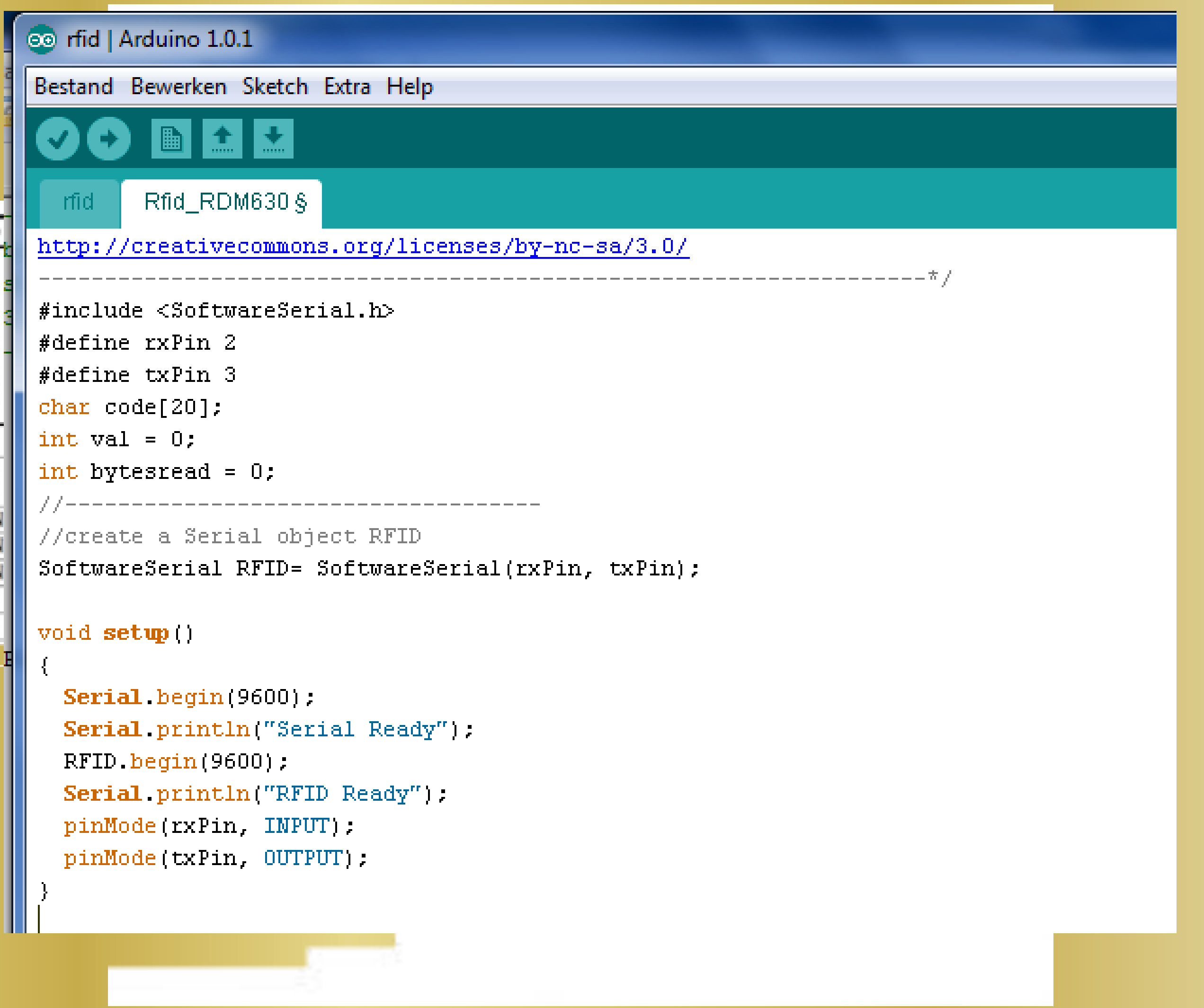


Opdracht 3: Lilypad

Opdracht 4, 6: RFID 125 kHz

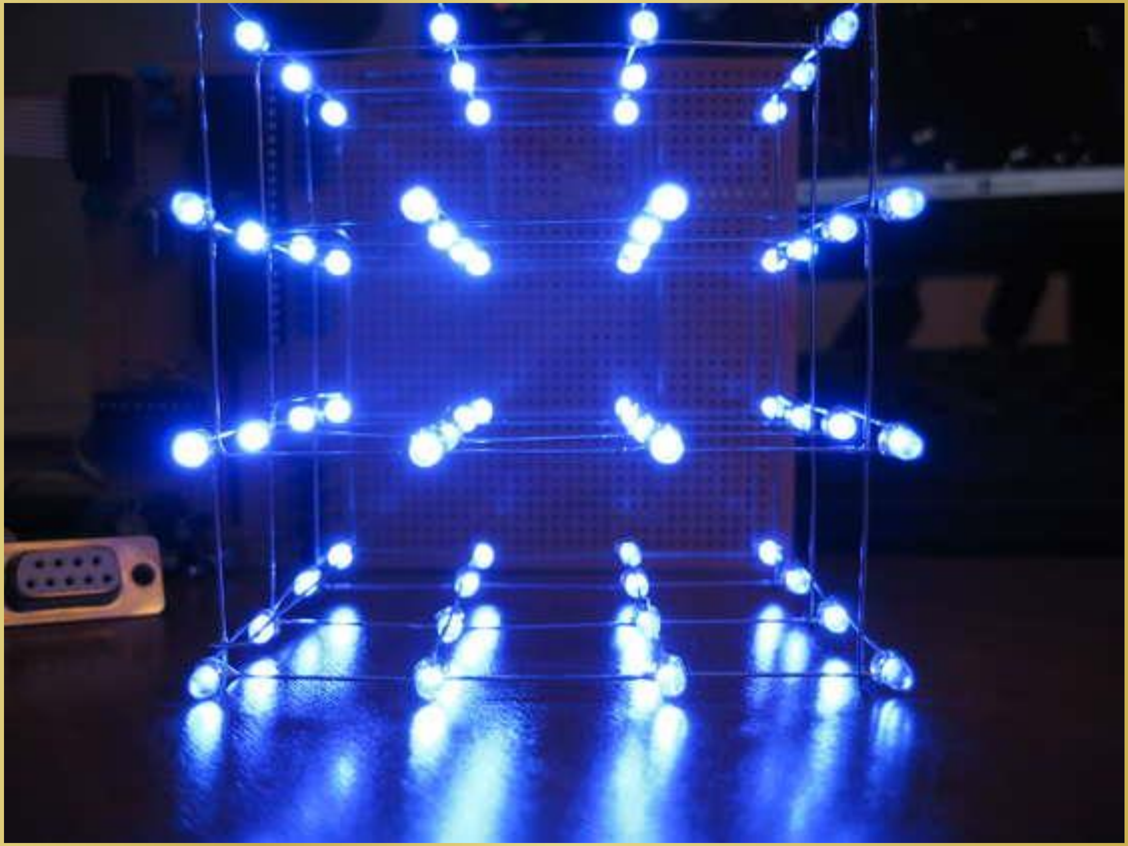


P1	P2	
PIN1---TX	PIN1---ATN1	PIN
PIN2---RX	PIN2---ATN2	PIN
PIN3		PIN
PIN4---GND		
PIN5---+5v(DC)		

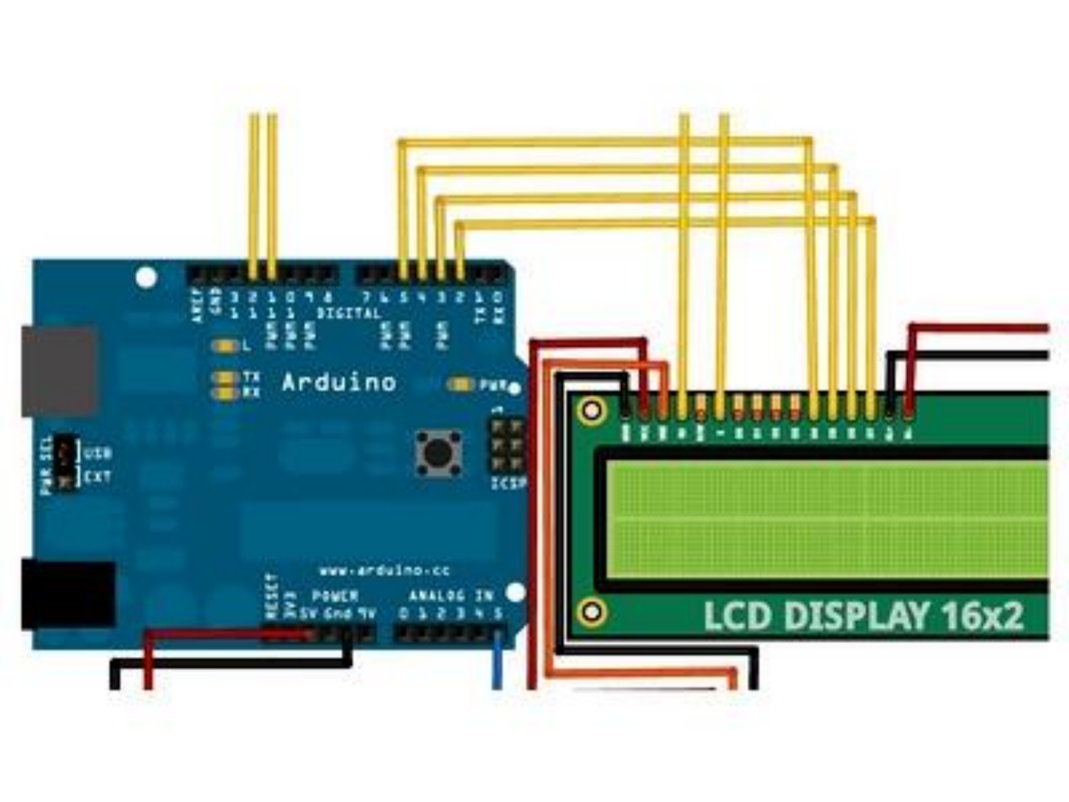


```
http://creativecommons.org/licenses/by-nc-sa/3.0/
---------------------------------------------------------------------*/
#include <SoftwareSerial.h>
#define rxPin 2
#define txPin 3
char code[20];
int val = 0;
int bytesread = 0;
//-----------------------------------
//create a Serial object RFID
SoftwareSerial RFID= SoftwareSerial(rxPin, txPin);

void setup()
{
  Serial.begin(9600);
  Serial.println("Serial Ready");
  RFID.begin(9600);
  Serial.println("RFID Ready");
  pinMode(rxPin, INPUT);
  pinMode(txPin, OUTPUT);
}
```

Opdracht 5: 3D cube



Opdracht 7: LCD



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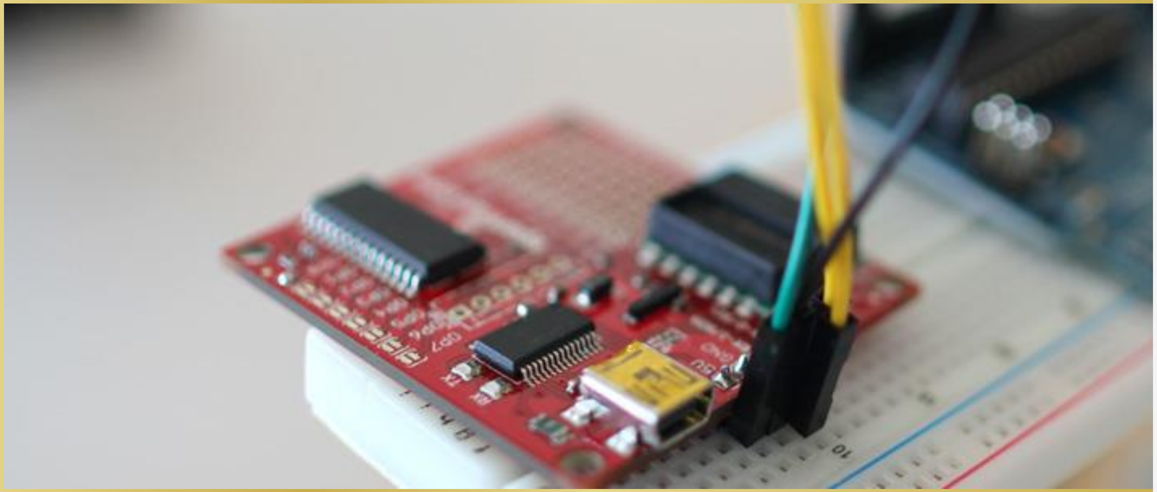
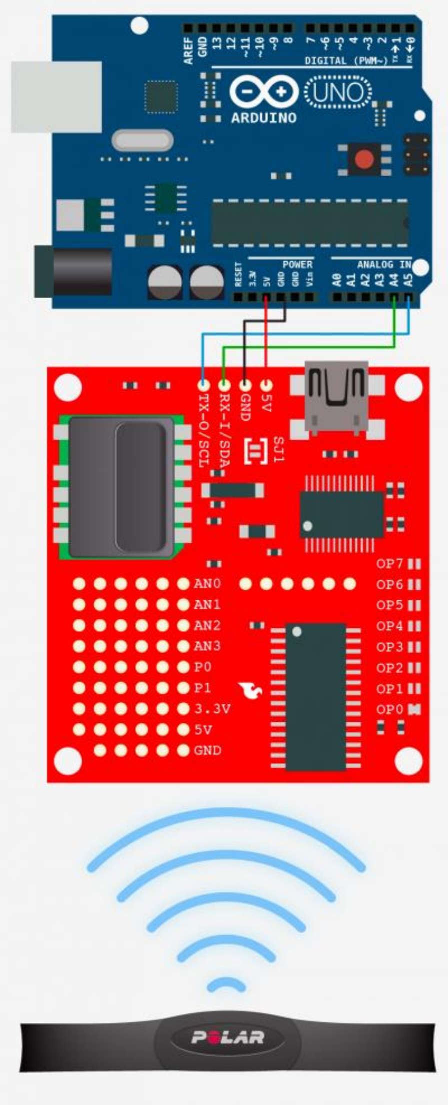
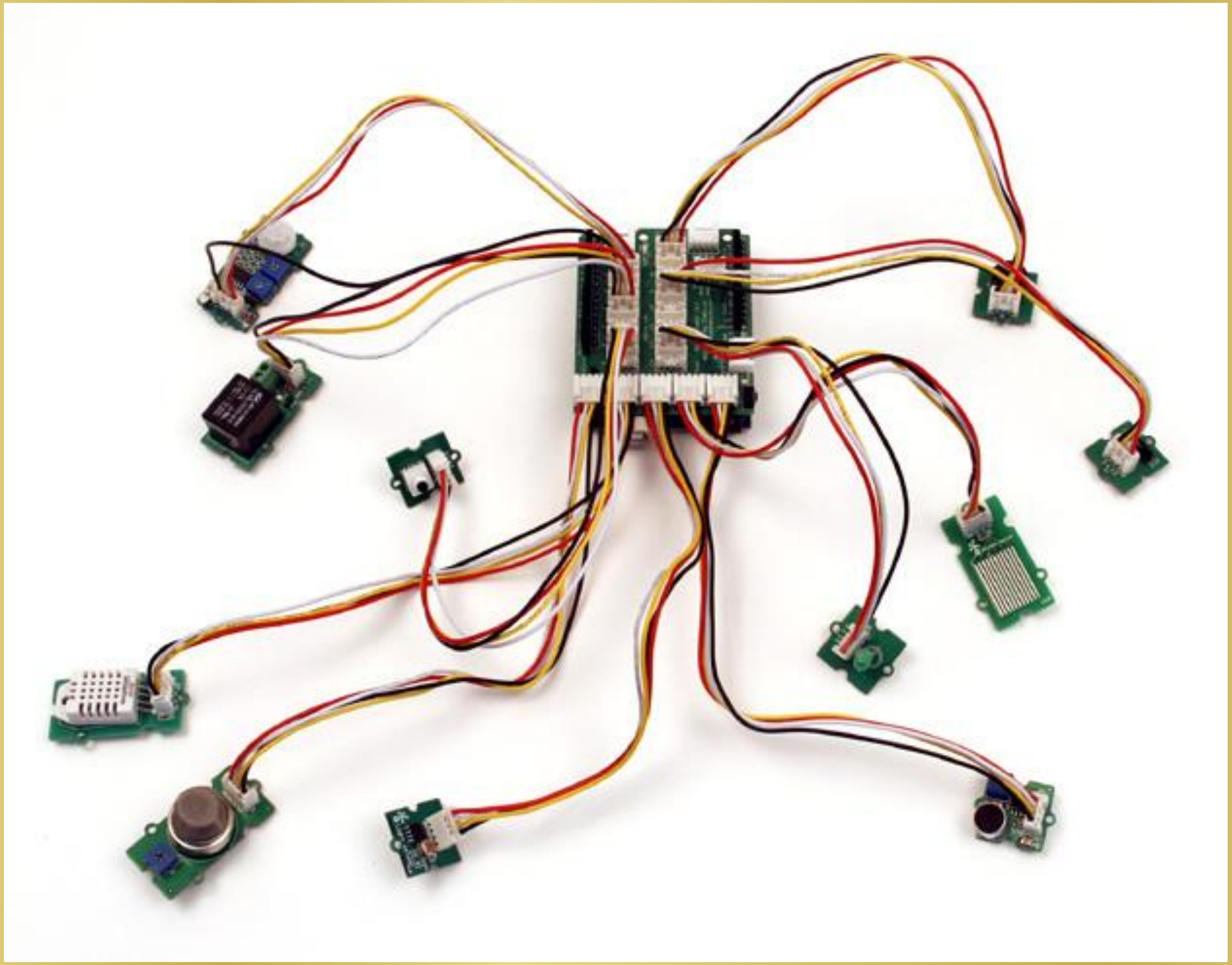
Opdracht 8: Hartslag

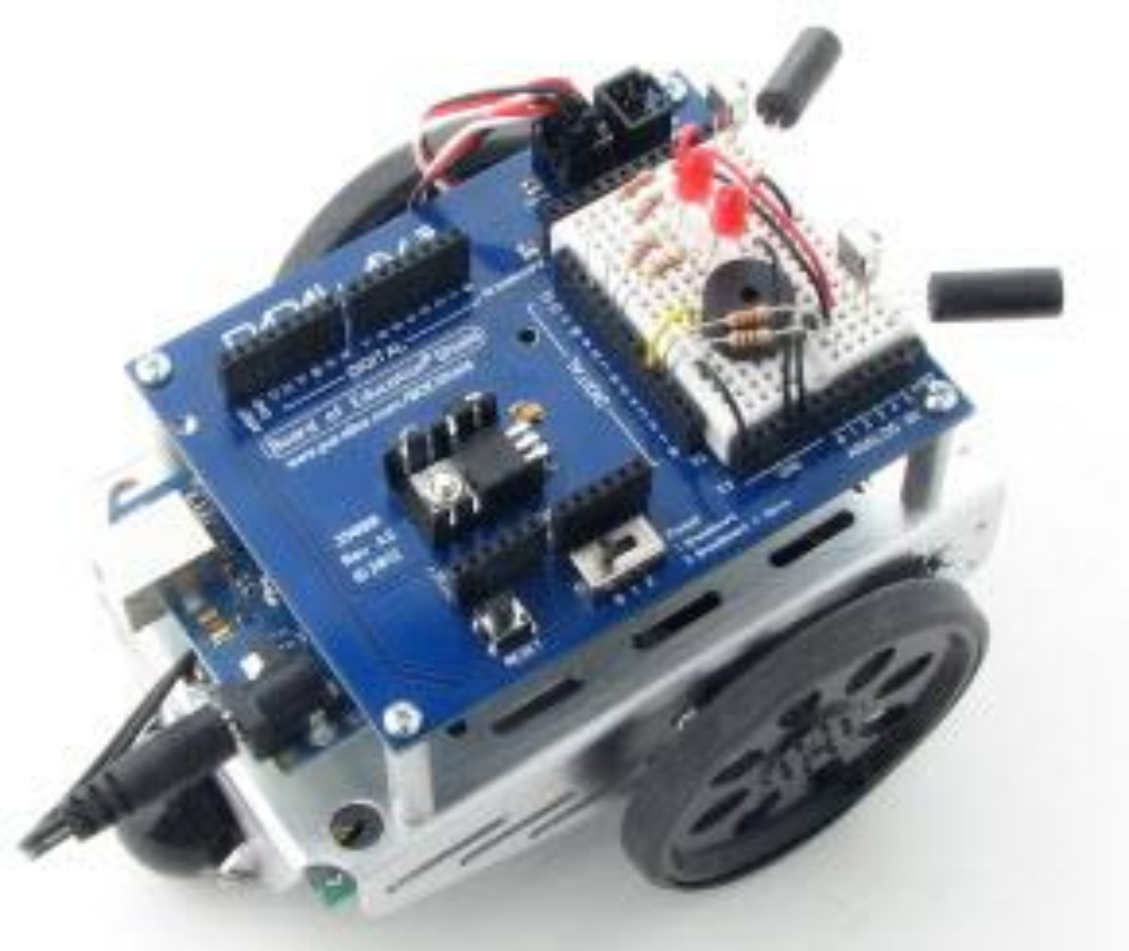




Opdracht 9: Grove



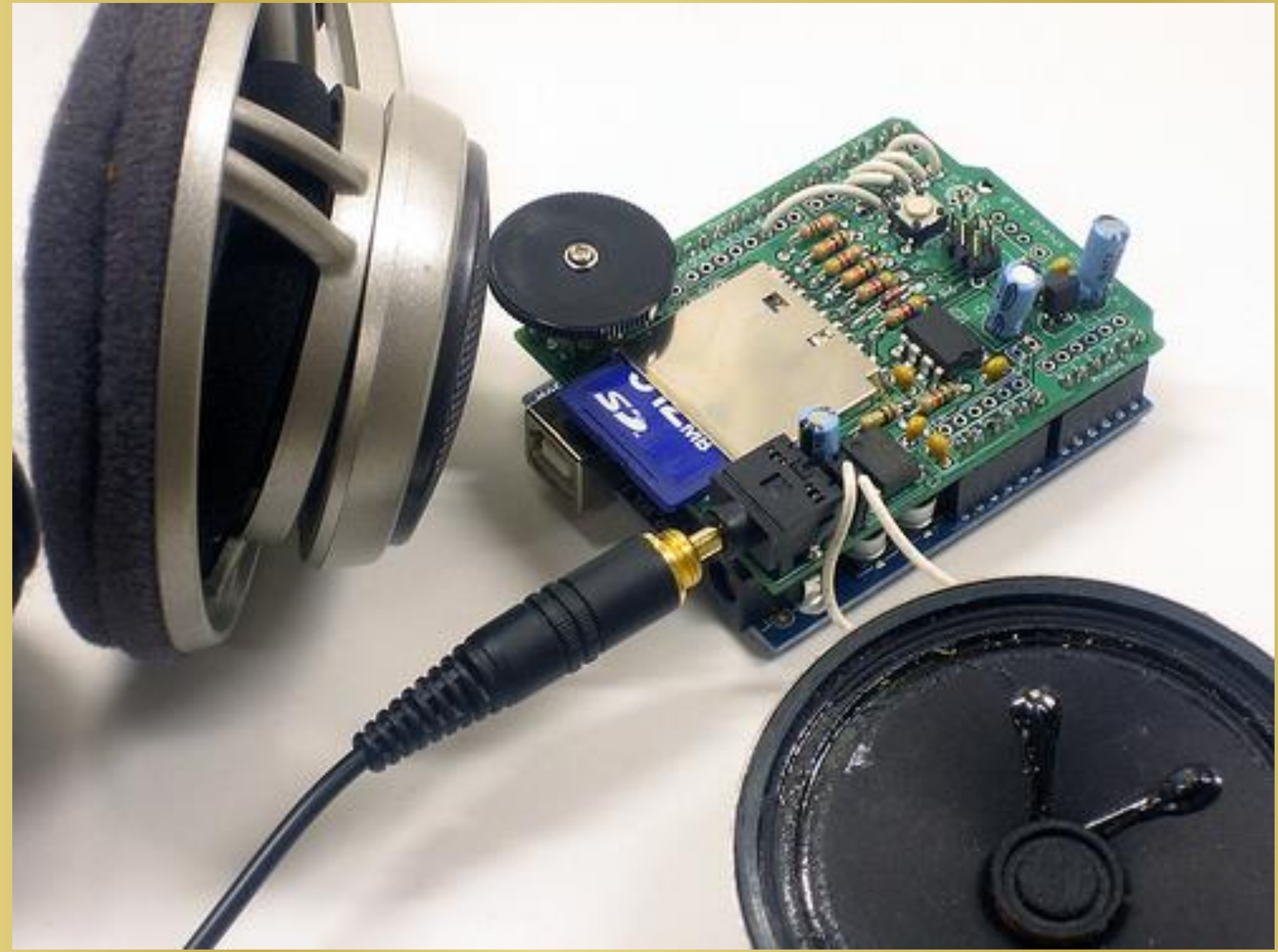
Opdracht 10,11: Robot



Opdracht 12 Deurbel, Xbee

↔

Opdracht 13 Muziek



Opdracht 14: LOL

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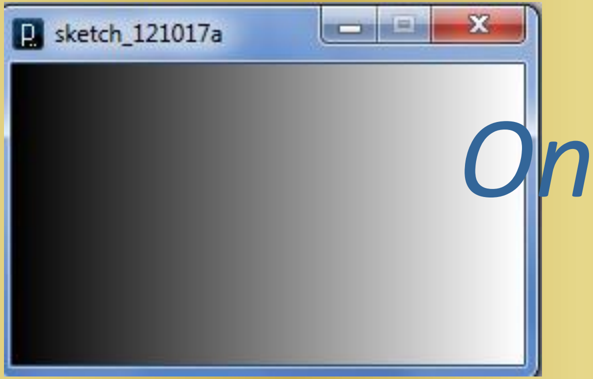
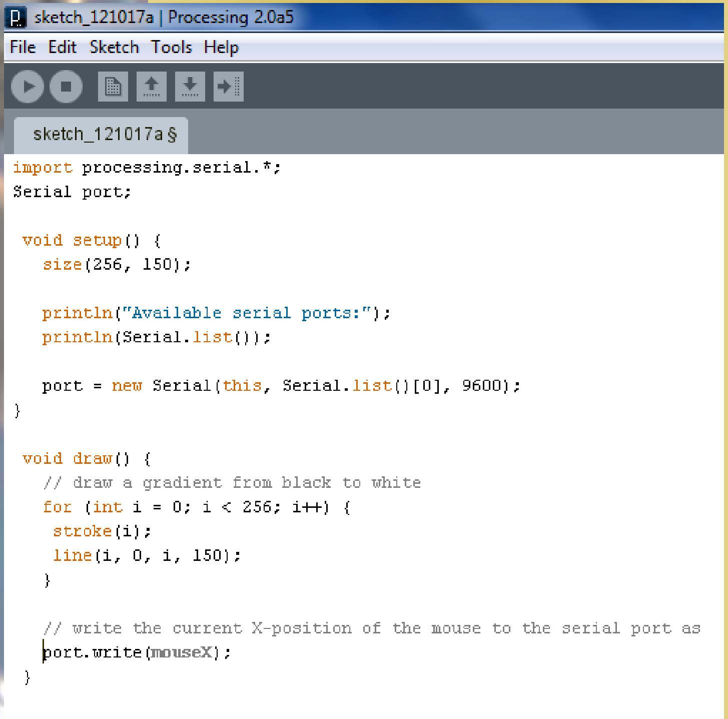
Opdracht 15-19

Opdracht 15-19

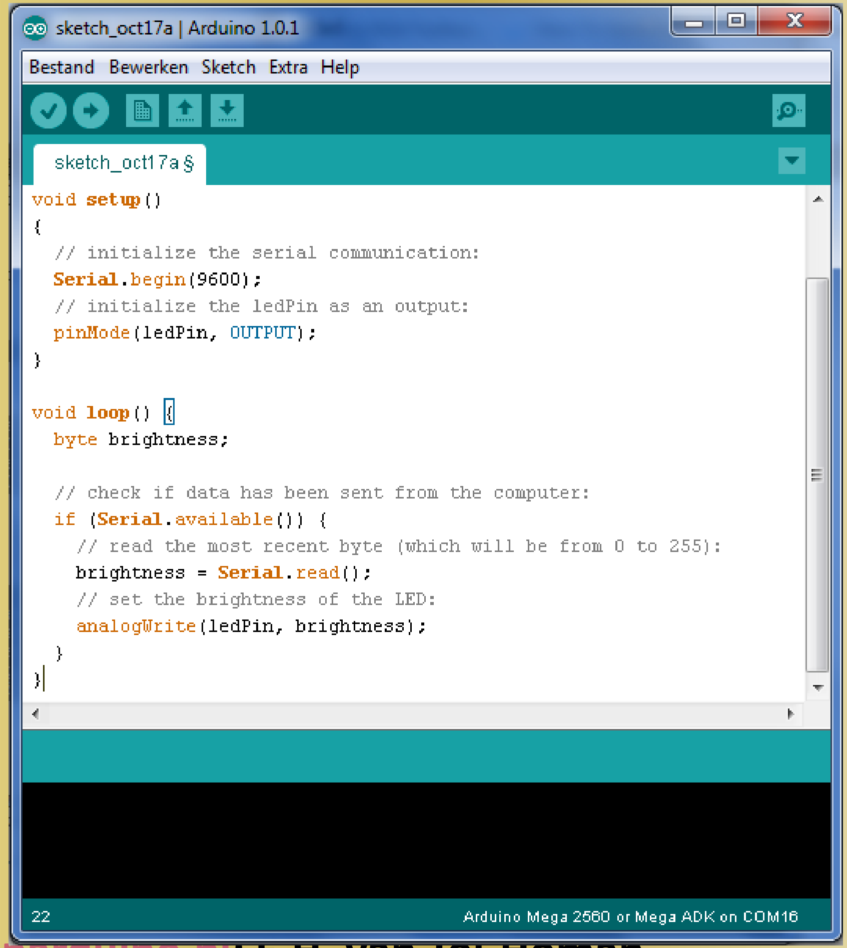
Onderwerp 19




sketch_121017a | Processing 2.0a5
File Edit Sketch Tools Help
sketch_121017a §

```
import processing.serial.*;
Serial port;

 void setup() {
   size(256, 150);

   println("Available serial ports:");
   println(Serial.list());

   port = new Serial(this, Serial.list()[0], 9600);
}

 void draw() {
   // draw a gradient from black to white
   for (int i = 0; i < 256; i++) {
    stroke(i);
    line(i, 0, i, 150);
   }

   // write the current X-position of the mouse to the serial port as
   port.write(mouseX);
 }
```

↔


sketch_oct17a | Arduino 1.0.1
Bestand Bewerken Sketch Extra Help
sketch_oct17a §

```
void setup()
{
  // initialize the serial communication:
  Serial.begin(9600);
  // initialize the ledPin as an output:
  pinMode(ledPin, OUTPUT);
}

void loop() {
  byte brightness;

  // check if data has been sent from the computer:
  if (Serial.available()) {
    // read the most recent byte (which will be from 0 to 255):
    brightness = Serial.read();
    // set the brightness of the LED:
    analogWrite(ledPin, brightness);
  }
}
```

```
22                                    Arduino Mega 2560 or Mega ADK on COM16
```

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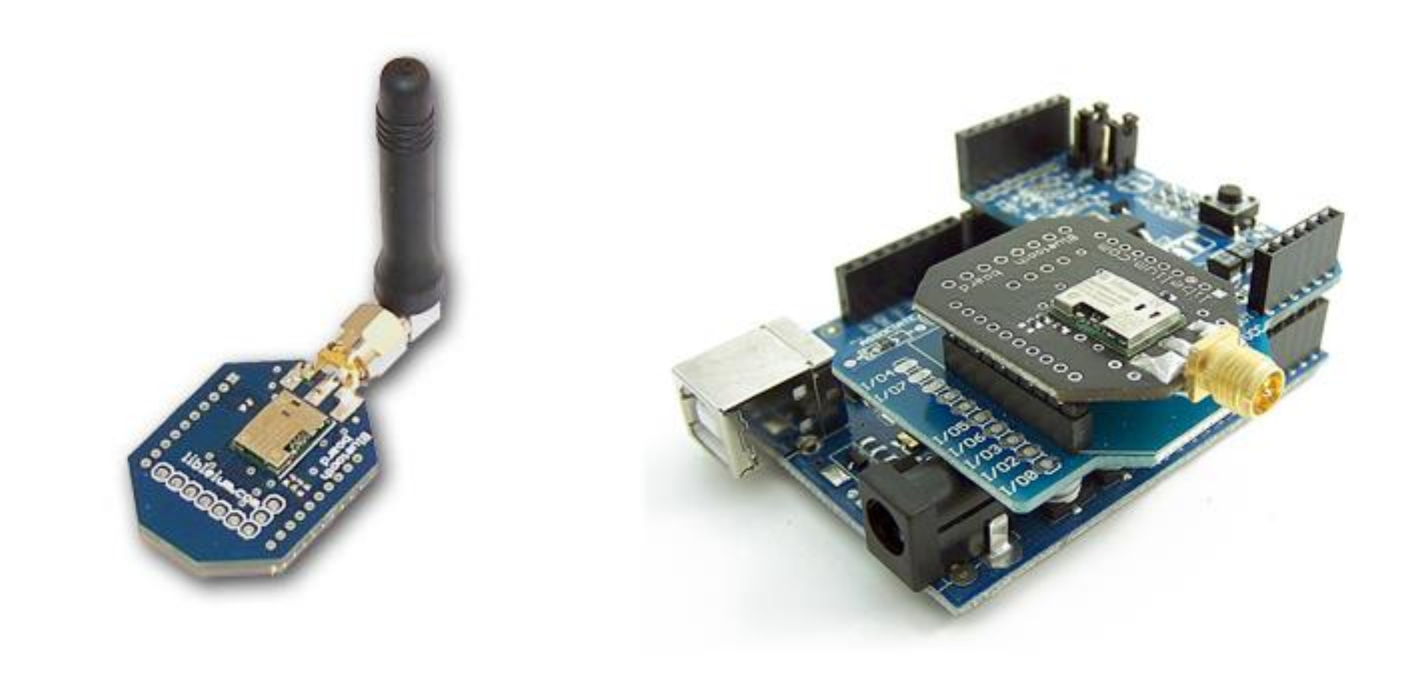
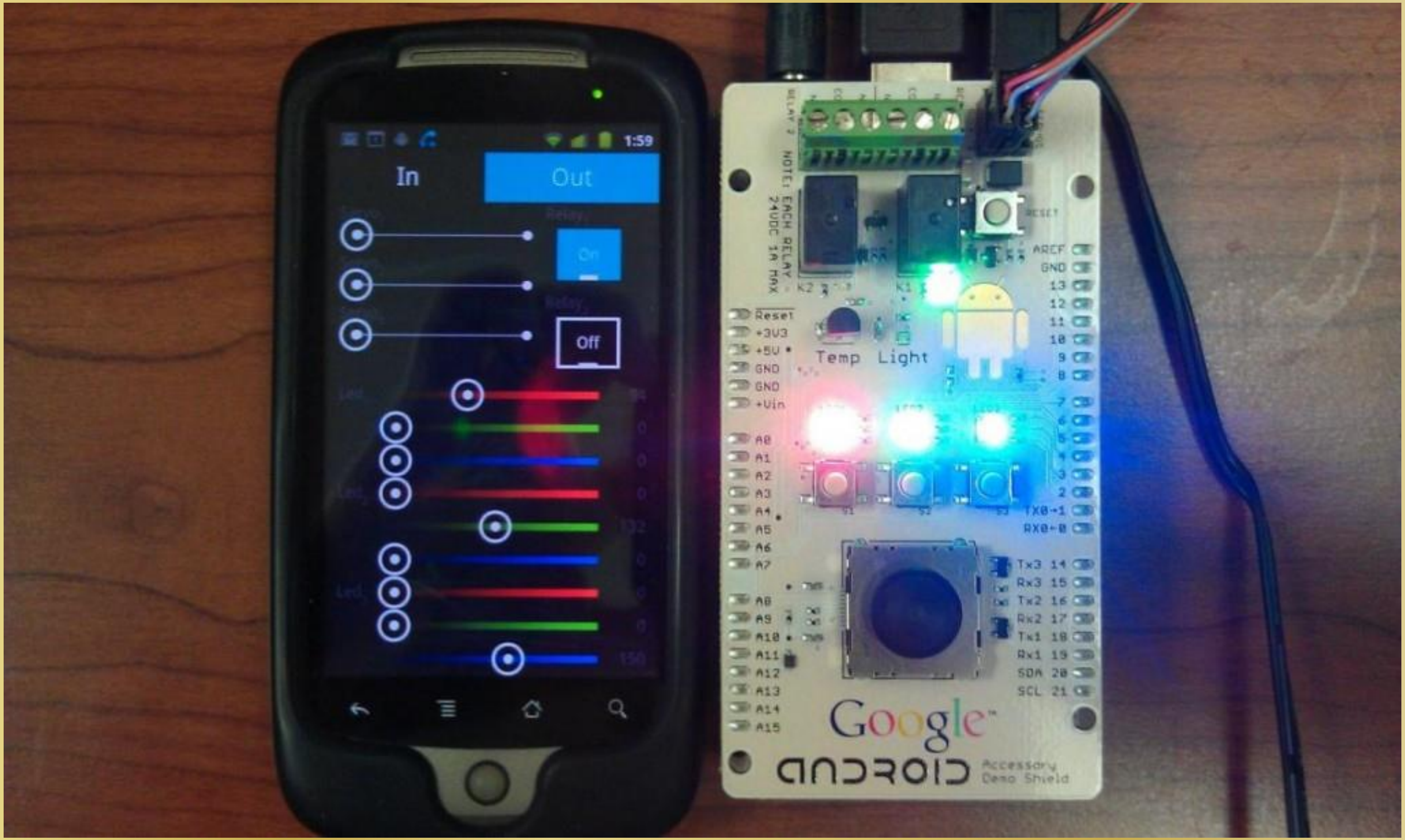
Opdracht 20: Bluetooth



Opdracht 21: Android + Arduino ADK



Arduino ***Workshop***

Opdracht 1 tot met 21

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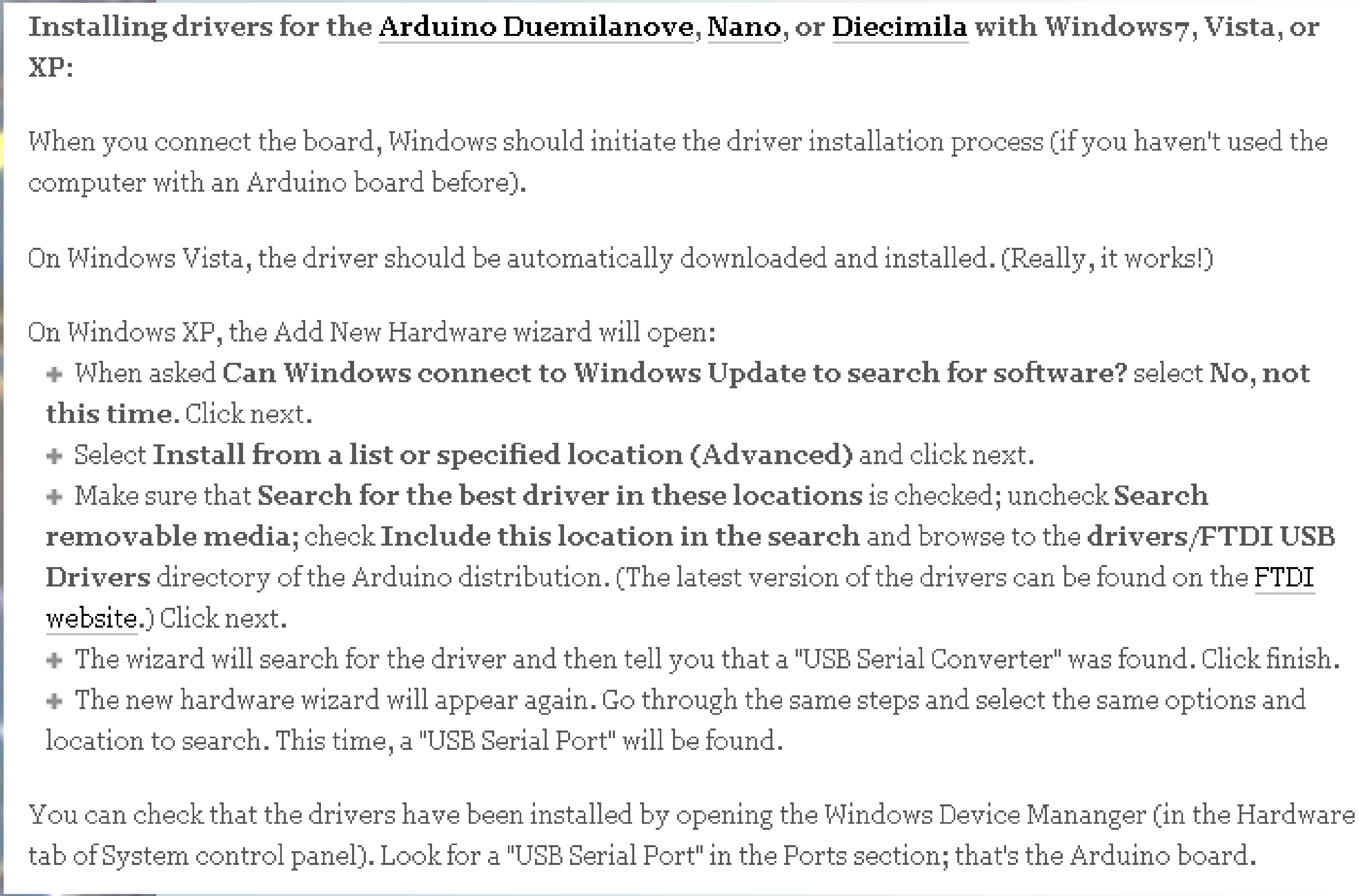
Installatie



Installing drivers for the Arduino Duemilanove, Nano, or Diecimila with Windows7, Vista, or XP:

When you connect the board, Windows should initiate the driver installation process (if you haven't used the computer with an Arduino board before).

On Windows Vista, the driver should be automatically downloaded and installed. (Really, it works!)

On Windows XP, the Add New Hardware wizard will open:

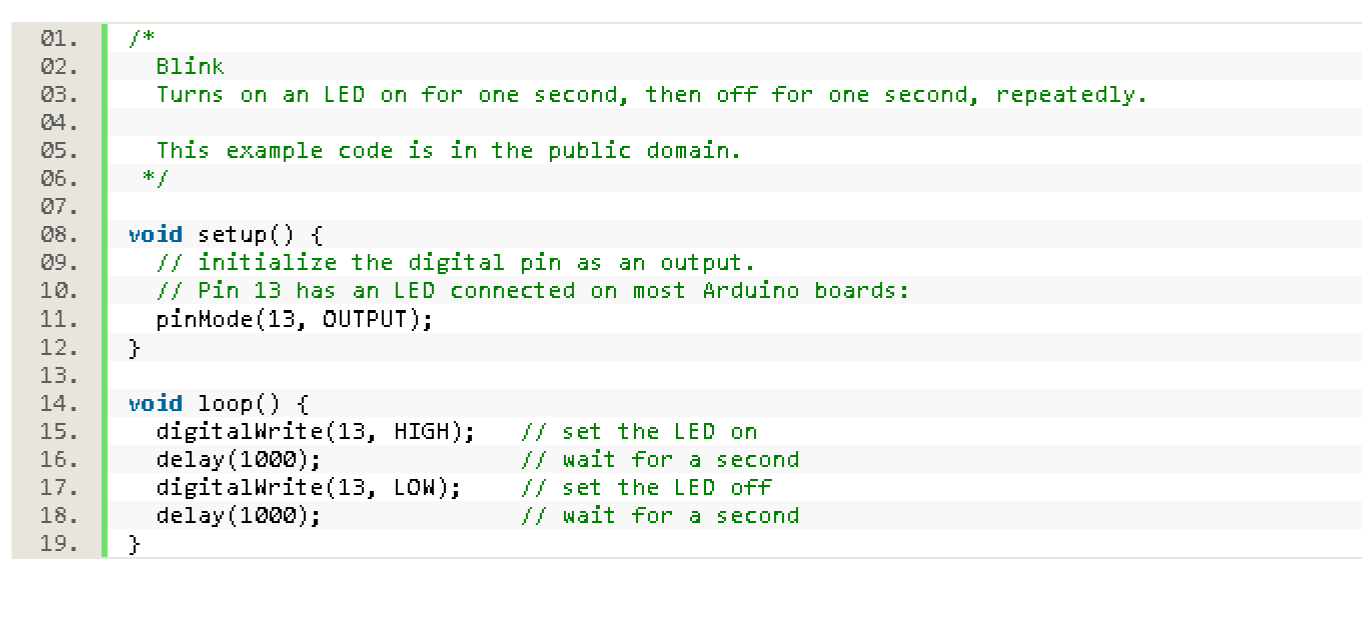
- When asked **Can Windows connect to Windows Update to search for software?** select **No, not this time.** Click next.
- Select **Install from a list or specified location (Advanced)** and click next.
- Make sure that **Search for the best driver in these locations** is checked; uncheck **Search removable media;** check **Include this location in the search** and browse to the **drivers/FTDI USB Drivers** directory of the Arduino distribution. (The latest version of the drivers can be found on the FTDI website.) Click next.
- The wizard will search for the driver and then tell you that a "USB Serial Converter" was found. Click finish.
- The new hardware wizard will appear again. Go through the same steps and select the same options and location to search. This time, a "USB Serial Port" will be found.

You can check that the drivers have been installed by opening the Windows Device Mananger (in the Hardware tab of System control panel). Look for a "USB Serial Port" in the Ports section; that's the Arduino board.

Tenslotte

Syntax

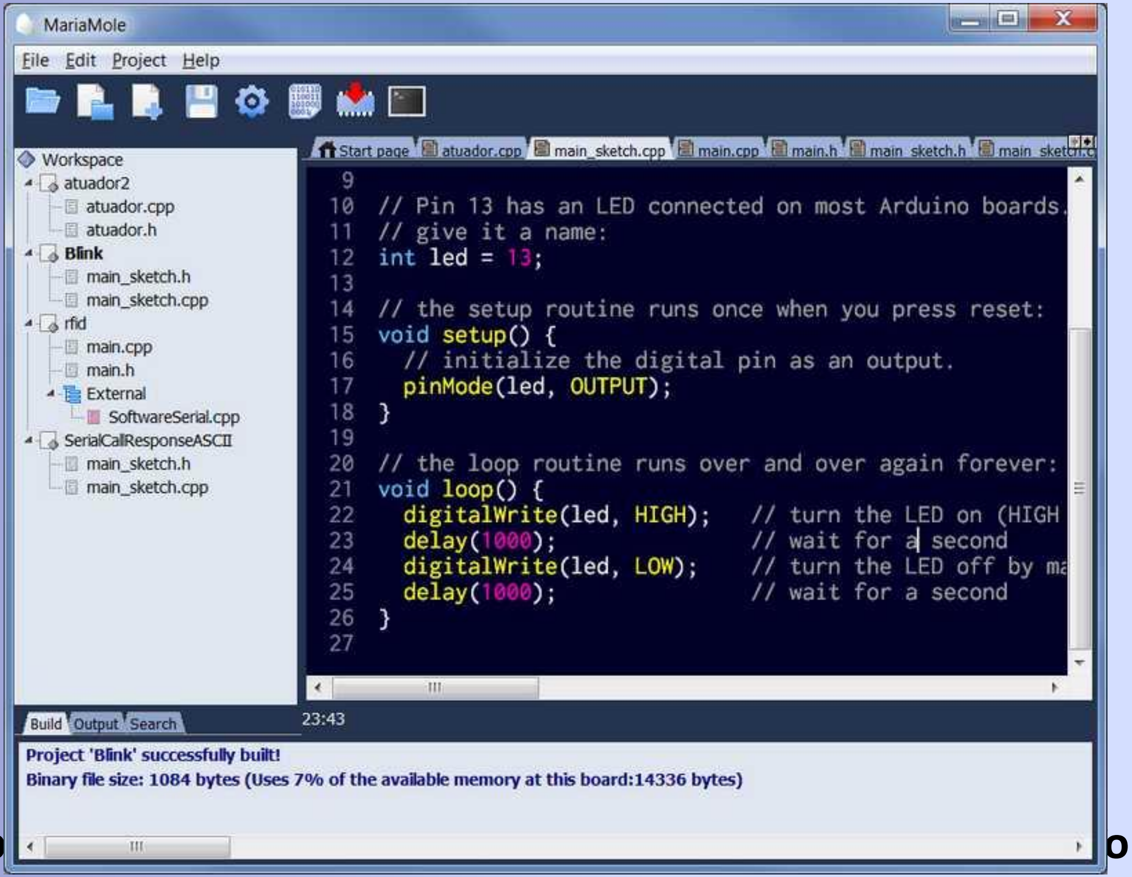
- http://www.planetb.ca/projects/syntaxHighlighter/
- Layout:



```
/*
  Blink
  Turns on an LED on for one second, then off for one second, repeatedly.

  This example code is in the public domain.
 */

void setup() {
  // initialize the digital pin as an output.
  // Pin 13 has an LED connected on most Arduino boards:
  pinMode(13, OUTPUT);
}

void loop() {
  digitalWrite(13, HIGH);    // set the LED on
  delay(1000);               // wait for a second
  digitalWrite(13, LOW);     // set the LED off
  delay(1000);               // wait for a second
}
```

Maria Mole

- http://dalpix.com/mariamole



```

// Pin 13 has an LED connected on most Arduino boards.
// give it a name:
int led = 13;

// the setup routine runs once when you press reset:
void setup() {
  // initialize the digital pin as an output.
  pinMode(led, OUTPUT);
}

// the loop routine runs over and over again forever:
void loop() {
  digitalWrite(led, HIGH);   // turn the LED on (HIGH
  delay(1000);               // wait for a second
  digitalWrite(led, LOW);    // turn the LED off by ma
  delay(1000);               // wait for a second
}

```

```
Project 'Blink' successfully built!
Binary file size: 1084 bytes (Uses 7% of the available memory at this board:14336 bytes)
```

Cursussen

- Voor scholen / docenten binnenkort de mogelijkheid om:

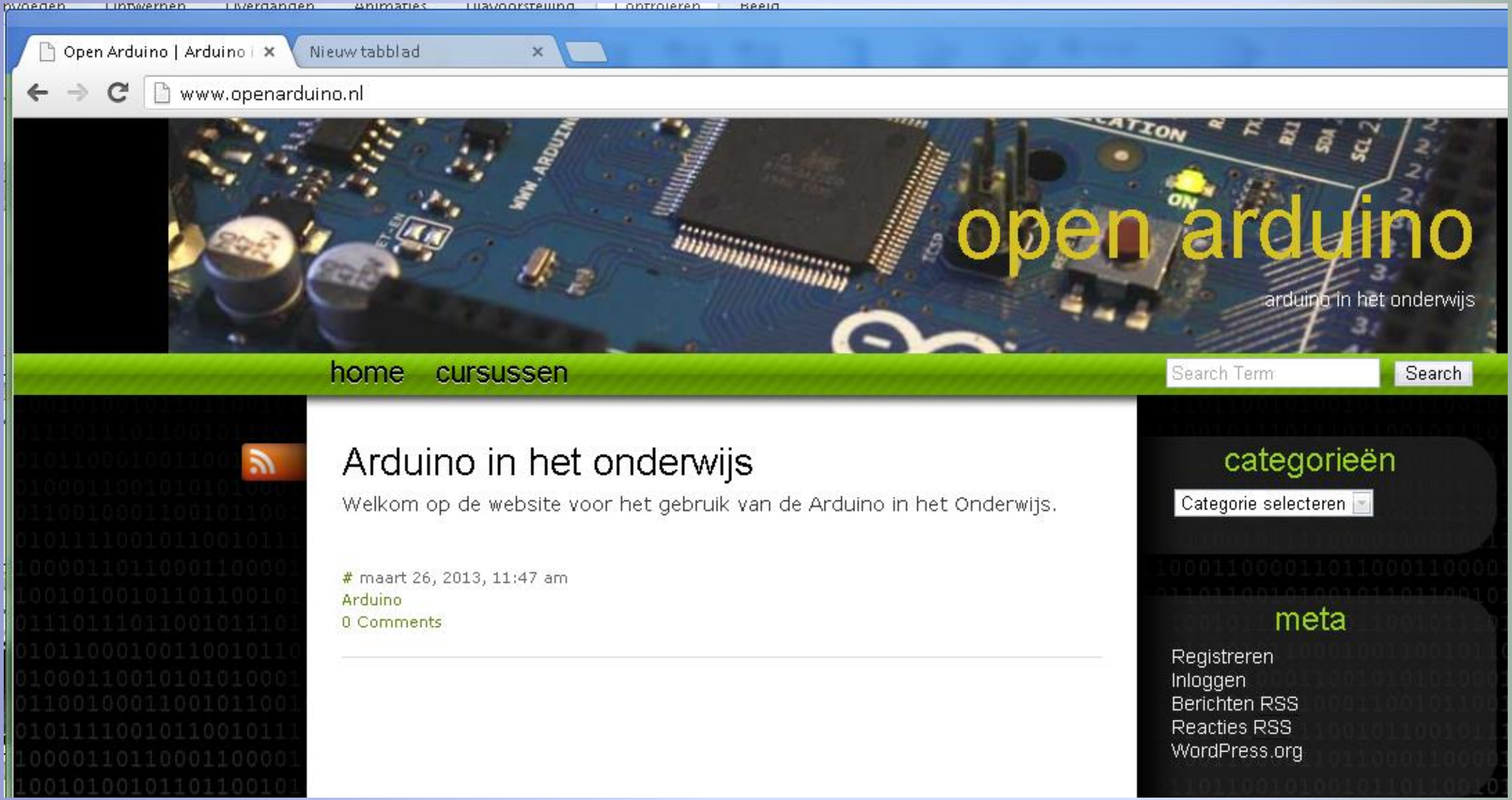
  cursussen te volgen;

  lesmateriaal te gebruiken;

  arduino-sets te kopen;

- Zie: http://www.openarduino.nl

Website: OpenArduino.nl

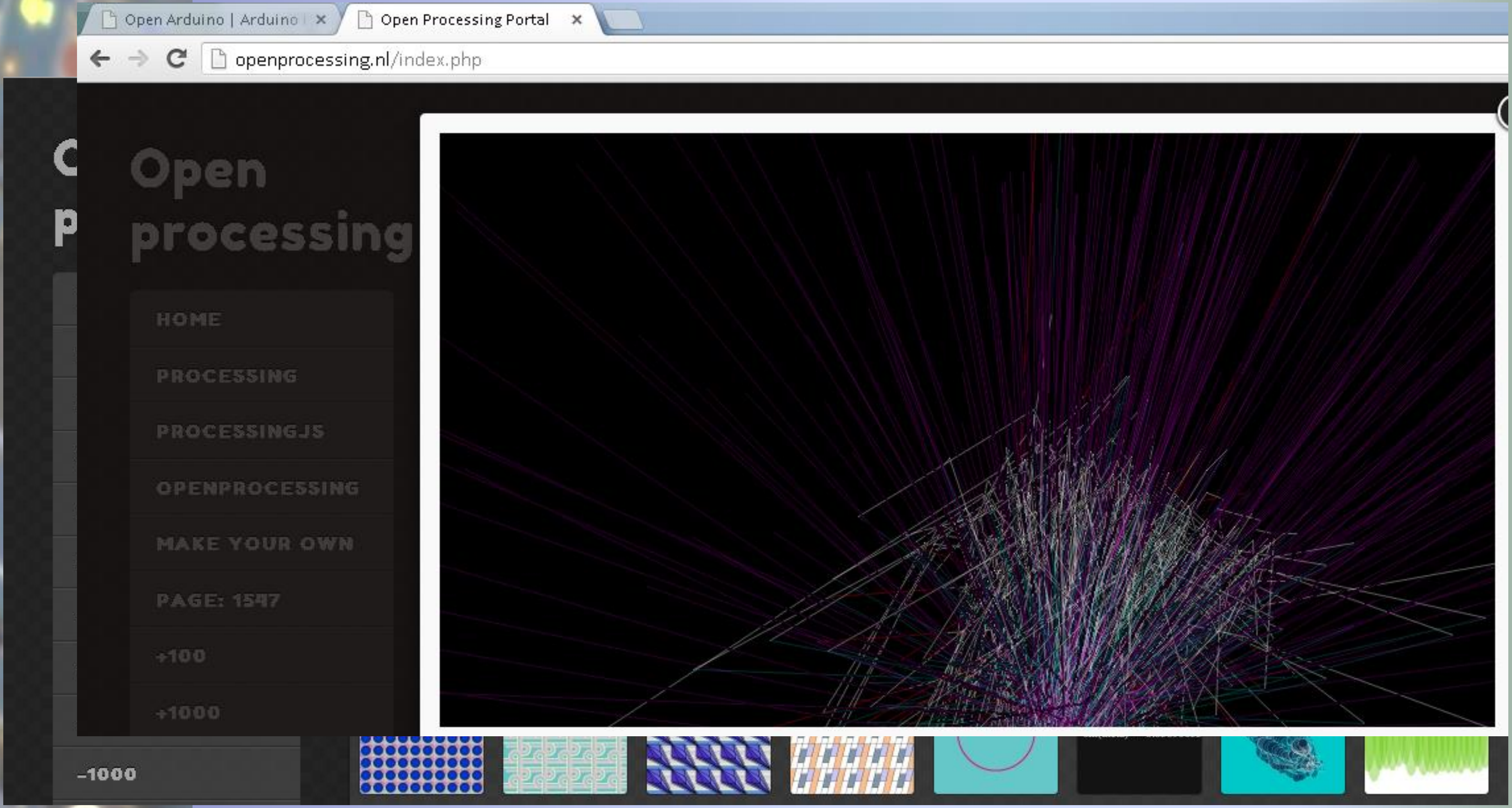


Arduino in het onderwijs

Welkom op de website voor het gebruik van de Arduino in het Onderwijs.

maart 26, 2013, 11:47 am
Arduino
0 Comments

Website: OpenProcessing.nl



Vragen ???

Els.vantol@gmail.com