

*Introducción a la Ingeniería*

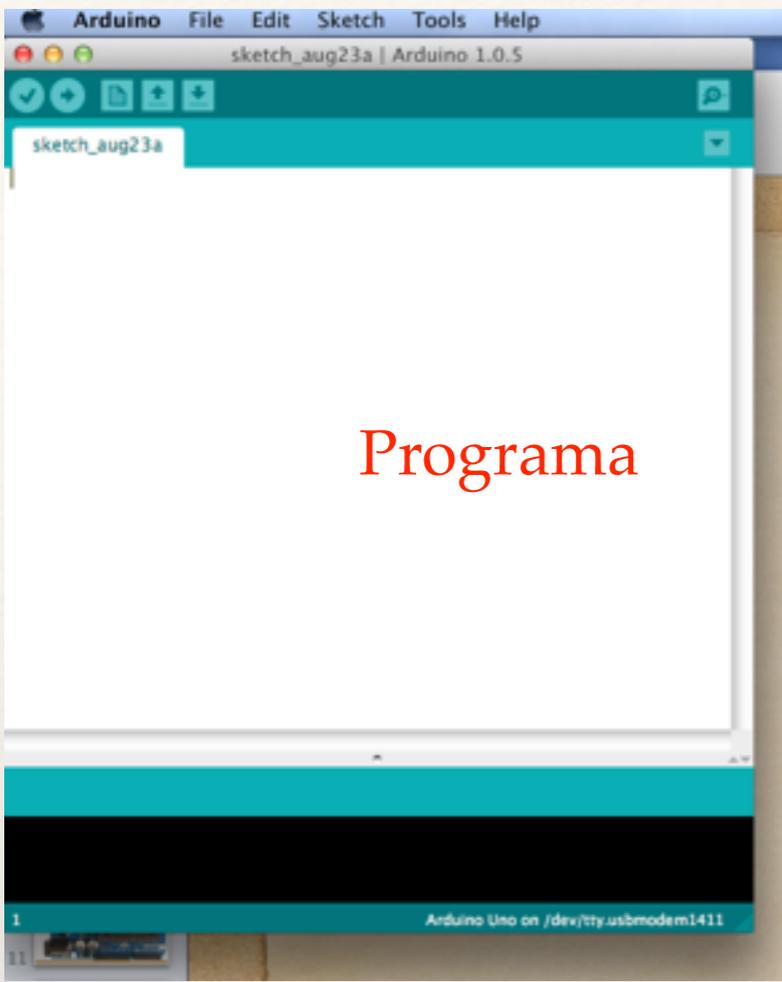
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# ALGORITMOS BÁSICOS

Presentación No. 6

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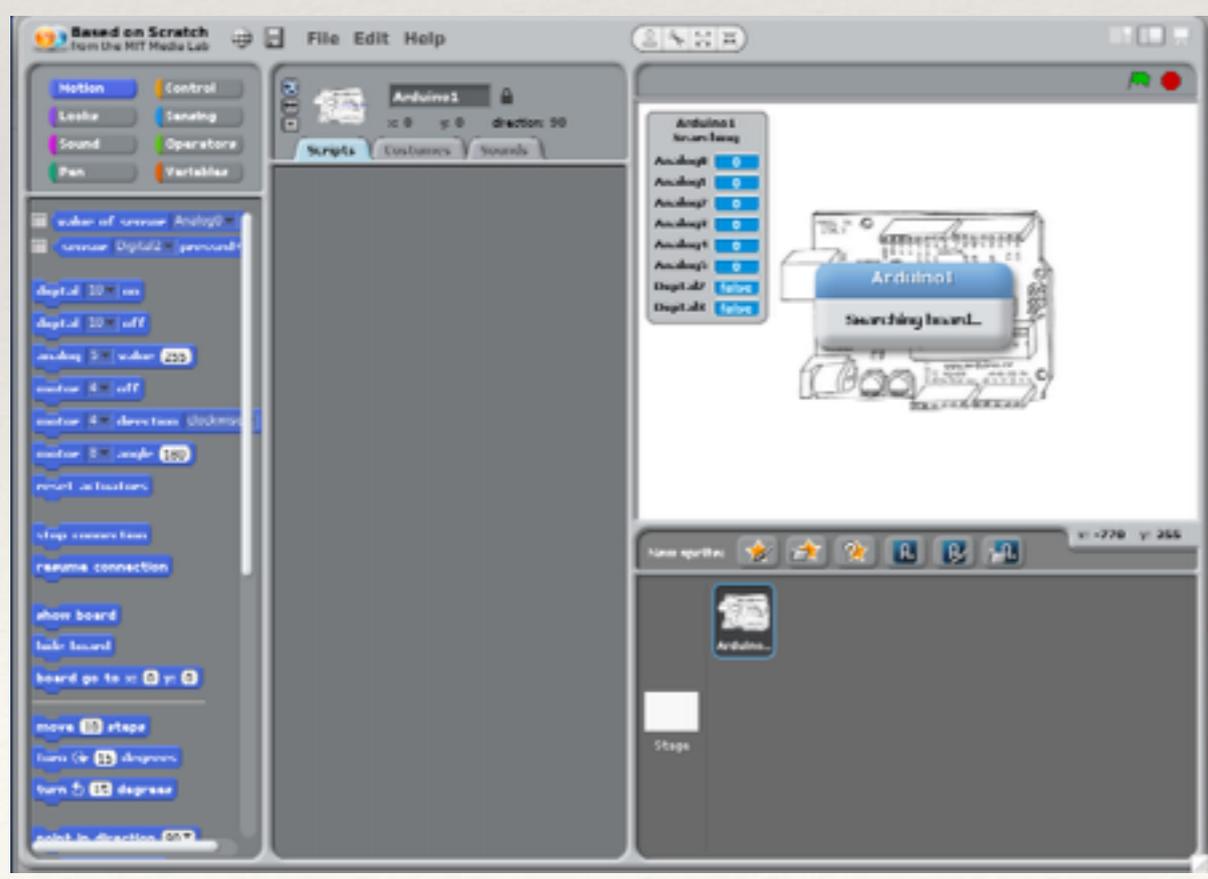
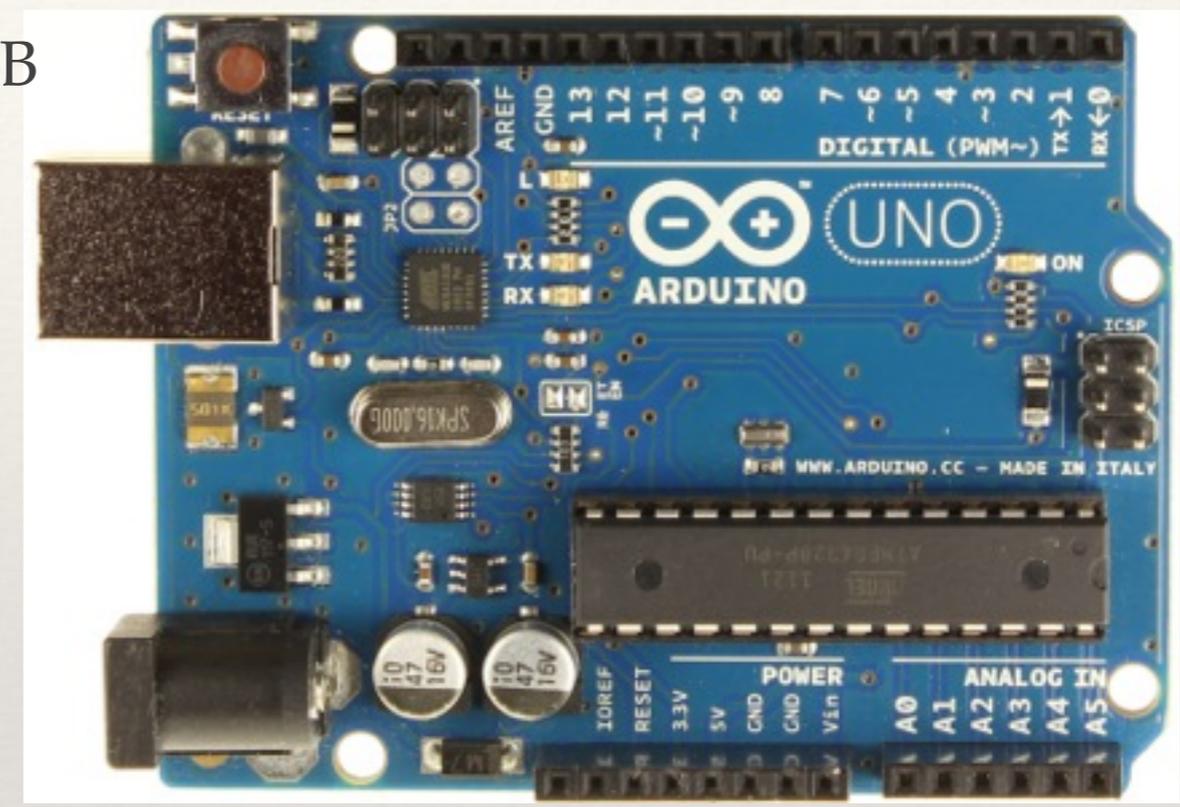
Entorno de desarrollo co



Programa

IDE de Arduino

Cable USB



S4A

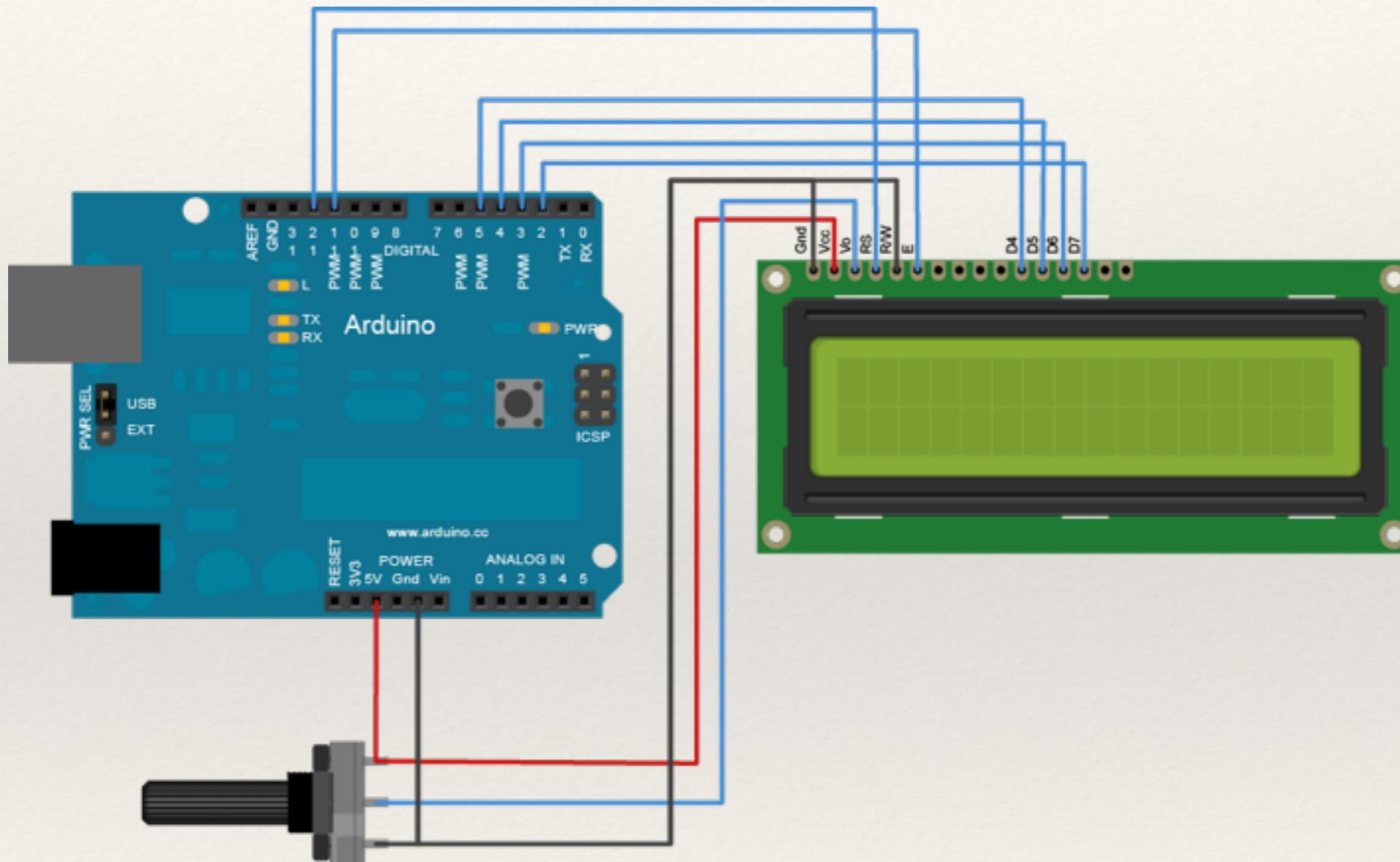
# SISTEMA



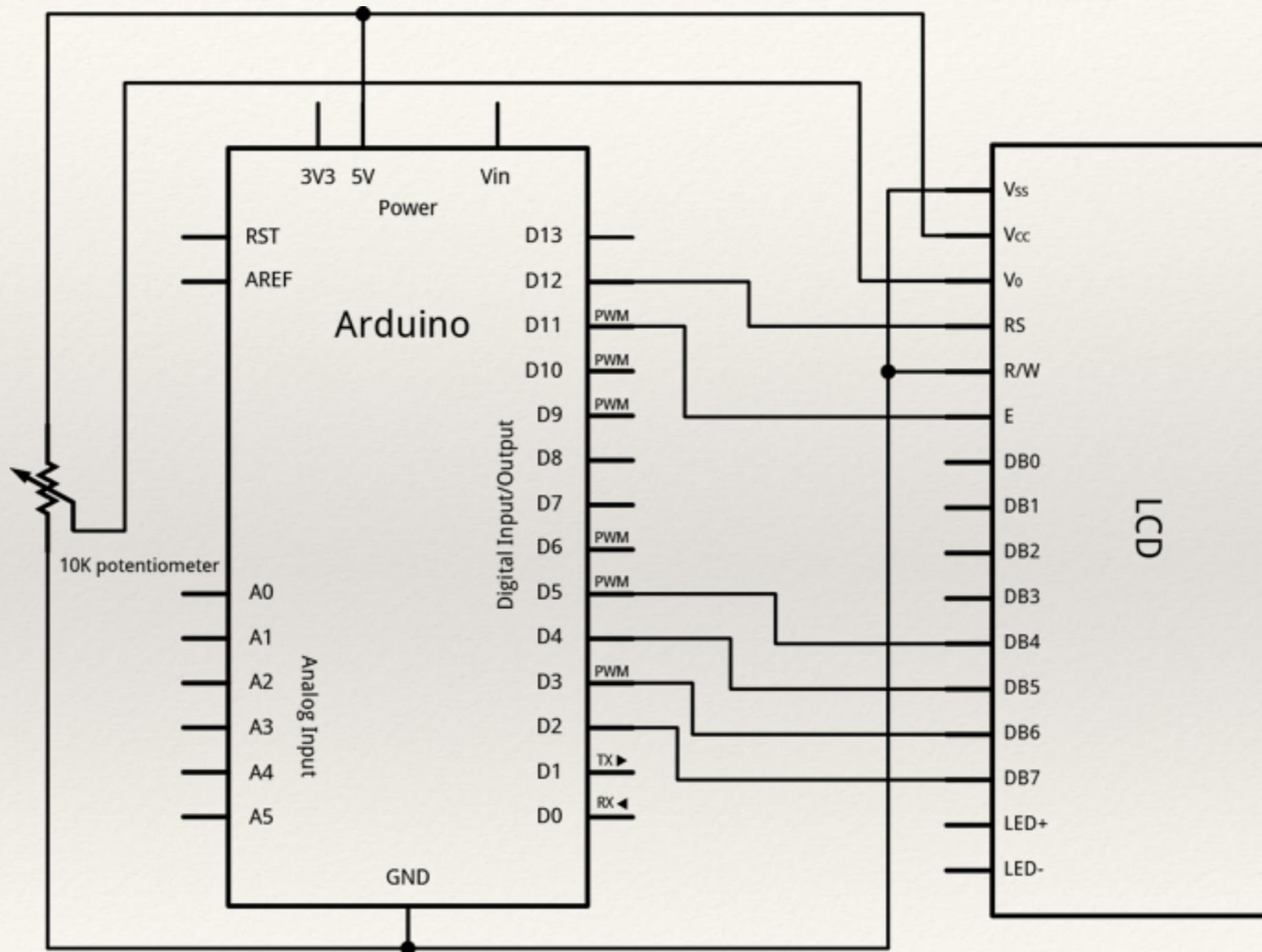
Ejemplo: Medidor de Energía Eléctrica

- ENTRADAS: Sensor de Voltaje, Sensor de Corriente
- SALIDAS: Display
- SISTEMA : micro-Controlador

# Pantalla LCD



# Pantalla LCD



# Pantalla LCD

## LiquidCrystal Library - Hello World

Demonstrates the use a 16x2 LCD display. The LiquidCrystal library works with all LCD displays that are compatible with the Hitachi HD44780 driver. There are many of them out there, and you can usually tell them by the 16-pin interface.

This sketch prints "Hello World!" to the LCD and shows the time.

### The circuit:

- \* LCD RS pin to digital pin 12
- \* LCD Enable pin to digital pin 11
- \* LCD D4 pin to digital pin 5
- \* LCD D5 pin to digital pin 4
- \* LCD D6 pin to digital pin 3
- \* LCD D7 pin to digital pin 2
- \* LCD R/W pin to ground
- \* 10K resistor:
  - \* ends to +5V and ground
  - \* wiper to LCD VO pin (pin 3)

Library originally added 18 Apr 2008

by David A. Mellis

library modified 5 Jul 2009

by Limor Fried (<http://www.ladyada.net>)

example added 9 Jul 2009

by Tom Igoe

modified 22 Nov 2010

by Tom Igoe

This example code is in the public domain.

<http://www.arduino.cc/en/Tutorial/LiquidCrystal>

\*/

```
// 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);
```

```
}
```

# Ejemplo de aplicación

```
// 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);
int valor[100];
int i=0;
int j=0;
int promedio=0;
int mayor=0;
int menor=2000;
int spromedio=0;
int smayor=0;
int smenor=2000;
void setup() {
  // set up the LCD's number of columns and rows:
  lcd.begin(16, 2);
  lcd.clear();
  Serial.begin(9600);
  // Print a message to the LCD.
  for(int k=0;k<1000;k++) {
    //Serial.println(i);
    valor[i] = analogRead(A0);
    if (valor[i]>mayor) {
      mayor=valor[i];
    }
    if (valor[i]<menor) {
      menor=valor[i];
    }

    promedio+=valor[i]/100;
    i=i+1;
  }
}
```

```

promedio+=valor[i]/100;
i=i+1;
if (i>99) {
    i=0;
    j=j+1;
    if (j > 0) {
        lcd.setCursor(0,0);
        lcd.print("promedio=");
        lcd.print(promedio);
        lcd.setCursor(0,1);
        lcd.print("my=");
        lcd.print(mayor);
        lcd.print("mn=");
        lcd.print(menor);
        Serial.print("promedio=");
        Serial.println(promedio);
        Serial.print("my=");
        Serial.println(mayor);
        Serial.print("mn=");
        Serial.println(menor);
        j = 0;
        spromedio<promedio;
        smayor=mayor;
        smenor=menor;
    }
    mayor=0;
    menor=2000;
    promedio=0;
}

```

```

    }
    delay(1);
}
int kzero=(smenor + (smayor-smenor)/2)/10;
int kpunto;
for(int k=0;k<99;k++) {
    kpunto = valor[k]/10;
    if (kpunto<kzero) {
        for(int col=0;col<kpunto;col++){
            Serial.print(".");
        }
        Serial.print("*");
        for(int col=kpunto+1;col<kzero;col++){
            Serial.print(" ");
        }
        Serial.println("+");
    }
    else {
        for(int col=0;col<kzero;col++){
            Serial.print(".");
        }
        Serial.print("+");
        for(int col=kzero+1;col<kpunto;col++){
            Serial.print(".");
        }
        Serial.println("*");
    }
}
}

Serial.println("==");

```

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# Pantalla LCD

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Ejemplo de aplicación

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# Pantalla gráfica

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Smart GPU 2

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# Pantalla gráfica

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Ejemplo de aplicación

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# Sensor de voltaje

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Ejemplo de aplicación

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# Sensor de corriente

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Ejemplo de aplicación

# TAREA

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- ❖ Complete el capítulo 3 de la documentación del proyecto.
- ❖ Con el proyecto terminado, complete el capítulo 4 de la documentación.
- ❖ **RECUERDE QUE NOS QUEDAN 4 SEMANAS DE CLASE**

