

Fisica, tecnologia, scienze applicate:
*uLAB2, un laboratorio portatile basato su arduino e due
piccoli robot, LEMU e MOMOLAB, vanno a scuola*

I sensi di μ LAB

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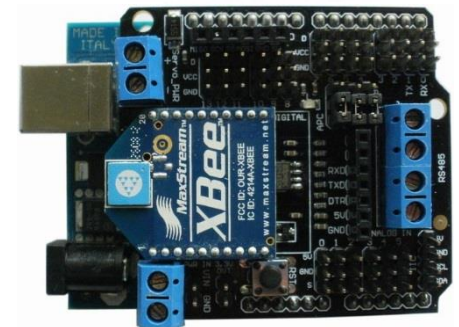
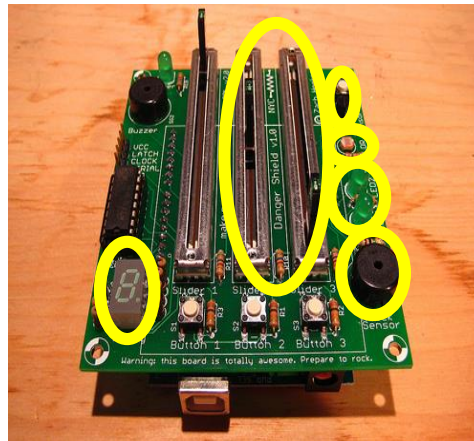


μLAB

μLAB è un dispositivo costituito da un arduino, uno o più sensori, una o più shield e ... software !!!

- μLAB 1.0 basato su arduino ed una breadboard che ospitava sensori ed adapter
- μLAB 2.0 basato sulla danger shield modificata
- μLAB 3.0 basato sulla shield 4884 DFROBOT
- μLAB 3.0 radio basato sulla

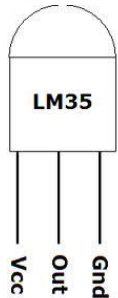
DFRobot I/O Expansion Shield V5 + XBEE oppure bluetooth



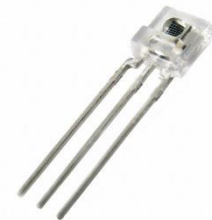
I sensi di μ LAB



1. Ultrasuoni
2. Infrarossi
3. Concentrazione gas
4. Temperatura
5. Intensità di luce
6. ...



DS18B20



TSL235R

Proviamo ad utilizzare i sensori



Gli ultrasuoni per stimare distanze, velocità, accelerazioni
misurare la velocità del suono in aria



Come trigger (in combinazione con un contatore)

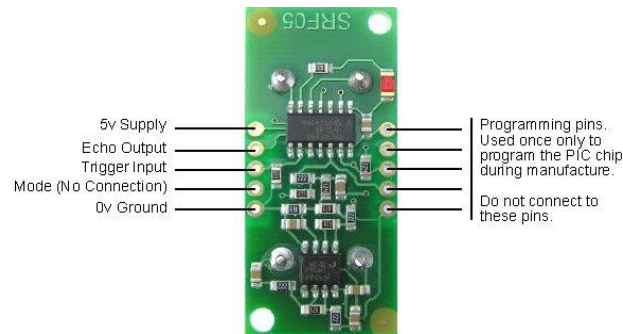
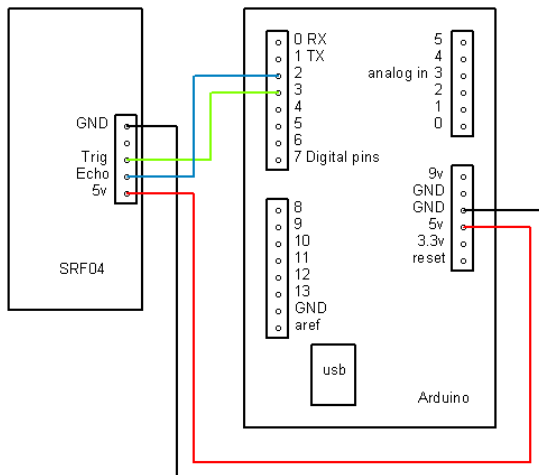
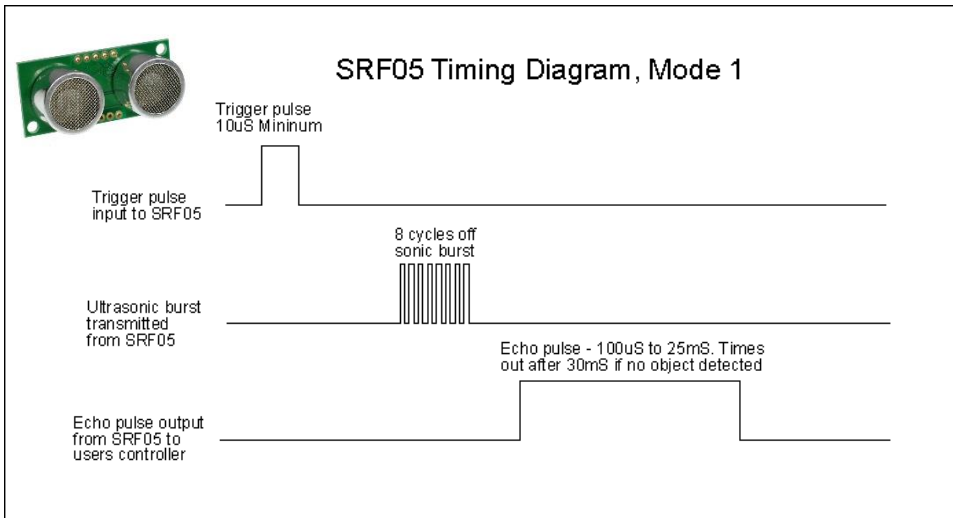


Per stimare distanze, velocità accelerazioni
Come trigger (in combinazione con un contatore)



Per misurare la temperatura di liquidi

Pinger ultrasuoni



Connections for 2-pin Trigger/Echo Mode (SRF04 compatible)

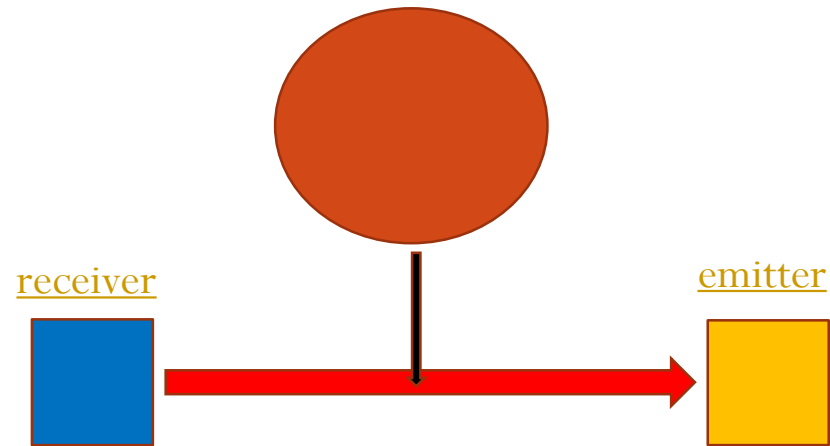
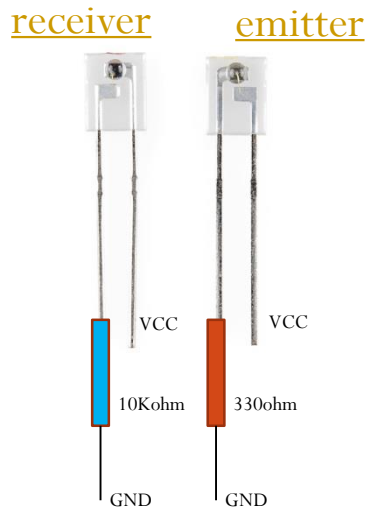
```
#define ECHOPIN 2
#define TRIGPIN 3

void setup(){
  Serial.begin(9600);
  pinMode(ECHOPIN, INPUT);
  pinMode(TRIGPIN, OUTPUT);
}

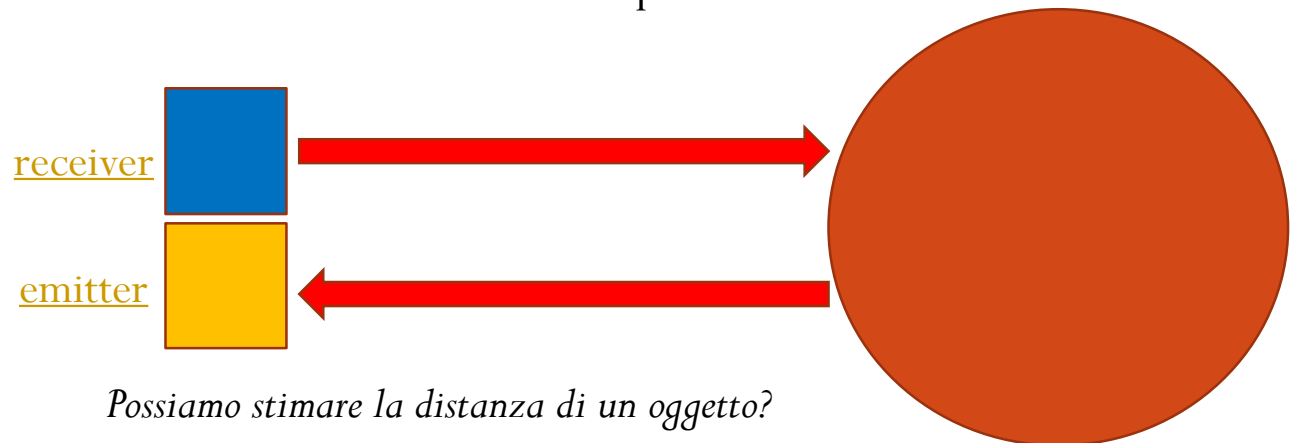
void loop(){
  // Set the trigger pin to low for 2µs
  digitalWrite(TRIGPIN, LOW);
  delayMicroseconds(2);
  // Send a 10µs high to trigger ranging
  digitalWrite(TRIGPIN, HIGH);
  delayMicroseconds(10);
  // Send pin low again
  digitalWrite(TRIGPIN, LOW);
  // Read in times pulse
  int distance = pulseIn(ECHOPIN, HIGH);
  // Calculate distance from time of pulse
  // cs=340 m/s
  distance = distance / 58;
  Serial.println(distance);
  delay(50); // Wait 50ms before next ranging
}
```

Coppia RX TX infrarosso

Sfruttiamo l'interruzione del fascio IR

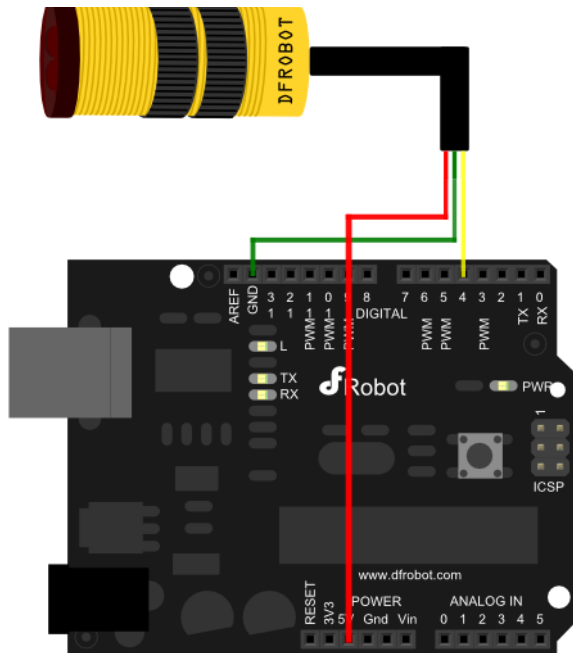


Sfruttiamo a riflessione di parte della radiazione IR emessa



Possiamo stimare la distanza di un oggetto?

Trigger infrarosso



```
const int InfraredSensorPin = 4  
const int LedDisp = 13;
```

```
void setup()
```

```
{  
  Serial.begin(57600);  
  Serial.println("Start!");  
  pinMode(InfraredSensorPin,INPUT);  
  pinMode(LedDisp,OUTPUT);  
  digitalWrite(LedDisp,LOW);  
}
```

```
void loop()
```

```
{  
  if(digitalRead(InfraredSensorPin) == LOW)  
    digitalWrite(LedDisp,HIGH);  
  else digitalWrite(LedDisp,LOW);  
  Serial.print("Infrared Switch Status:");  
  Serial.println(digitalRead(InfraredSensorPin),BIN);  
  delay(50);  
}
```

Temperatura con sonda DS18B20



[Robot-domestici](#)
[Robot Italy](#)

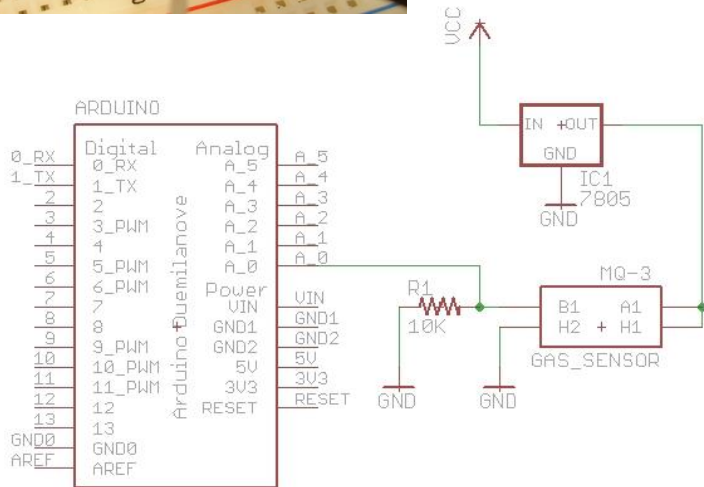
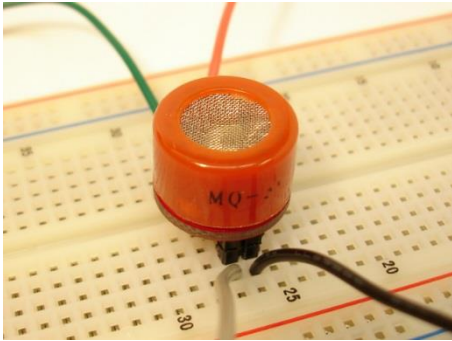
[Datasheet](#)
[Libreria onewire](#)

```
#include <OneWire.h>
#include <DallasTemperature.h>
// Data wire is plugged into pin 2 on the Arduino
#define ONE_WIRE_BUS 2
// Setup a oneWire instance to communicate with any OneWire devices (not
just Maxim/Dallas temperature ICs)
OneWire oneWire(ONE_WIRE_BUS);
// Pass our oneWire reference to Dallas Temperature.
DallasTemperature sensors(&oneWire);
void setup(void) {
  // start serial port
  Serial.begin(9600);
  Serial.println("Dallas Temperature IC Control Library Demo");

  // Start up the library
  // IC Default 9 bit. If you have troubles consider upping it 12.
  // Ups the delay giving the IC more time to process the temperature
  measurement
  sensors.begin();
}
void loop(void) {
  // call sensors.requestTemperatures() to issue a global temperature
  // request to all devices on the bus
  Serial.print("Requesting temperatures...");
  sensors.requestTemperatures(); // Send the command to get temperatures
  Serial.println("DONE");

  Serial.print("Temperature for Device 1 is: ");
  // Why "byIndex"? You can have more than one IC on the same bus
  // 0 refers to the first IC on the wire
  Serial.print(sensors.getTempCByIndex(0));
}
```


Gas sensor (alcohol)



<http://playground.arduino.cc//Main/MQGasSensors>

datasheet <http://www.pololu.com/file/0J310/MQ3.pdf>

calibrazione o correlazione? <http://nootropicdesign.com/projectlab/2010/09/17/arduino-breathalyzer/>

alcohol nel sangue: http://en.wikipedia.org/wiki/Blood_alcohol_content