

# Soirée Pratique

# Build your own robot

**Sensor reading**

**slides + extra information:**

**[www.ieee-sb-leuven.be/soireepratique2015](http://www.ieee-sb-leuven.be/soireepratique2015)**

# Information

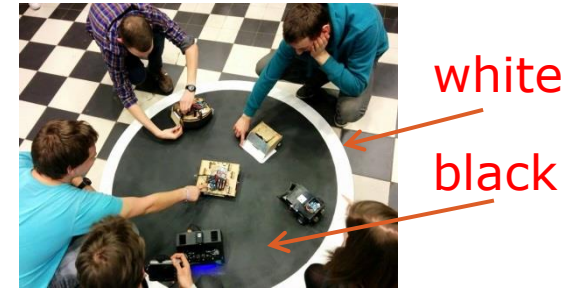
- <https://www.facebook.com/groups/1713711248854304/>
- <http://www.ieee-sb-leuven.be/soireepratique2015>
  
- Optical sensor (line detection):
  - <http://www.vishay.com/docs/83760/tcrt5000.pdf>
- Infrared distance sensor
  - [http://www.ieee-sb-leuven.be/sites/default/files/articlefiles/gp2y0a21yk\\_e.pdf](http://www.ieee-sb-leuven.be/sites/default/files/articlefiles/gp2y0a21yk_e.pdf)

# Schedule: sumo robot competition

- Tuesday 3/11 at 19h30:
  - first session sumo robots: introduction arduino, information on ordering parts
- Monday 16/11 at 19h30:
  - motor session: the “muscles”
- **Monday 30/11 at 19h30:**
  - sensor session: the “eyes”
- Second semester:
  - frame building: the “skeleton”
  - integration: sensors + motors + arduino + frame
  - advanced programming: the “brains”
  - training sessions
  - final competition

# Optical sensor

- For detecting white border of dohyo
- Vishay TCRT5000, short range distance sensor, **analog signal**
- Measures reflection of emitted light with photoresistor
- Module with TCRT5000, converts analog signal to **digital output**
- +5V = white, 0V = black
- Range: 0.2 to 15 mm

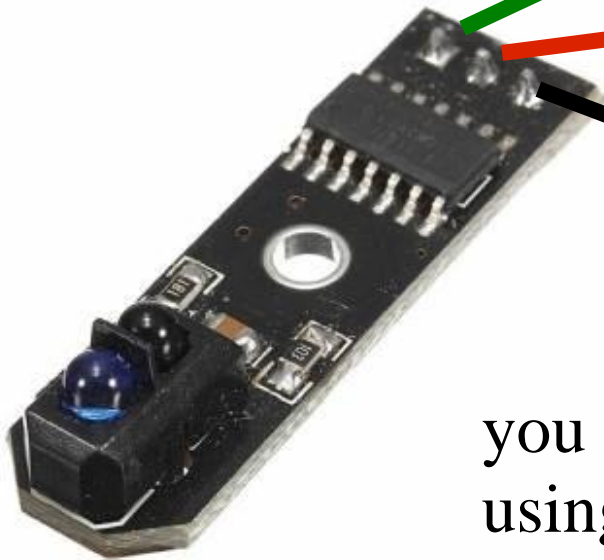


# Optical sensor connections

Arduino Input  
(for example: pin 2)

Arduino + 5V pin

Arduino GND pin



you can make connections to arduino using male/female wires:



# Example code: line detection

```
const int sensorPin = 2;    // the number of the line sensor pin
const int ledPin = 13;     // the number of the LED pin
// variables will change:
int sensorState = 0;      // variable for reading the sensor status

void setup() {
  pinMode(ledPin, OUTPUT);
  pinMode(sensorPin, INPUT);
}

void loop(){
  sensorState = digitalRead(sensorPin);
  if (sensorState == HIGH) {
    // turn LED on:
    digitalWrite(ledPin, HIGH);
  }
  else {
    // turn LED off:
    digitalWrite(ledPin, LOW);
  }
}
```

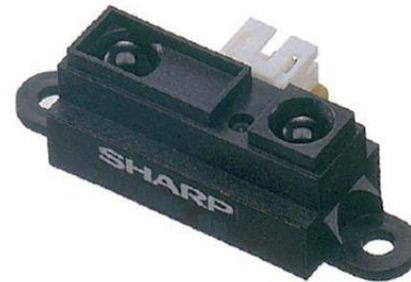
# Distance sensor

**SHARP**

GP2Y0A21YK0F

**GP2Y0A21YK0F**

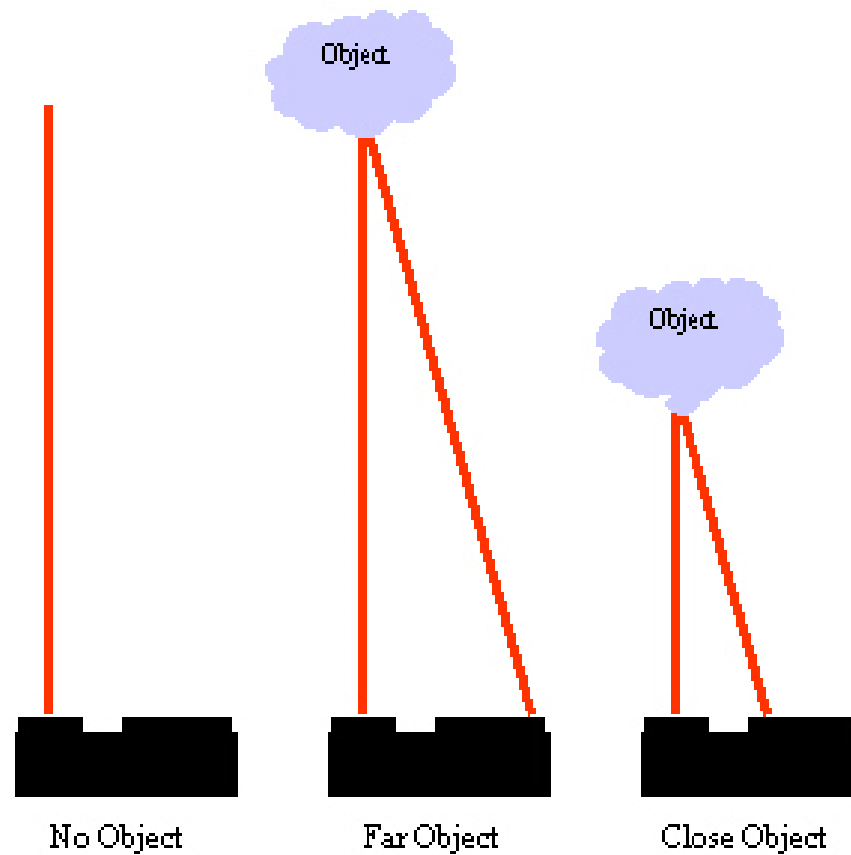
Distance Measuring Sensor Unit  
Measuring distance: 10 to 80 cm  
Analog output type



Datasheet: [http://www.ieee-sb-leuven.be/sites/default/files/articlefiles/gp2y0a21yk\\_e.pdf](http://www.ieee-sb-leuven.be/sites/default/files/articlefiles/gp2y0a21yk_e.pdf)

# Distance sensor

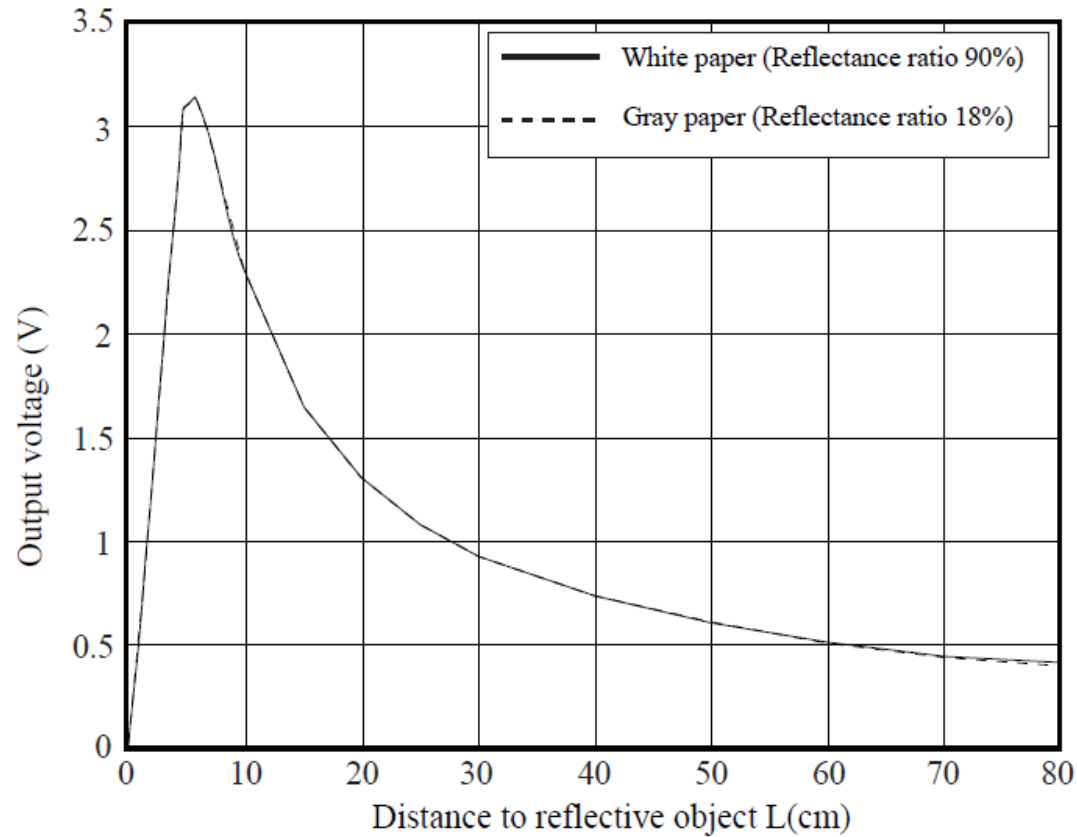
**infrared** emitter and detector



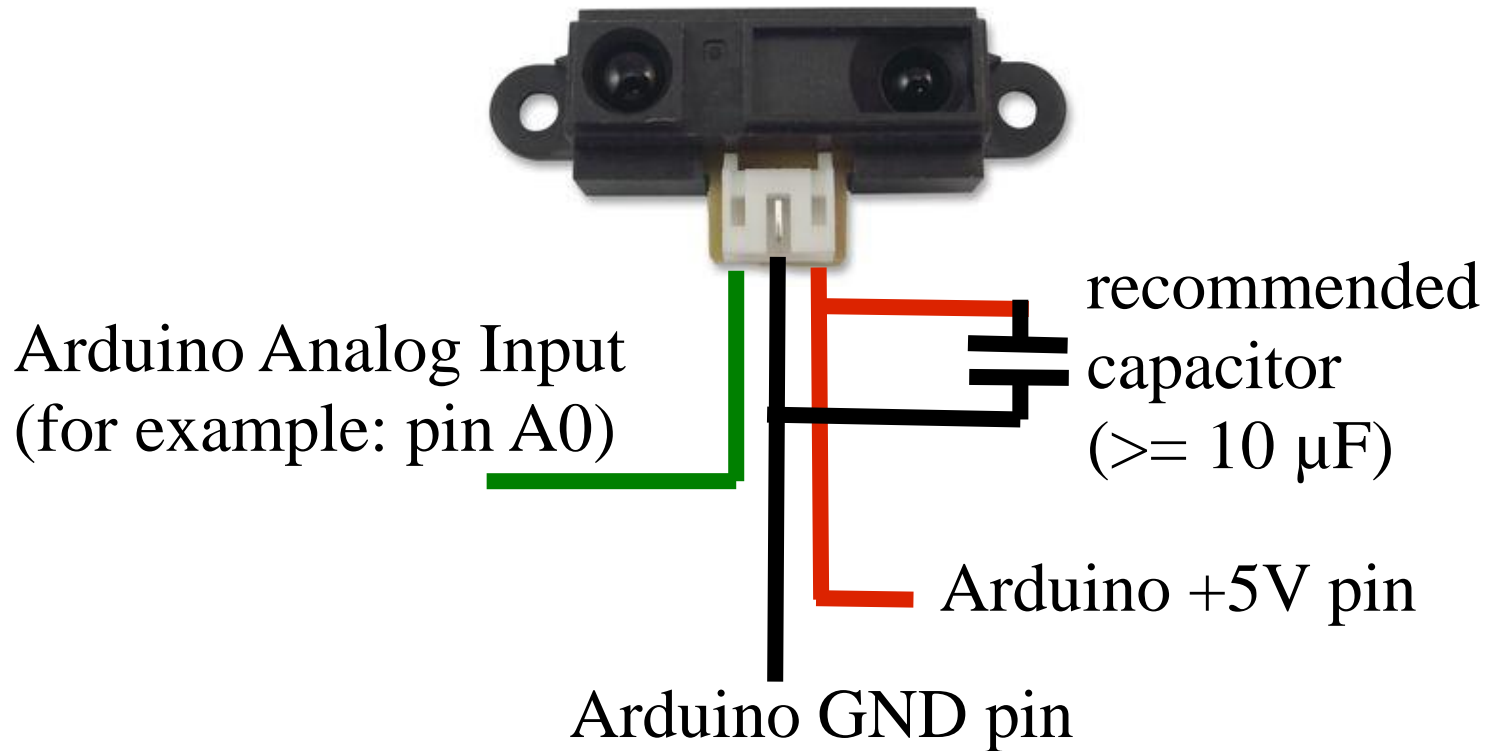


# Distance sensor: nonlinear relation

relation between output voltage and distance to object:



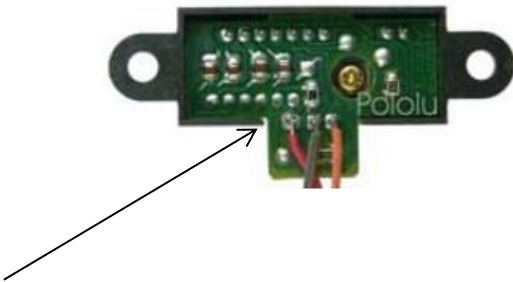
# Distance Sensor: connection



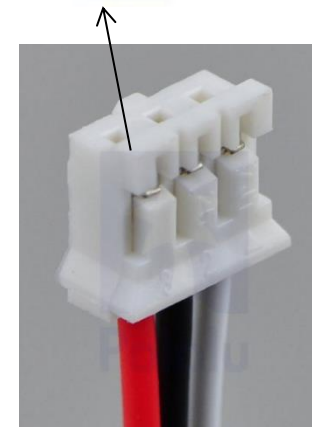
an extra capacitor may stabilize power supply

# Distance sensor: connection

- Two possibilities:



1) soldering directly



2) use special matching connector  
(<https://www.pololu.com/product/117>)  
about 1 dollar/cable

# Distance sensor: example code

- Start from arduino **analogRead** tutorials:
  - <http://arduino.cc/en/Tutorial/AnalogReadSerial>
  - To further reduce noise by software methods:
    - <http://arduino.cc/en/Tutorial/Smoothing>

# Sensors offered today

$$1 \times \text{[Image of sensor]} + 2 \times \text{[Image of sensor]} = \text{€}10$$

$$2 \times \text{[Image of sensor]} = \text{€}3$$

# Tips & tricks

- Have a look at the data sheets!  
(preferred orientation...)
- Low pass filtering/averaging of noisy sensor readings can be of interest
- Indicator leds when something is wrong/nothing is detected...

# Possible alternative sensors

## ■ ultrasonic sensor:

- order site:

<http://ledsee.com/index.php/sensors-others/ultrasonic-ranging-module-detail>

- datasheet:

<http://www.micropik.com/PDF/HCSR04.pdf>

- next session available for 2 euro

## ■ touch sensors

- contact detection

## ■ camera (...expensive)

- image processing

## ■ accelerometer

- collision detection / orientation detection



# Next Soiree Pratique

## ■ 2nd semester

- exact dates will be announced via bakske / facebook / flyers