



# Engineering Design – II (Buggy)

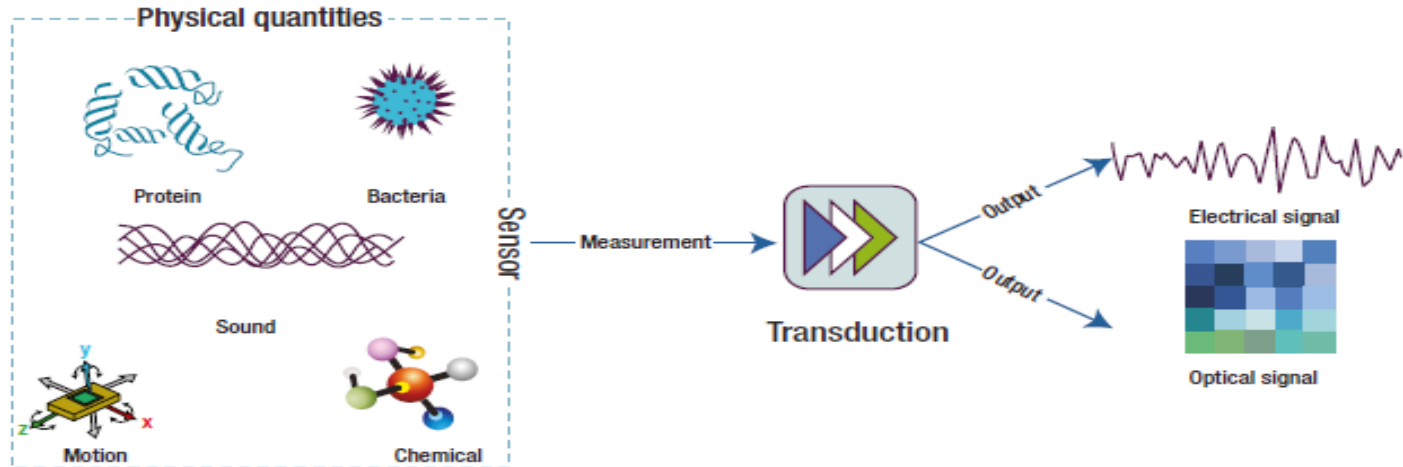
<https://sites.google.com/thapar.edu/buggy/home>

## Introduction to Sensors

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# What is a sensor?

- A device that receives a stimulus and responds with an electrical signal.
- A special type of transducer (device that converts one type of energy into another).



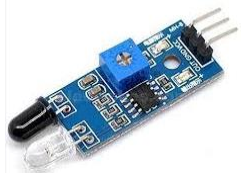
# Common Sensors

- ▶ Mechanical
  - Accelerometers: measure acceleration forces
  - Gyroscopes: useful for measuring or maintaining orientation.
- ▶ Optical
  - Photodetectors: Detect light
  - Infrared: emitting and/or detecting infrared radiation
  - Gas
  - Temperature
  - Magnetic

# Sensors to be used in this course

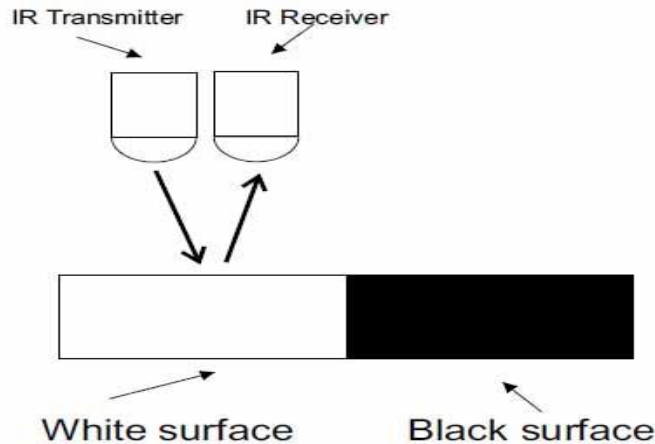
- Infra Red (IR) Sensor
- Ultrasonic Sensor
- Pulse Receiver
- Zig-Bee module (For inter buggy and Command centre communication)

# IR- SENSOR

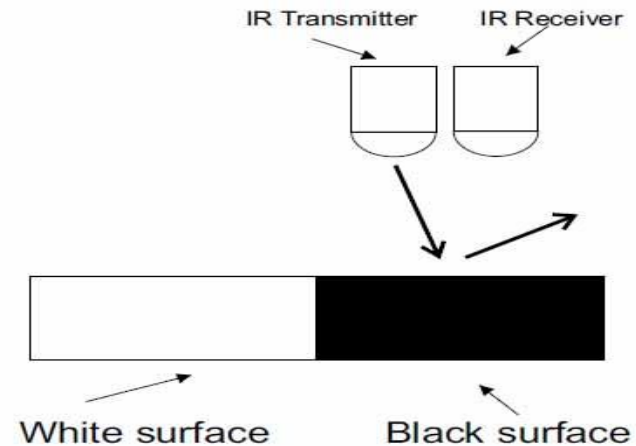


- ▶ IR sensor basically works on intensity of light
- ▶ RGB code for white is (255,255,255) and for Black is (0,0,0)

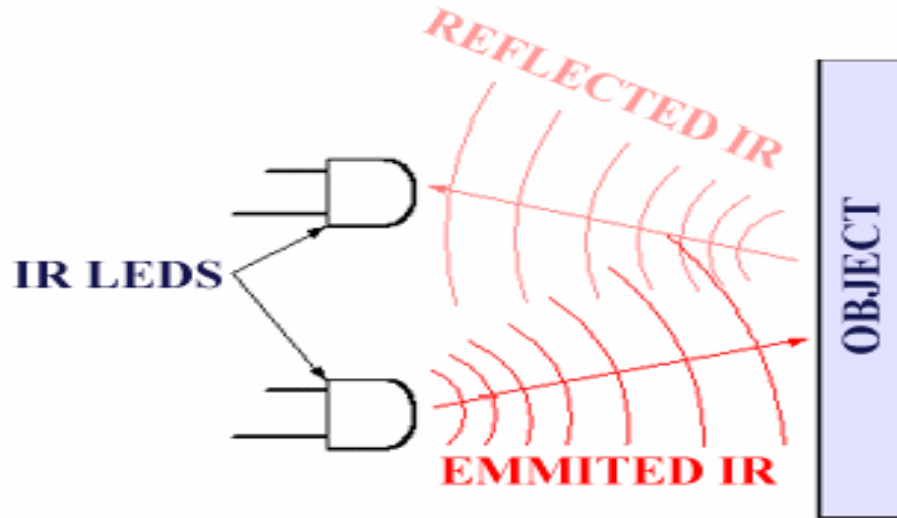
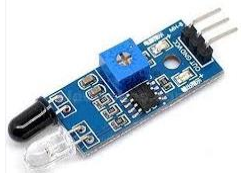
Light Reflected by White Surface



Light Reflected by Black Surface

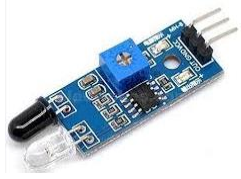


# IR LEDS



- ▶ IR-LED -Tx
- ▶ PD - Rx

## IR LED

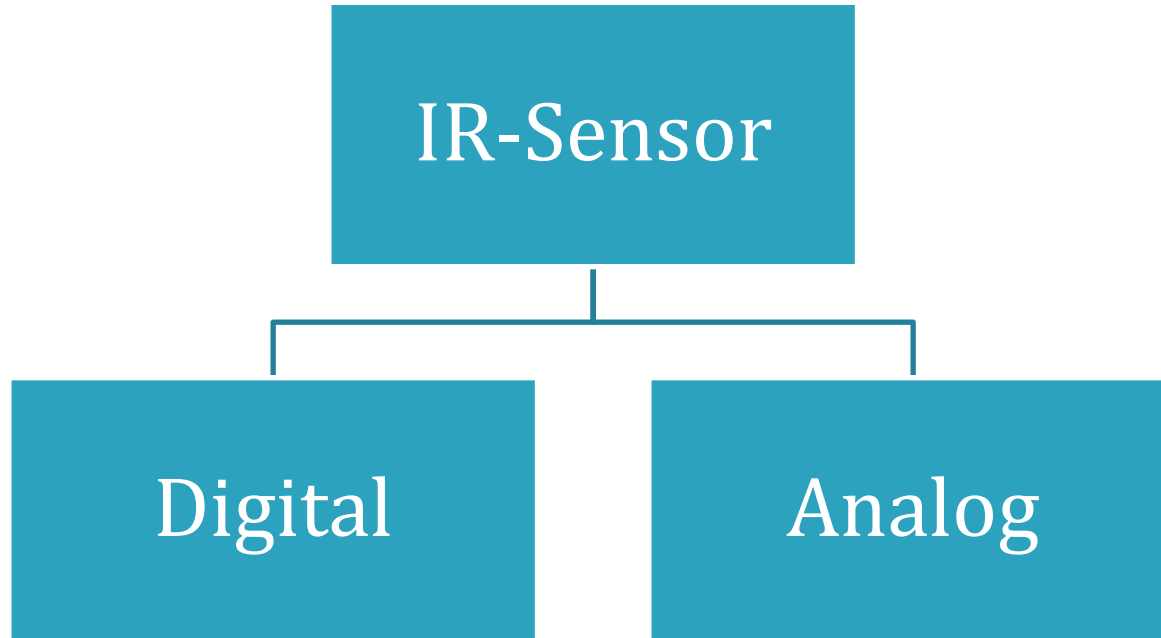
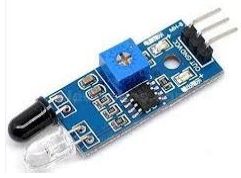


- ▶ IR-LED work similar to normal LED
- ▶ IR-LED transmit infrared light
- ▶ IR light is not visible to our naked eye
- ▶ IR light is detected by Photodiode

## PHOTODIODE (PD)

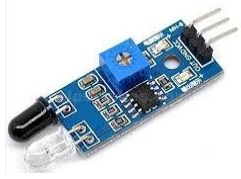
- ▶ How **PD** work ?
- ▶ PD generate the voltage depending on the intensity of light

# TYPES OF IR-SENSOR



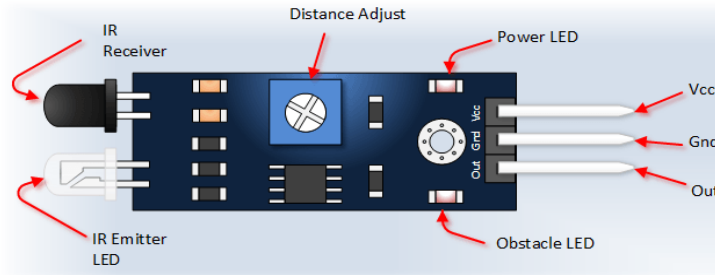
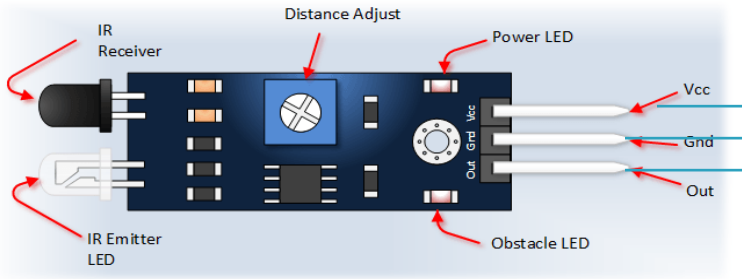


# TYPES OF IR-SENSOR

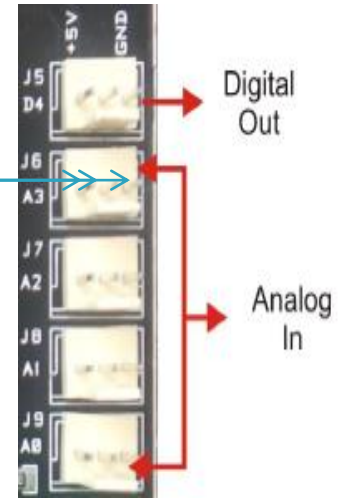


- ▶ **Digital** – In digital sensor output is digital (**High** or **Low**).
- ▶ **Analog** – In analog sensor detection depend on intensity of light received.

# IR-SENSOR MODULE PIN-OUT

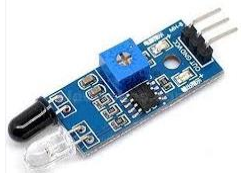


## ANALOG INPUT PORT IN BUGGY



In some module output is middle pin while in other its sideline pin. Extra caution is required to attach these pins to Arduino.

# IR SENSOR IN ARDUINO



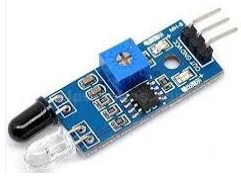
```
int r1;  
int r2;  
int r3;  
int r4;  
void setup() {  
  Serial.begin(9600);  
  pinMode(A1,INPUT);  
  pinMode(A3,INPUT);  
}
```

```
void loop() {  
  r1=analogRead(A1);  
  r2=analogRead(A3);  
  r3=digitalRead(A1);  
  r4=digitalRead(A3);  
  Serial.println(r1);  
  Serial.print("\t");  
  Serial.println(r2);  
  Serial.print("\t");  
  Serial.println(r3);  
  Serial.print("\t");  
  Serial.println(r4);  
}
```

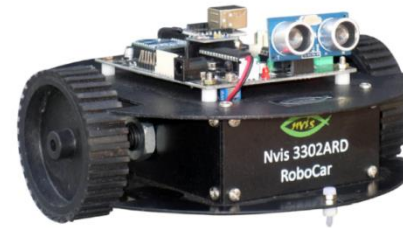
```
if(r1==LOW&&r2==LOW)
{
    digitalWrite(pin5,HIGH);
    digitalWrite(pin6,LOW);
    digitalWrite(pin7,LOW);
    digitalWrite(pin8,HIGH);

}
if(r1==HIGH&&r2==LOW)
{
    digitalWrite(pin5,LOW);
    digitalWrite(pin6,HIGH);
    digitalWrite(pin7,HIGH);
    digitalWrite(pin8,LOW);

}
```



Forward



Right



```
if(r1==LOW&&r2==HIGH)
{
    digitalWrite(pin5,HIGH);
    digitalWrite(pin6,LOW);
    digitalWrite(pin7,LOW);
    digitalWrite(pin8,HIGH);
}
if(r1==HIGH&&r2==HIGH)
{
    digitalWrite(pin5,HIGH);
    digitalWrite(pin6,LOW);
    digitalWrite(pin7,LOW);
    digitalWrite(pin8,HIGH);
}
}
```



Left



Forward



**Thanks**