IR Sensor Documentation - Raspberry Pi 5 Integration

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1 Description

An Infrared (IR) sensor is an electronic device that emits infrared light and detects its reflection to sense the presence of objects or surface types (light/dark). It is commonly used in two ways:

- **Line Detection:** Follows black or white tracks, used in robotic pathfinding.
- **Proximity Detection:** Detects nearby obstacles or objects without contact.

2 Applications

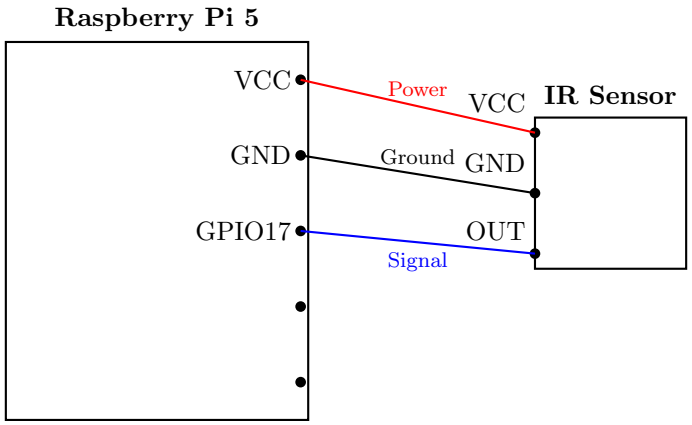
- Line-following robots
- Proximity and obstacle avoidance systems
- Automation and safety in industrial systems

3 Working Principle

IR sensors use an IR LED to emit light, and a photodiode or phototransistor to detect reflections. Light-colored surfaces reflect more IR light, producing a high signal, while dark surfaces absorb IR light, producing a low signal. The sensor typically outputs a **digital HIGH or LOW signal**.

4 Wiring Diagram

IR Sensor Pin	Raspberry Pi Pin	Function
VCC	3.3V or 5V	Power
GND	GND	Ground
OUT	GPIO17 (or any input)	Digital Output



5 Libraries Used

Python: RPi.GPIO

This library allows GPIO pin configuration and digital input/output operations.

- Setup with: `import RPi.GPIO as GPIO`
- Set pin mode: `GPIO.setmode(GPIO.BCM)`
- Read value: `GPIO.input(17)`

C: wiringPi

`wiringPi` is a C library for Pi GPIO control.

- Setup: `wiringPiSetup()`
- Set pin mode: `pinMode(0, INPUT)`
- Read value: `digitalRead(0)`

6 Python Example

```
import RPi.GPIO as GPIO
import time

SENSOR_PIN = 17

GPIO.setmode(GPIO.BCM)
GPIO.setup(SENSOR_PIN, GPIO.IN)

try:
while True:
if GPIO.input(SENSOR_PIN):
print("No obstacle detected")
else:
print("Obstacle detected")
time.sleep(0.5)
except KeyboardInterrupt:
GPIO.cleanup()
```

7 C Example

```
#include <wiringPi.h>
#include <stdio.h>

#define SENSOR_PIN 0 // wiringPi pin 0 = BCM 17

int main(void) {
        wiringPiSetup();
        pinMode(SENSOR_PIN, INPUT);

        while (1) {
                int value = digitalRead(SENSOR_PIN);
                if (value == HIGH)
```

```
                printf("No obstacle detected\n");
                else
                printf("Obstacle detected\n");
                delay(500);
        }

        return 0;
}
```

8 Conclusion

The IR sensor is a simple, responsive, and low-cost component ideal for basic object detection tasks. It provides an easy introduction to GPIO interaction on the Raspberry Pi using both C and Python.