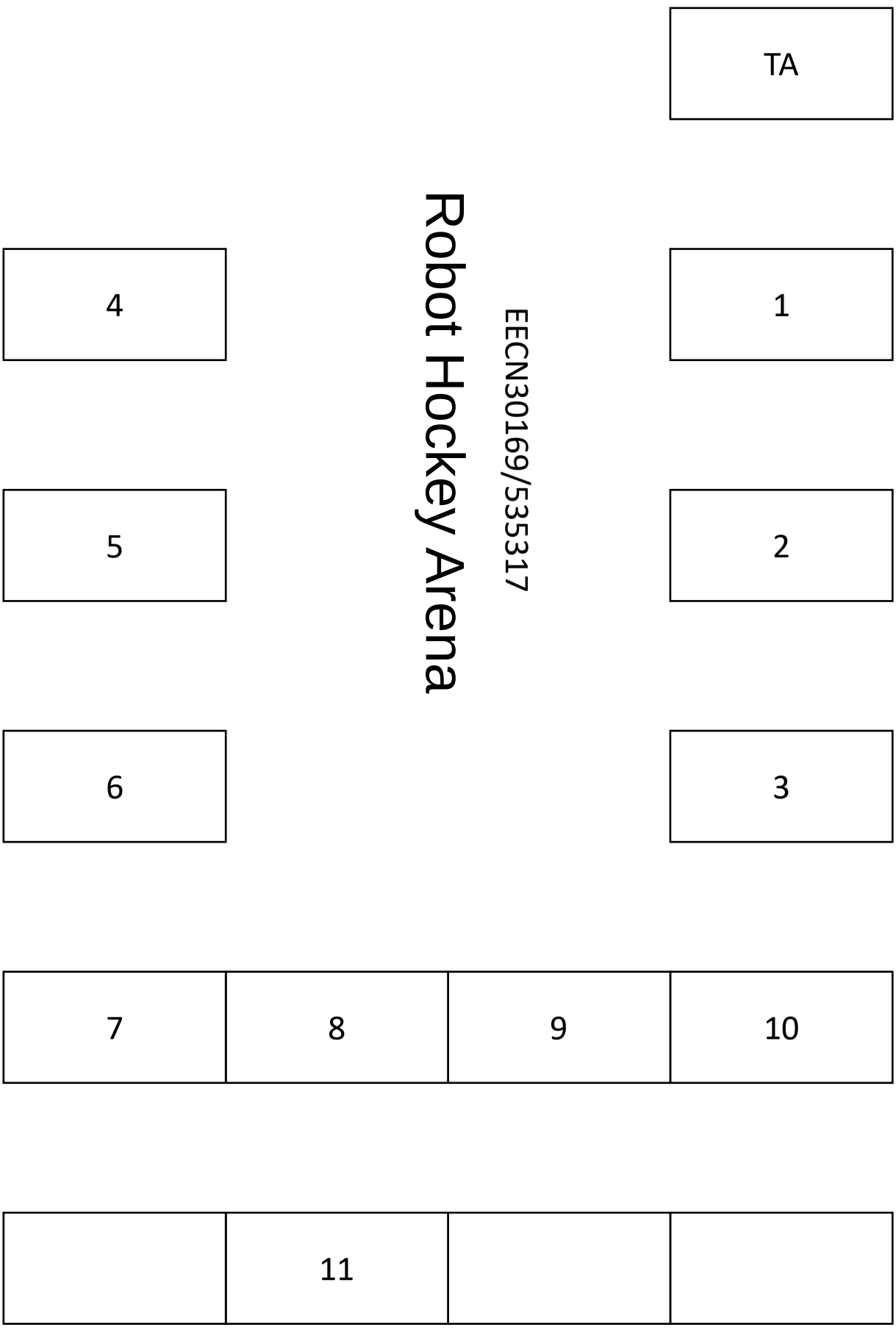
Floor plan EE632



Checkpoint #3
Obstacle Avoidance

Demo Due : 10/25/2024

Report Due：11/1/2024

Outline

- CP 3 Supplies Part List
- Checkpoint #3 Assignment
- Hardware Configuration
- GPIO of Raspberry Pi
- Light Sensor and Touch Sensor

CP 3 Supplies Part List

Checkpoint#3 Material List	
1	Photo resistor sensor x1
2	Touch sensors x3
3	47KΩ resistance x3
4	Breadboard
Team _____	

1

2

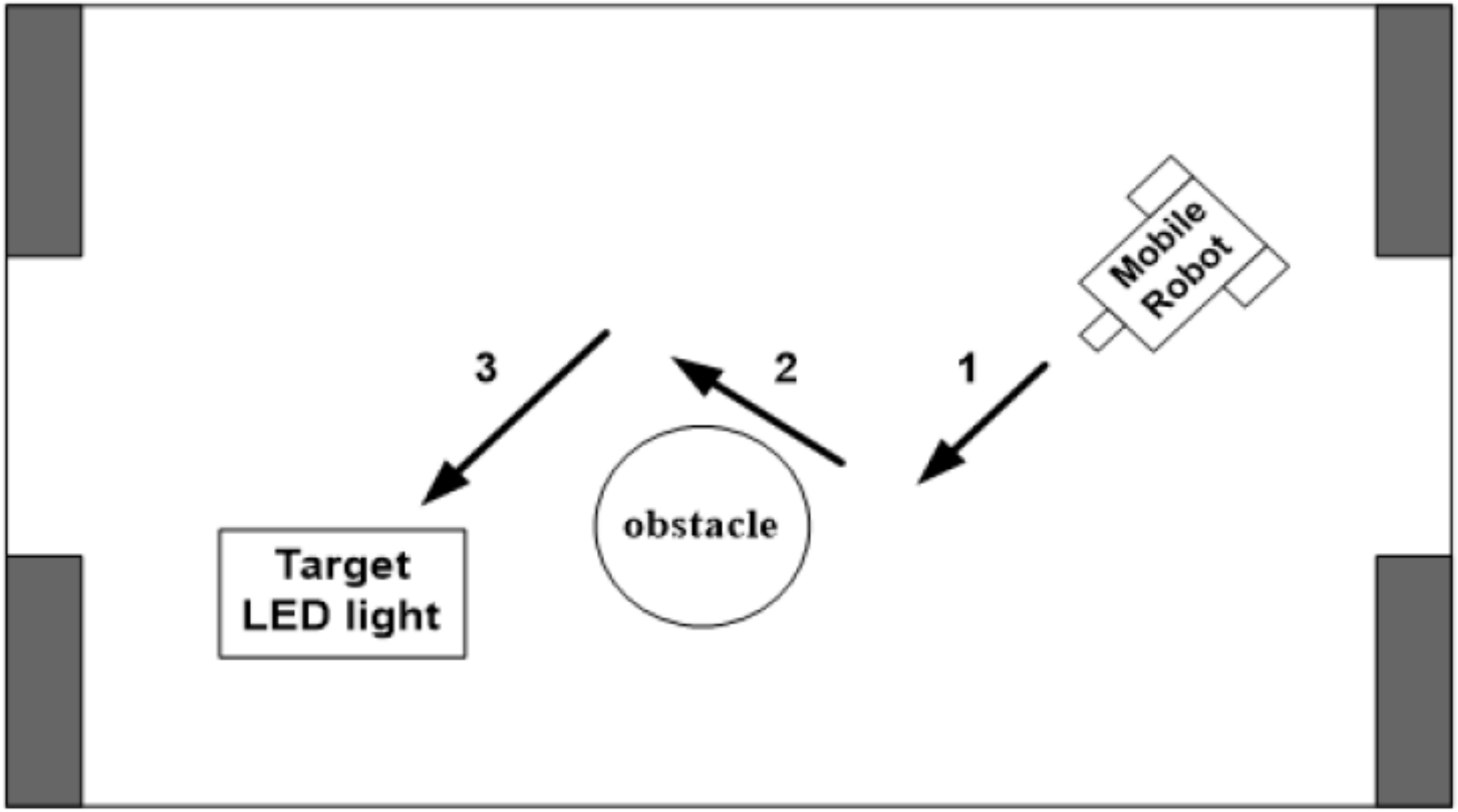
Checkpoint #3 Assignment

- The purpose of this checkpoint is to make sure you can control your robot to move in the arena.
- The mobile robot needs to detect an obstacle in front of it and take action to avoid the obstacle in order to continue its motion.
- Finally, your robot can find the assigned target. In this checkpoint, the target is a ring of LED lights.

Checkpoint #3 Grading Policy

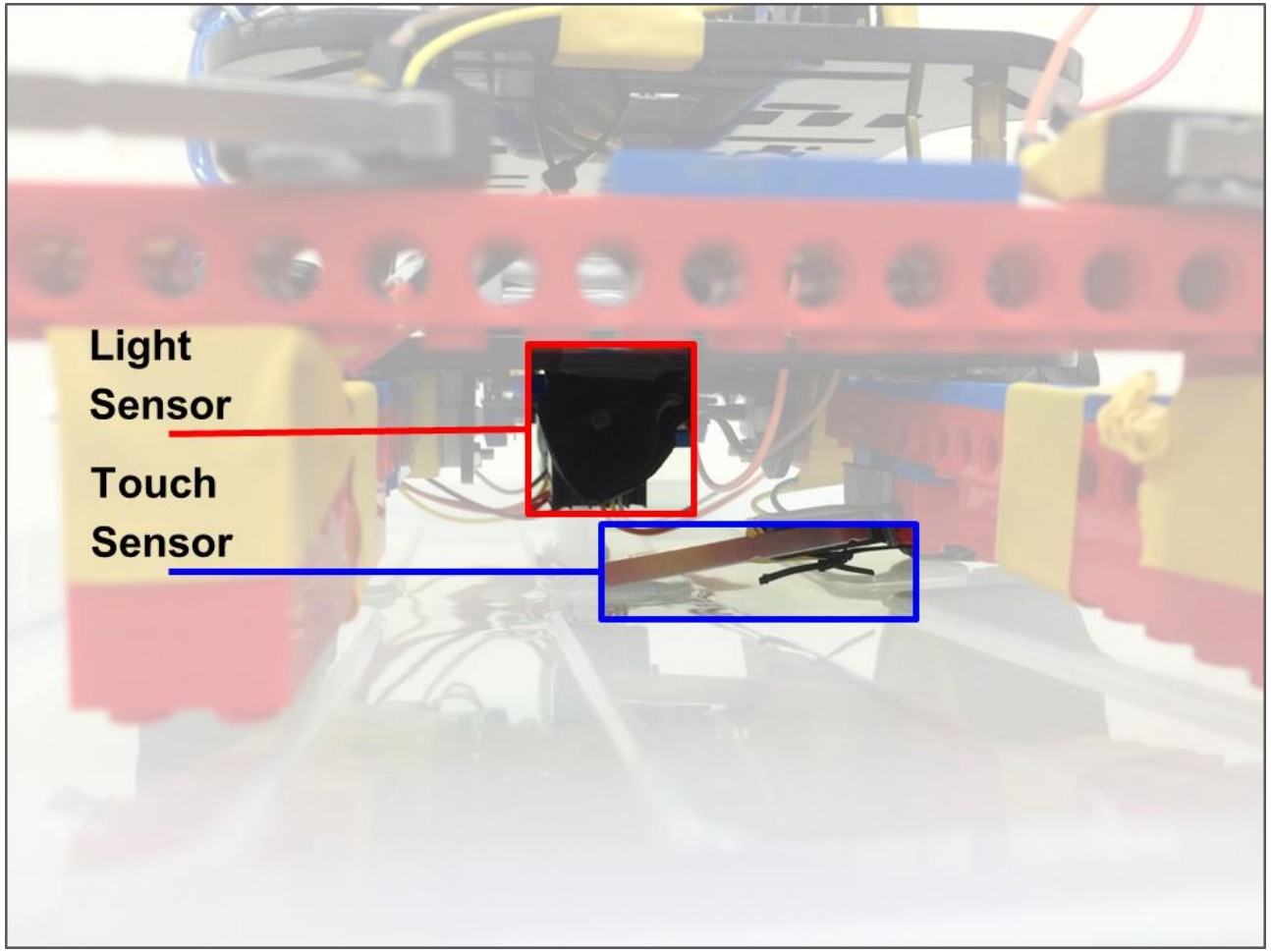
1. Please start to arrange the space configuration of your robot, make sure every and each component such as circuit boards and sensors is settled **firmly and stable** on the chassis and all robot functions will not be affected by wires. **(15%)**
2. Make sure that your robot can move freely. It means that you do not need to use keyboard to control it anymore. **(20%)**
3. Integrate a light sensor and three touch sensors to the robot and program your robot to find and move toward the LED light. **(30%)**
4. The time it takes for your robot to find and touch the LED light (in 90s). **(35%)**

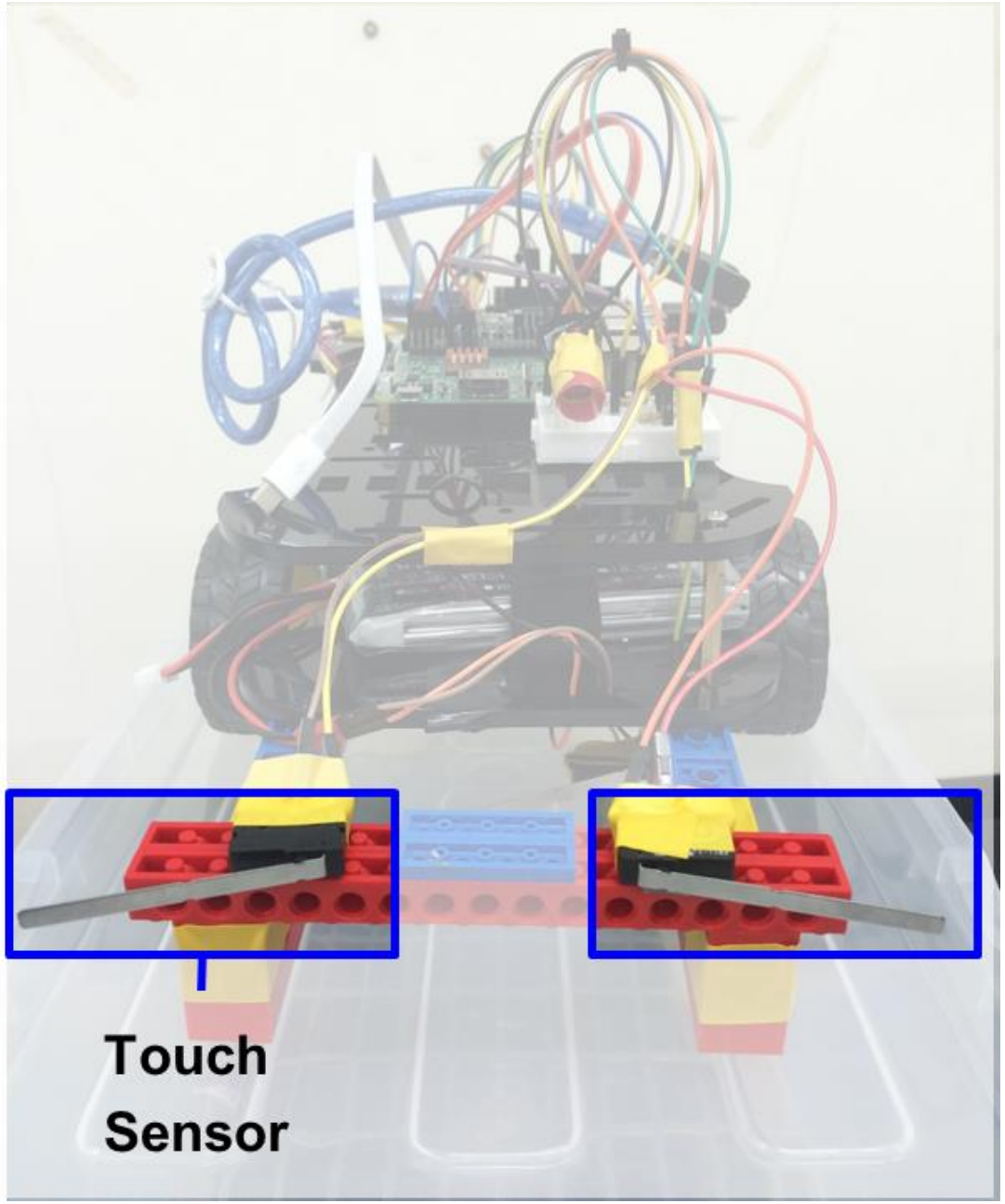
Checkpoint #3



Arena

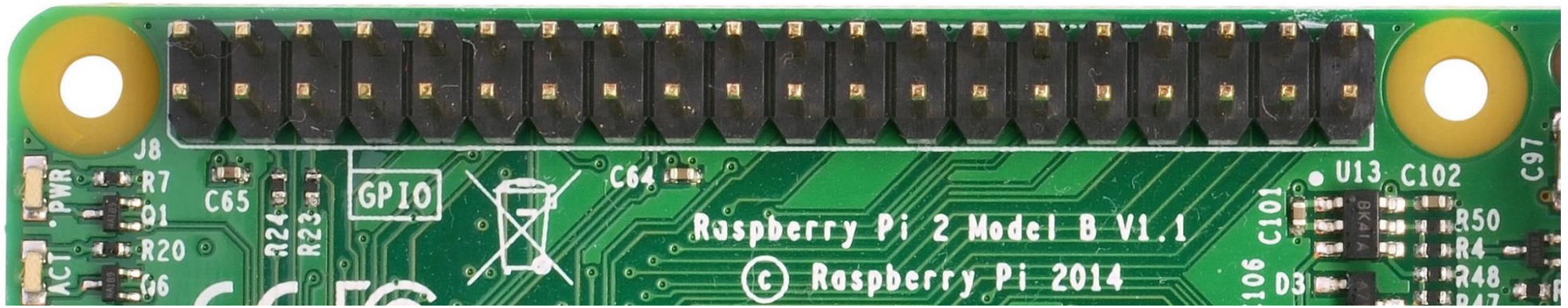
Hardware Configuration

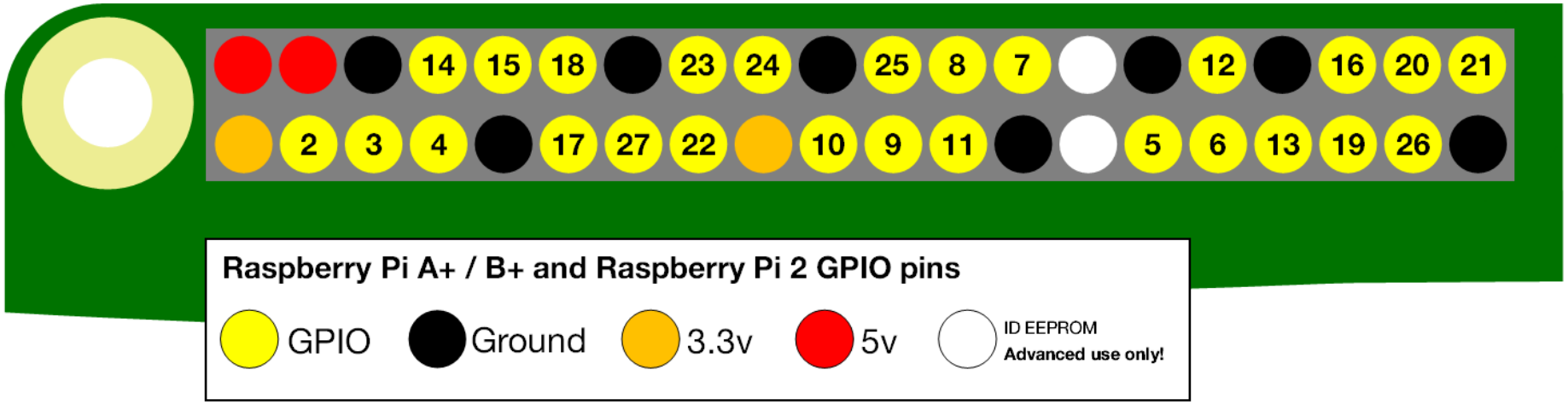




GPIO of Raspberry Pi

- GPIO: General-Purpose I/O

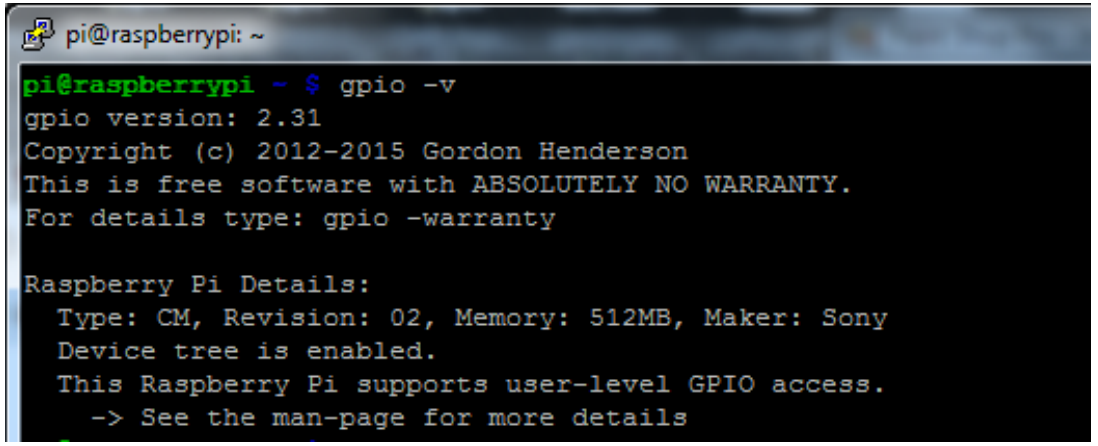




Wiring Pi: GPIO Interface Library

- WiringPi is an attempt to bring Arduino-wiring-like simplicity to the Raspberry Pi.
- The goal is to have a single common platform and set of functions for accessing the Raspberry Pi GPIO across multiple languages.
- Installation:
  - C: **$ sudo apt-get install wiringpi**

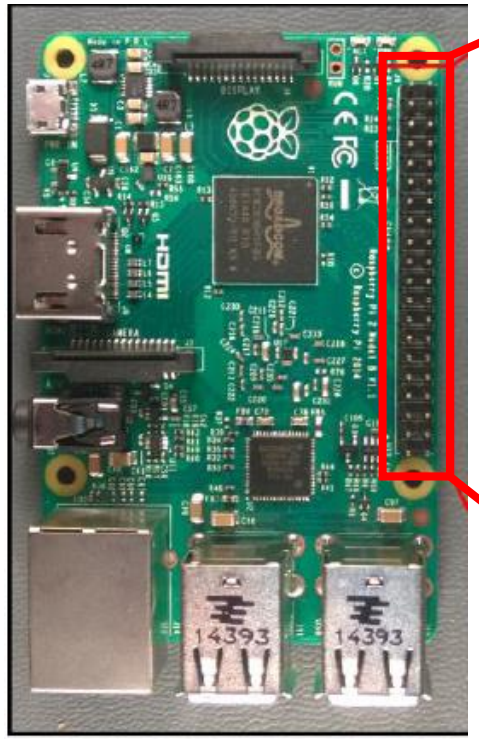
    $ sudo apt-get install libwiringpi2-dev
  - Python: **$ sudo pip install wiringpi2**
- Check：
  - **$ gpio -v**



- Reference: http://wiringpi.com/download-and-install/

WiringPi's Pin Number

- Prints a table of WiringPi's Pin number on terminal.
  $ gpio readall
- Website Reference: https://pinout.xyz/pinout/wiringpi



WiringPi Pin	Name	Header		Name	WiringPi Pin
	3.3v	1	2	5v	
8	SDA	3	4	5v	
9	SCL	5	6	0v	
7	GPIO7	7	8	TxD	15
	0v	9	10	RxD	16
0	GPIO0	11	12	GPIO1	1
2	GPIO2	13	14	0v	
3	GPIO3	15	16	GPIO4	4
	3.3v	17	18	GPIO5	5
12	MOSI	19	20	0v	
13	MISO	21	22	GPIO6	6
14	SCLK	23	24	CE0	10
	0v	25	26	CE1	11
WiringPi Pin	Name	Header		Name	WiringPi Pin

Example Code

- Sensor‘s pin is connected to Header pin 15 and the WiringPi pin is 3.
- Include the Head file

  #include <wiringPi.h>
- Library setup function.

  wiringPiSetup () ;
- Setup pin mode

  int sensor_pin = 3; //wiringpi’s pin

  pinMode (sensor_pin, INPUT) ;
- Read pin’s data

  sensor_data = digitalRead(sensor_pin) ;

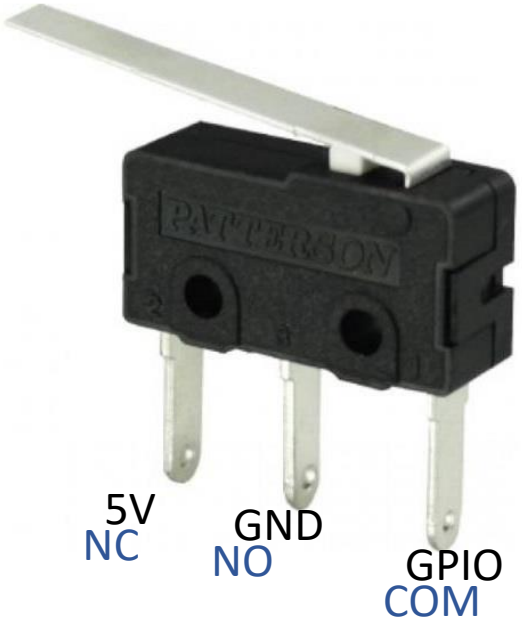
WiringPi Pin	Name	Header		Name	WiringPi Pin
	3.3v	1	2	5v	
8	SDA	3	4	5v	
9	SCL	5	6	0v	
7	GPIO7	7	8	TxD	15
	0v	9	10	RxD	16
0	GPIO0	11	12	GPIO1	1
2	GPIO2	13	14	0v	
3	GPIO3	15	16	GPIO4	4
	3.3v	17	18	GPIO5	5
12	MOSI	19	20	0v	
13	MISO	21	22	GPIO6	6
14	SCLK	23	24	CE0	10
	0v	25	26	CE1	11
WiringPi Pin	Name	Header		Name	WiringPi Pin

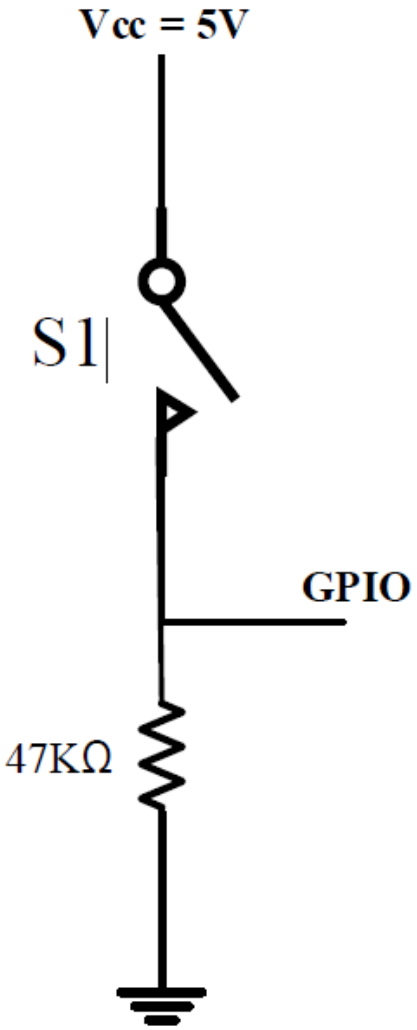
Photo-Resistor Light Sensor

- Use Photo resistor sensor to detect the LED light.
- V_{cc} connect to Pi3's 5V.
- GND connect to Pi3's GND.
- D_0 connect to GPIO Pin.
- You can change the Variable Resistor to increase the sensitivity of the sensor. If the brightness is bright enough, D_0 will be 0.

Touch Sensor

- Integrate touch sensors to avoid an obstacle and walls of the area.





Deadline

- Checkpoint#3 Demo : 10/25
- Checkpoint #3 Report : 11/1