Floor plan EE632

TA

1

2

3

10

12

EECN30169/535307

Robot Hockey Arena

9

13

8

4

5

6

7

11

Checkpoint #2

Demo Due : 10/21/2022

Report Due：10/28/2022

Outline

- CP2 Supplies

- Motor control system

- Connections of L298N

- Motor with Encoder

- Checkpoint #2 Assignment

CP #2 Supplies

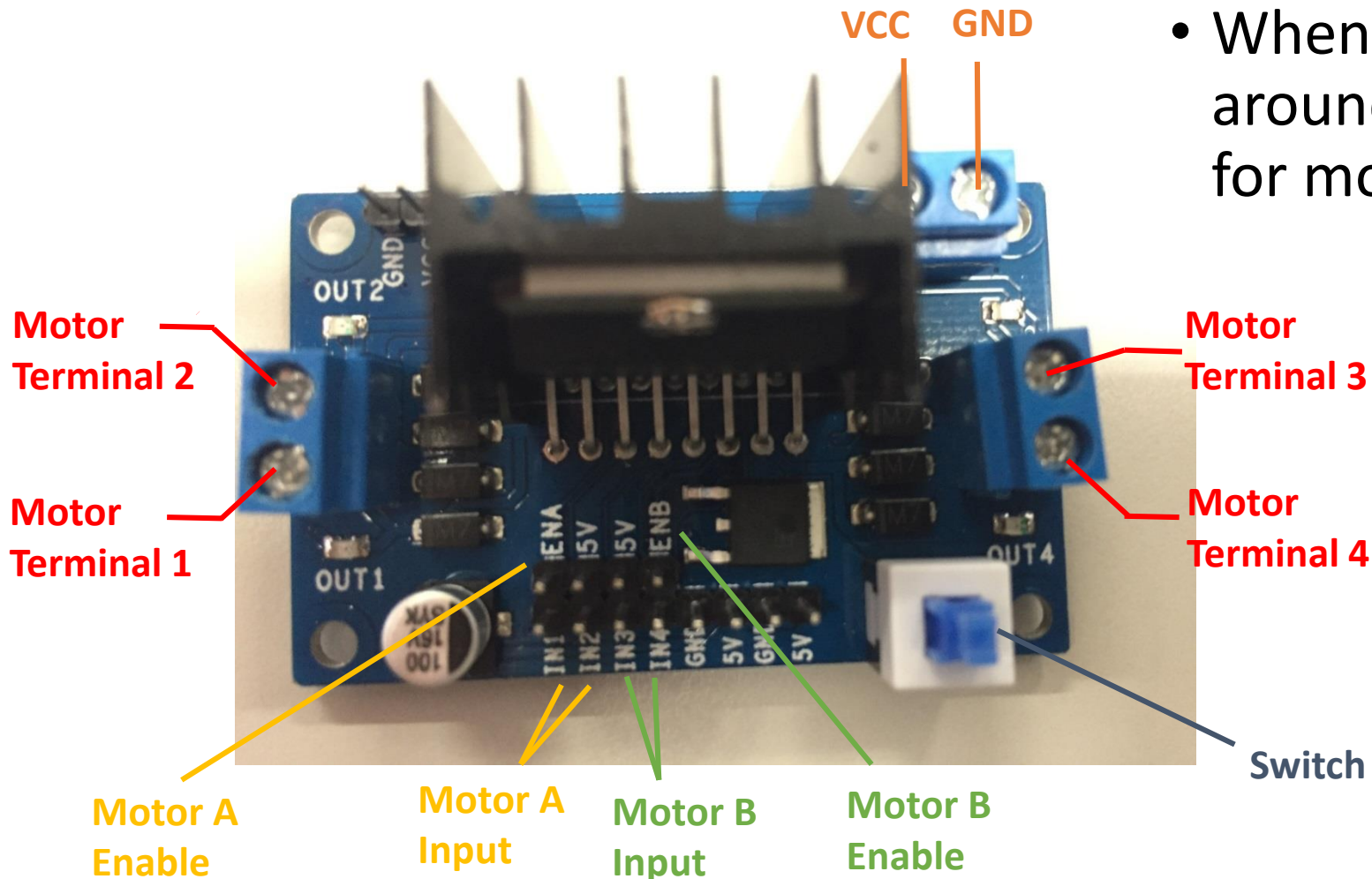| Checkpoint#2 Material List			
1	Chassis	5	L298N Motor driver module
2	DC Motor x 2	6	Li-po battery
3	Wheel x 2	7	A pack of screws
4	Caster wheel	8	Screwdriver
Team _____			

Motor with Encoder

- Two gear head motors are used for the robot. The motor is with an encoder.

- The motor is with a **120:1** gearbox and an integrated quadrature encoder, which provides **16** pulse counts per revolution.

- So, it gives **1920** pulse counts for one turn of the wheel shaft.
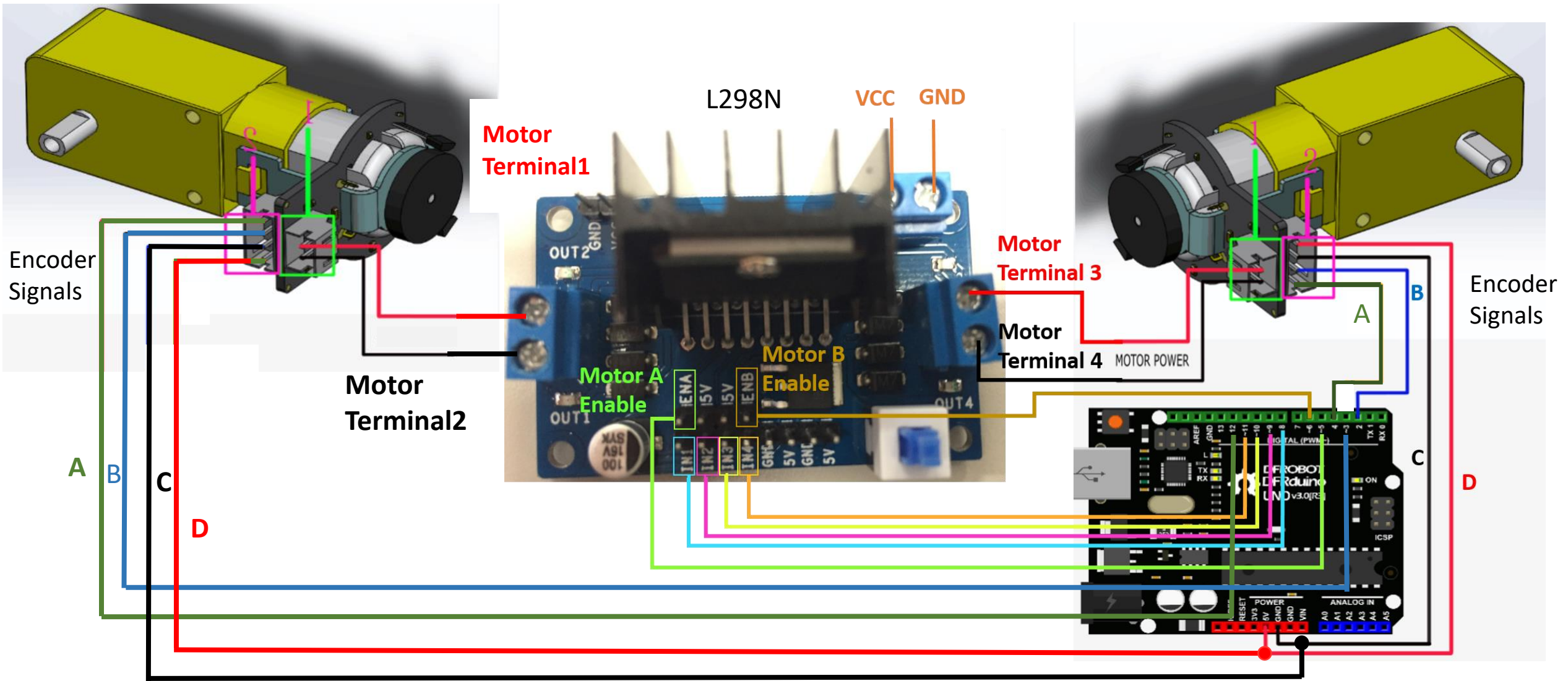   - 120 x 16 = 1920

Encoder
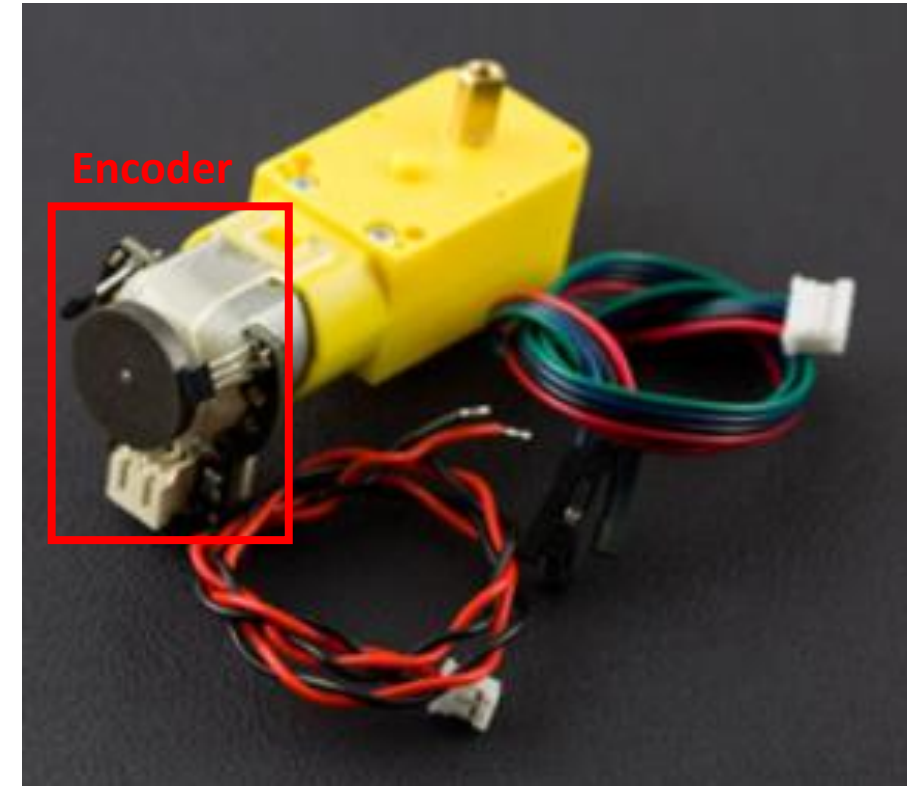
L298N H-Bridge

- Double H-bridge driver module
- When the input voltage is given around 7V to 12V, can supply 5V for motors

- IN1, IN2, IN3 and IN4 : High/Low pulse for rotation direction
- ENA, ENB: PWM for speed control

VCC   GND

Motor Terminal 2
Motor Terminal 1
Motor Terminal 3
Motor Terminal 4

Motor A Enable
Motor A Input
Motor B Input
Motor B Enable

Switch

Motor control system

Connections for L298N and Encoders

L298N

L298n	Arduino	Description
ENA	6	Motor A PWM
ENB	5	Motor B PWM
IN1	10	Motor A direction
IN2	11	Motor A direction
IN3	8	Motor B direction
IN4	9	Motor B direction

Encoder

Pin	Description
A	Encoder A phase output
B	Encoder B phase output
C	Encoder supply GND
D	Encoder power supply 4.5-7.5V

Motor with Encoder

- Interrupts are useful for making things happen automatically in microcontroller programs and can help solve timing problems.

- using an interrupt can free the microcontroller to get some other work done while not missing the input.

- Interrupt Port with Different Board

	Board	Int.0	Int.1	Int.2	Int.3	Int.4	Int.5
attachInterrupt()	**Uno**,Ethernet	2	3				
	Mega2560	2	3	21	20	19	18
	Leonardo	3	2	0	1	7	

Control Programming

```
analogWrite(6, enA);
digitalWrite(10, in1);
digitalWrite(11, in2);
analogWrite(5, enB);
digitalWrite(8, in3);
digitalWrite(9, in4);
```

```
void EncoderInit()
{
  Direction_L = true; //default -> Forward
  Direction_R = true; //default -> Forward
  pinMode(encoder0pinB_L, INPUT);
  attachInterrupt(0, wheelSpeed_L, CHANGE);
  pinMode(encoder0pinB_R, INPUT);
  attachInterrupt(1, wheelSpeed_R, CHANGE);
}

void wheelSpeed_L()
{
  int Lstate_L = digitalRead(encoder0pinA_L);
  if ((encoder0PinALast_L == LOW) && Lstate_L == HIGH)
  {
    int val_L = digitalRead(encoder0pinB_L);
    if (val_L == LOW && Direction_L)
    {
      Direction_L = false; //Reverse
    }
    else if (val_L == HIGH && !Direction_L)
    {
      Direction_L = true; //Forward
    }
  }
  encoder0PinALast_L = Lstate_L;

  if (!Direction_L)
    duration_L++;
  else
    duration_L--;
}
```

Checkpoint #2 Assignment

- Purpose:
  Motion Control of basic DC motors by encoder with Raspberry Pi and Arduino.

- Tasks:
  To control two motors with encoder signals.
  - Move forward. (25%)
  - Move backward. (25%)
  - Turn right. (15%)
  - Turn left. (15%)
 - How straight the robot can move when moving forward. (20%)

Checkpoint #2

You should send the right wheel and left wheel PWM signal command on the RPI, then send the command to Arduino to control motors in each task.

```
setting /run_id to 0fc9125a-1011-11e8-9501-b827ebaa4d9b
process[rosout-1]: started with pid [2832]
started core service [/rosout]
process[connect_arduino-2]: started with pid [2835]
process[checkpoint2-3]: started with pid [2836]
user's right is 120
user's left is 120
user's right is -100
user's left is 50
user's right is 100
user's left is 200
user's right is 0
user's left is 0
user's right is 100
user's left is 100
user's right is -50
user's left is 50
user's right is 0
user's left is 0
```

Checkpoint #2 Task 5 Scoring Rules

- Your mobile robot will move forward 3 meters until the caster wheel passes the finish line. You have two chances to challenge.

- We will measure how far the caster wheel deviate from the center point of the finish line.

- One point will be deducted for every deviation of 1 cm.

- If the deviation is over 20 cm, you will get 0 point in task 5.

20 cm

20 cm

3 m
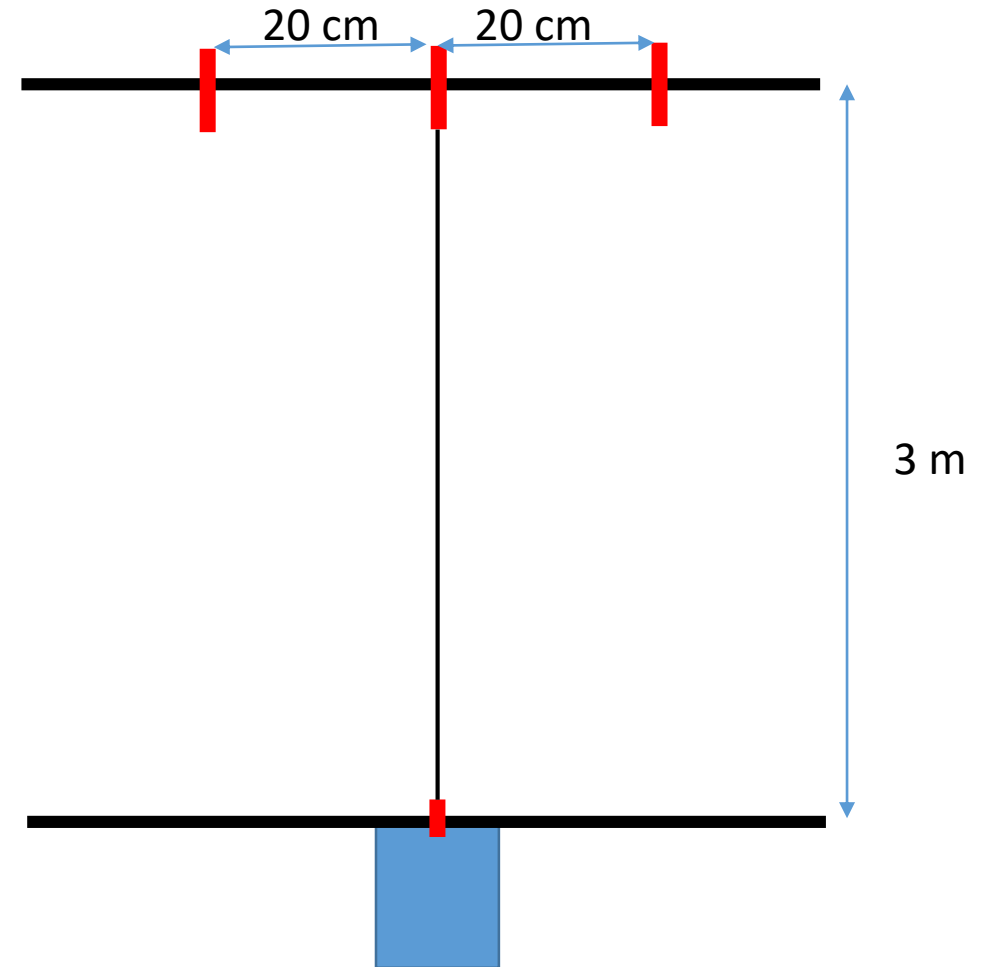
Reference

- Micro DC Motor with Encoder
  - https://wiki.dfrobot.com/Micro_DC_Motor_with_Encoder-SJ01_SKU__FIT0450

- L298n
  - https://kknews.cc/zh-tw/education/b5nm256.html

- Digital Pins With Interrupts
  - https://www.arduino.cc/reference/en/language/functions/external-interrupts/attachinterrupt/

CP 1 Demo Timetable

Wi-Fi1

- SSID：iscilab621-new2.4
- PWD：iscilab621

Wi-Fi2

- SSID：mobile_robot
- PWD：eelab632

Group A 09:30 ~ 10:30	Group B 10:30 ~ 12:00
Team 1	Team 8
Team 2	Team 9
Team 3	Team 10
Team 4	Team 11
Team 5	Team 12
Team 6	Team 13
Team 7	