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# Mobile Robot Platform Assembly


Department of Mechanical Engineering
Massachusetts Institute of Technology

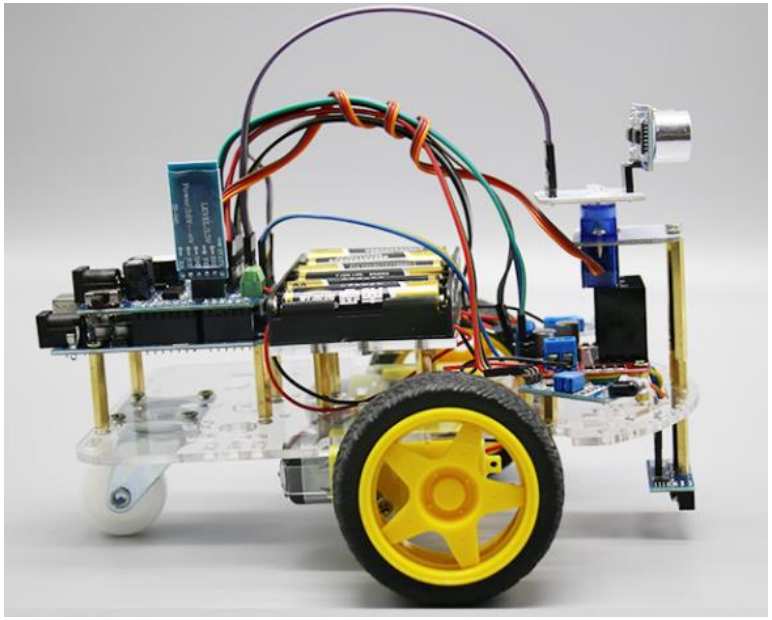
# Outline

- Car Assembly
  - Chassis, motor, optical encoder plate, wheels, sensor pan servo
  - Driver, Arduino, sensor shield, battery, LED
  - Sensors
    - line following
    - ultrasonic distance
    - obstacle avoidance
    - optical encoder
    - grey scale
- Gripper Assembly
  - Mechanical assembly
- Wire Connection

# Chassis and Actuator Assembly

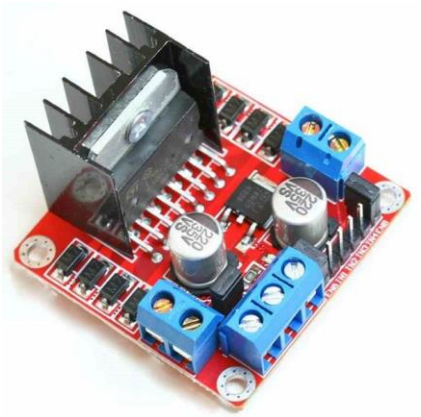
- Assemble with Instructions
- Add Optical Encoder Plate

Optical Encoder Plate



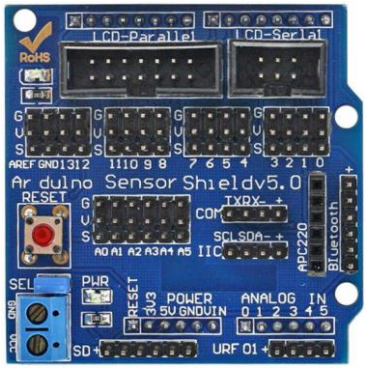
Arduino Mobile Platform

# Driver, Arduino, Sensor Shield, Battery, LED



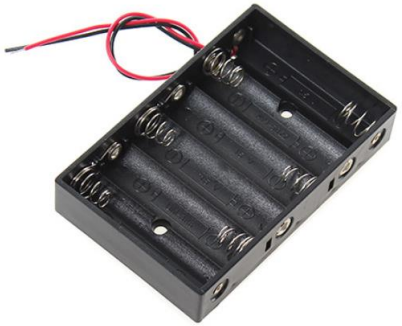
L298N Driver


Arduino Uno



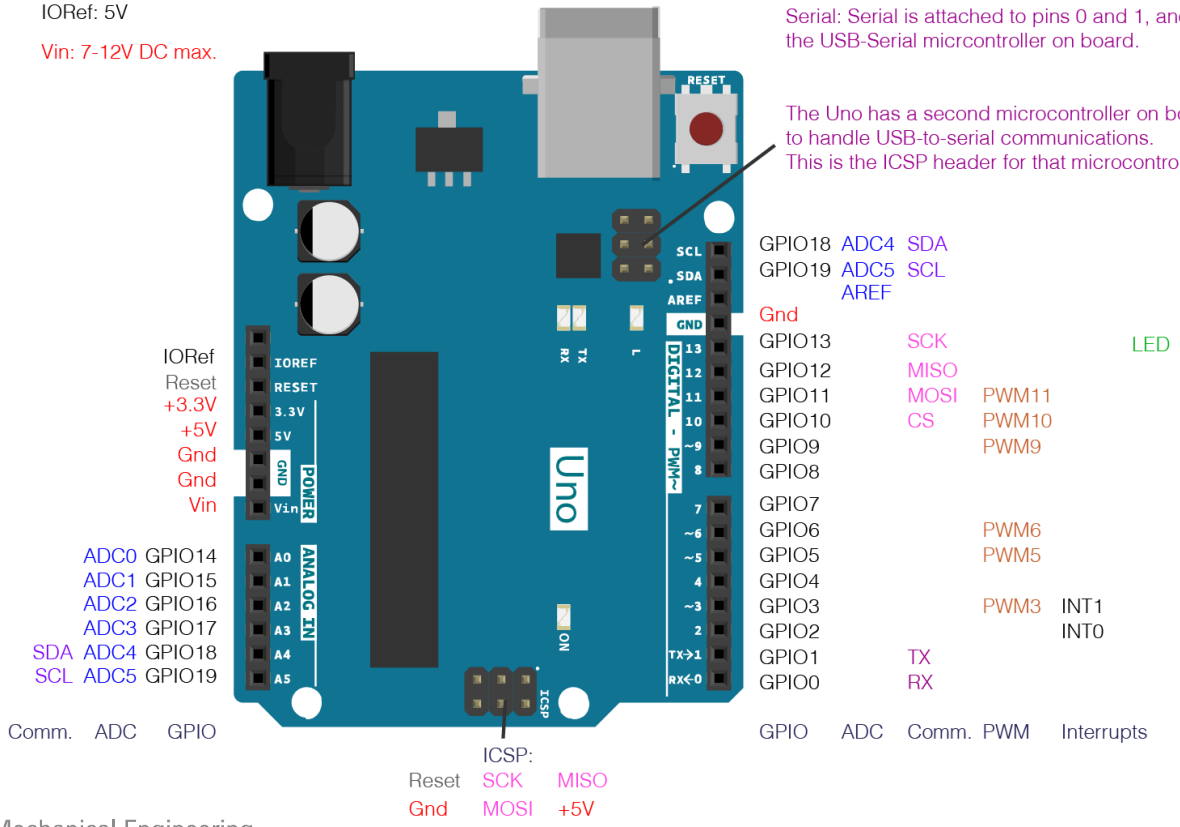

Sensor Shield

LED Light

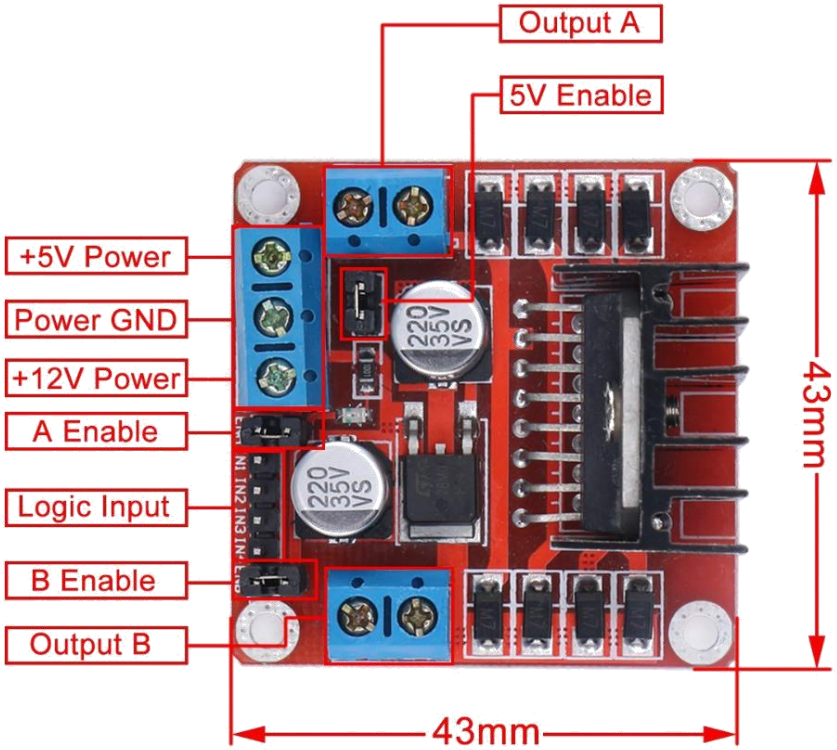


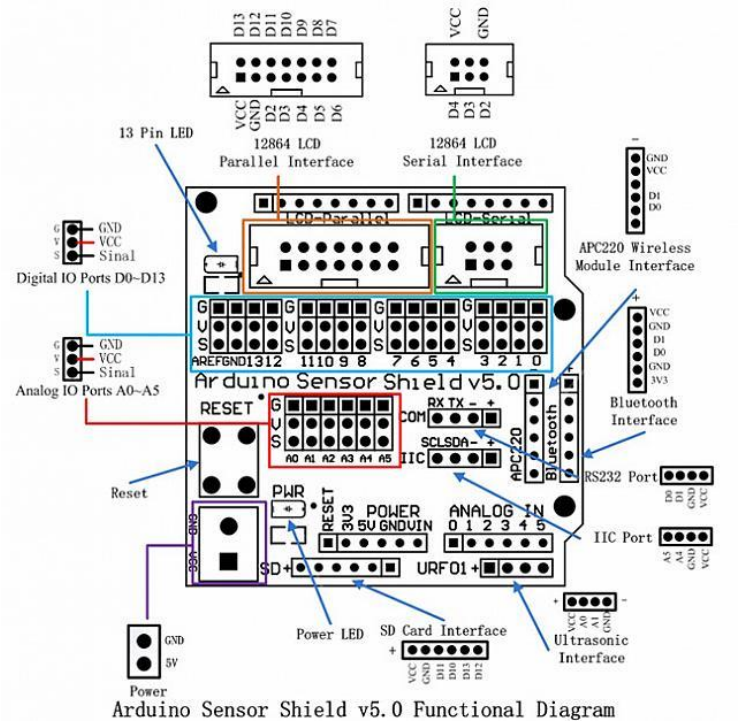
Battery case

# Arduino Pins



# L298N and Sensor Shield Pins



# Line Following Sensor

- Infrared light sensor used for line tracking
- Black line detected = low voltage = on board blue LED lights up
- Tunable sensitivity
- 4 channel digital signal
- Can do cross road turning

# Ultrasonic Distance and Obstacle Avoidance

- Ultrasonic Distance Sensor
  - Trig: send pulse
  - Echo: measure return signal delay
  - Obtain distance measurement

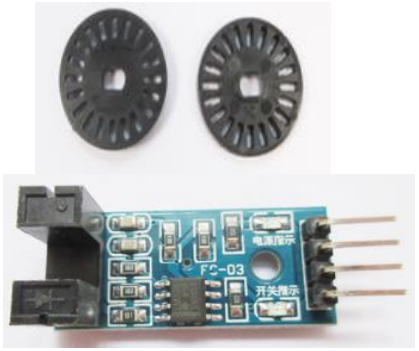
Ultrasonic Distance

- Obstacle Avoidance
  - 1 channel digital signal
  - Obstacle detected = low voltage
  - On board green LED lights up for obstacle
  - Tunable sensitivity
  - Used mainly for obstacle avoidance


Obstacle Avoidance

# Optical Encoder and Grey Scale Sensor

- Optical Encoder
  - Used for counting rotation roughly
  - 20 slots on plate circle (40 signal level changes achievable)
  - Count changes of digital signal using Arduino interruption
- Grey Scale Sensor
  - Analog sensor measurement for greyscale color




Optical Encoder Set

Grey Scale Sensor

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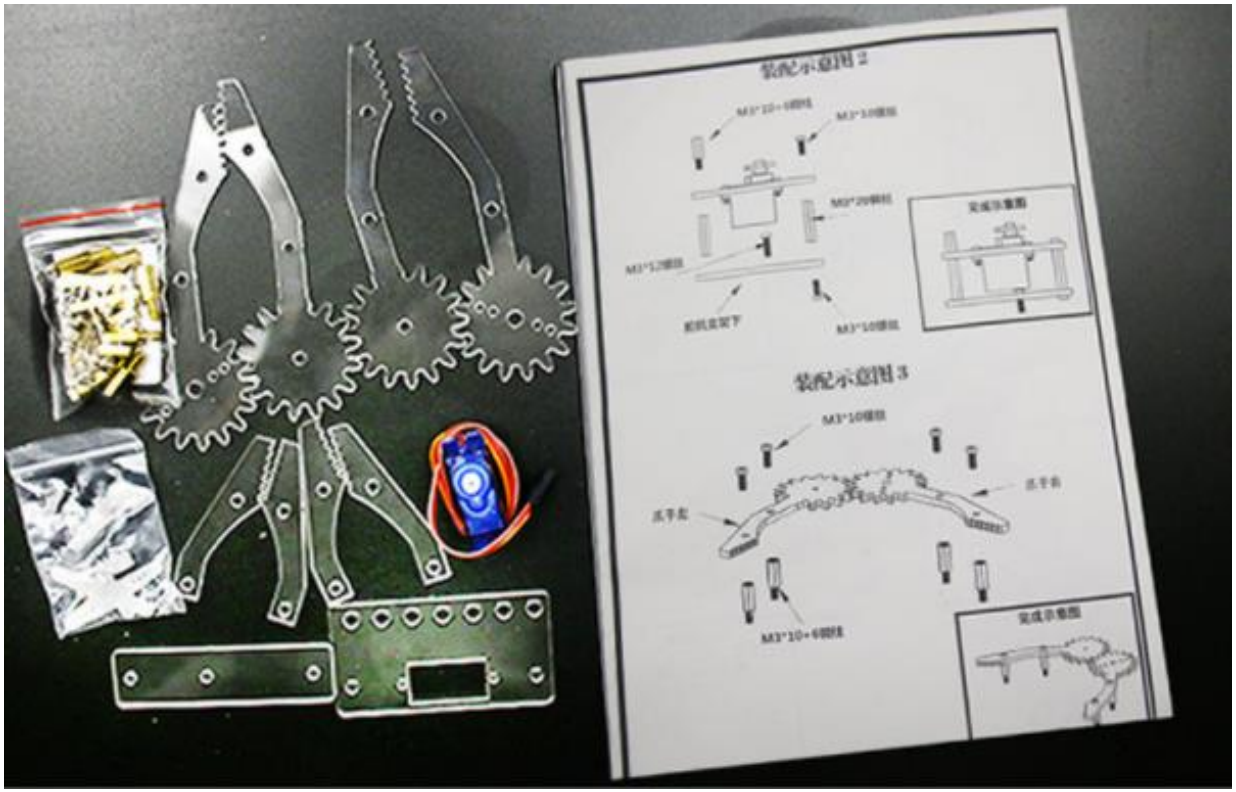
# Gripper Assembly



# Assembly Notes

- Start with soldering of motor connector and power switch
- Assemble mobile platform in the paper box
  - Change original shield to sensor shield
  - Mount battery case, motor and sensor shield
  - Mount the power driver with only 2 bolts in the front
- Assemble the ultrasonic distance sensor with servo platform
- Assemble gripper based on the given instruction sheet.
- Do the wiring based on the instructions
- Mount the sensors
  - Mount grey scale and line following sensors in the slots
  - Use tape for the encoder

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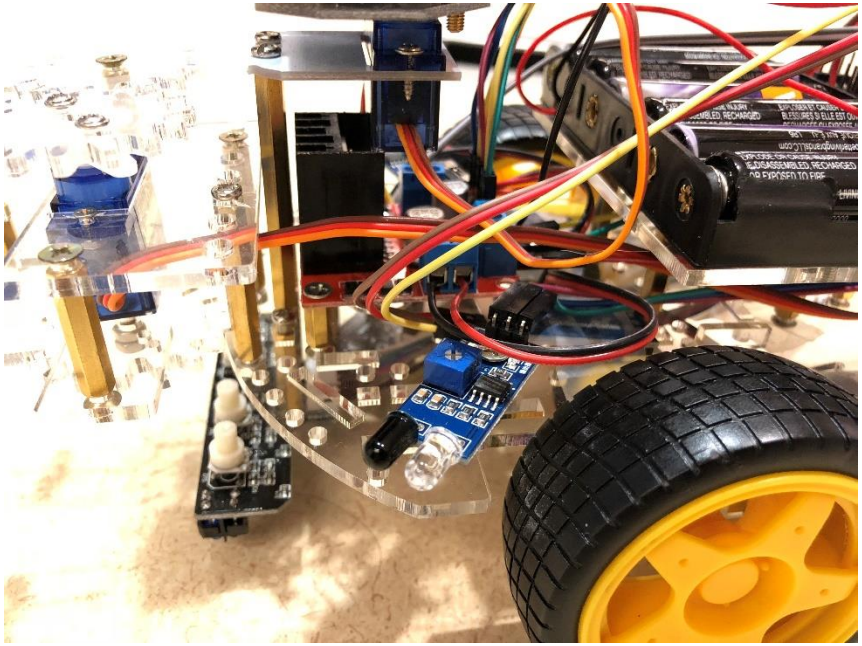
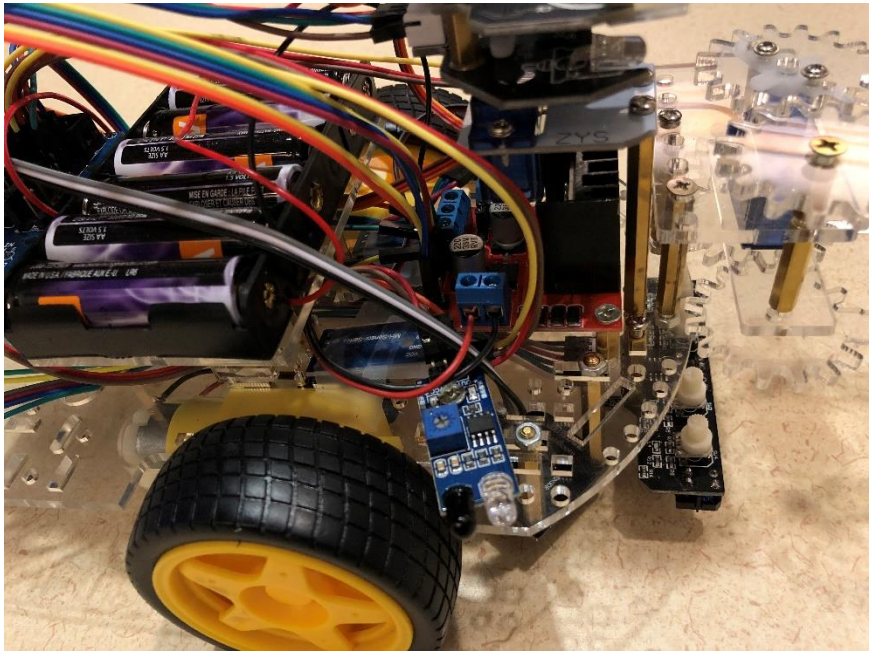
# Motor Driver Wiring



Left motor



Right motor

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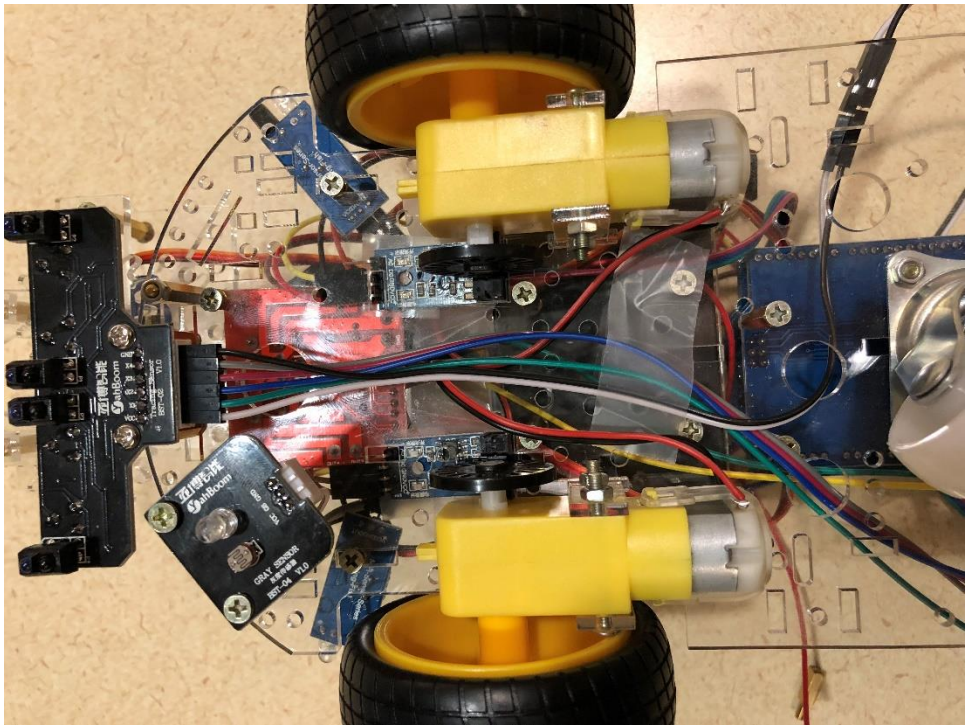
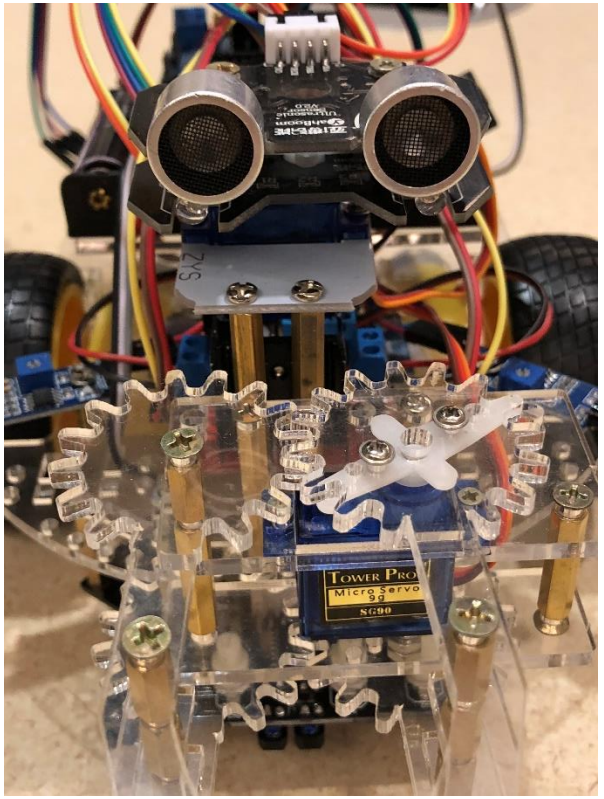
# Motor Driver Wiring



Bottom view




Front view

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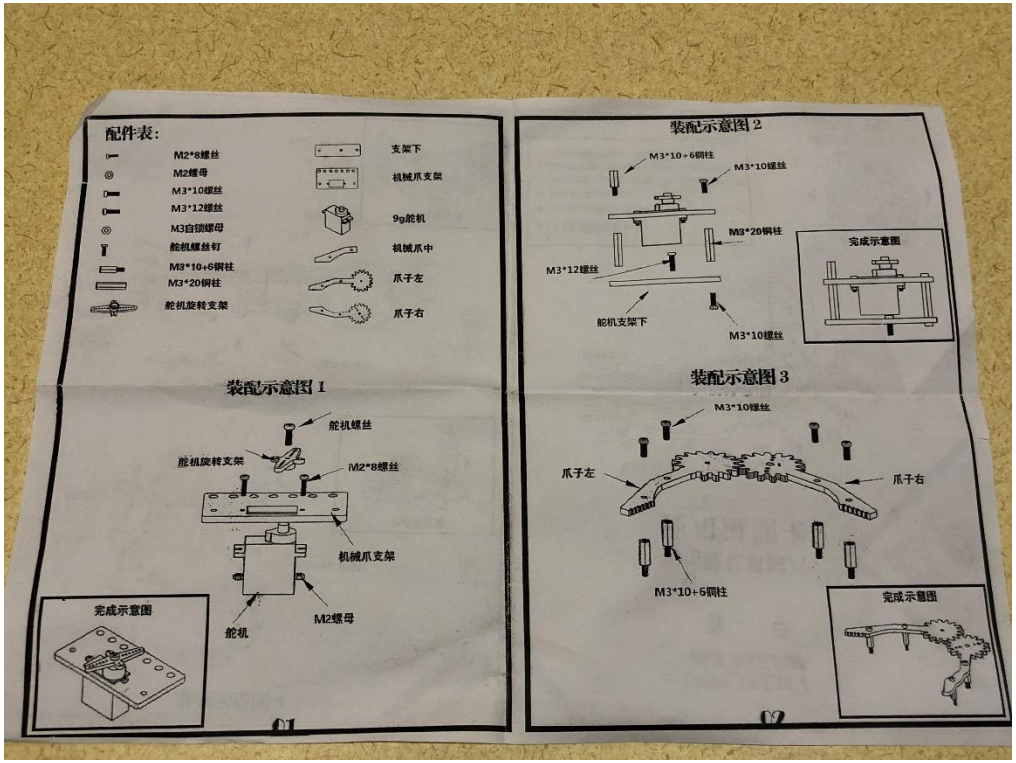
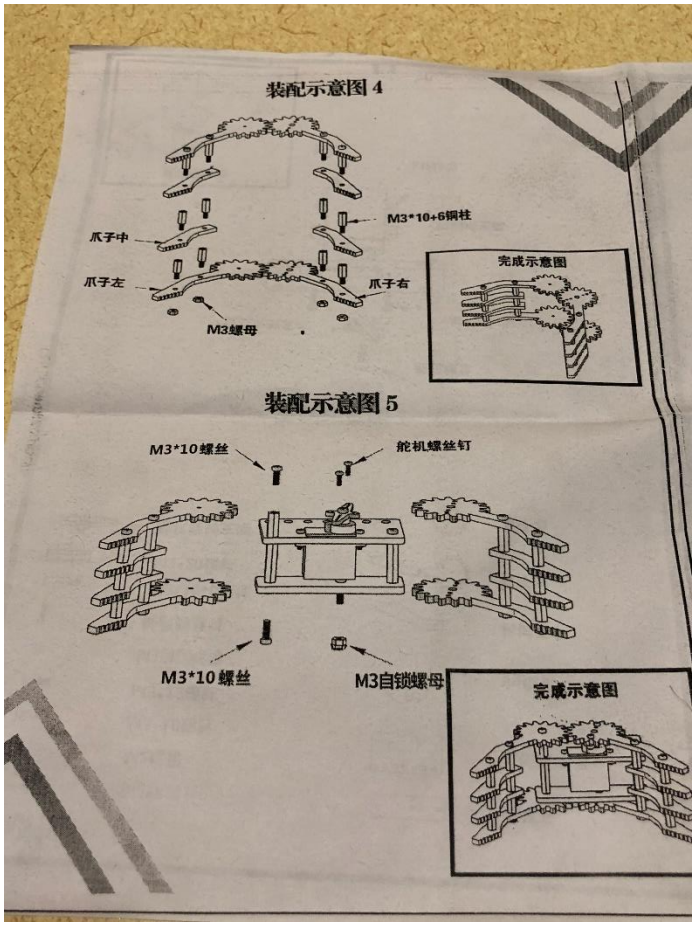
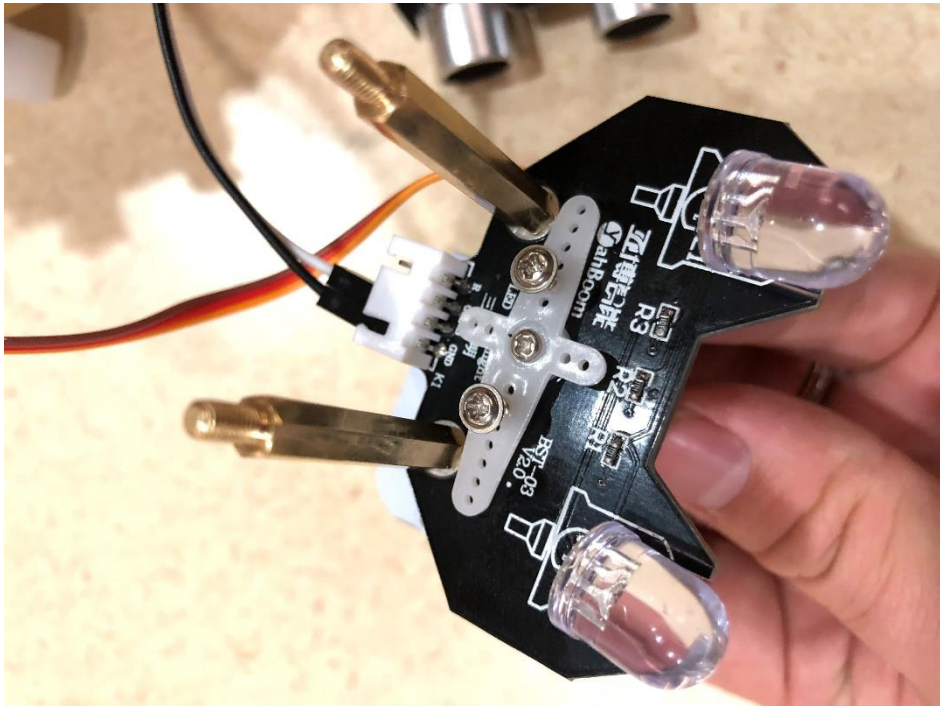
# Gripper Assembly Instruction

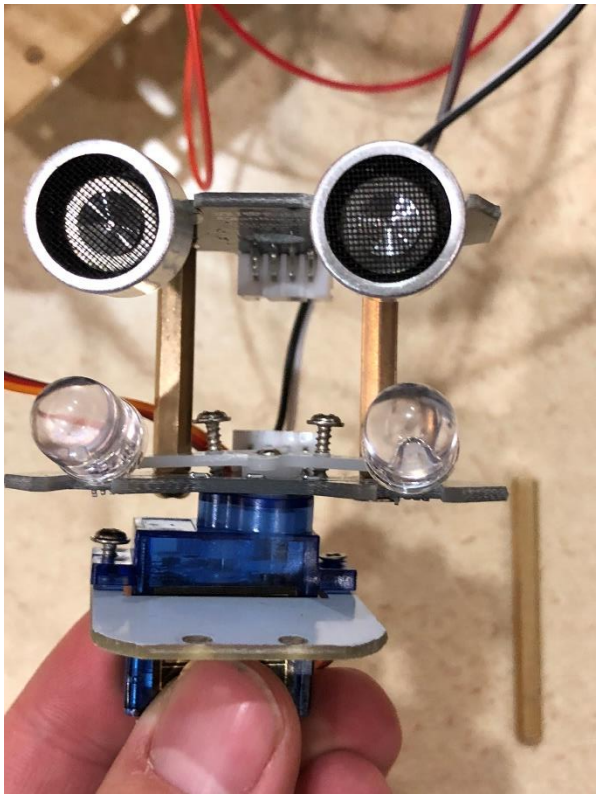


# Ultrasonic Sensor Platform Assembly



LED mount to servo



Stack on ultrasonic sensor

# Wire Instructions

- Wire the sensors before mechanical mounting is easier
- VCC connect to V on sensor shield for 5 V voltage supply
- GND connect to G on sensor shield for 0 V
- Signal connect to S on sensor shield based on instruction
- LED only has RGB signal channel and GND
- Encoder A0 channel is not used and don’t need connection
- Servo has red (VCC), brown (GND) and orange (signal) connection
- Be careful not to flip the pins to avoid short circuit
- Test the polarity of the motor pins to match the code forward motion
- Use zip tie to clean up wires

# Wire Connection

0: obstacle avoidance left
1: LED one color channel
2: right optical encoder
3: left optical encoder
4: (IN1) left motor -
5: (ENA) left motor (pwm)
6: (ENB) right motor (pwm)
7: (IN2) left motor +
8: X1 (right line following)
9: gripper servo
10: platform servo

11: X2 (middle right line following)
12: X3 (middle left line following)
13: X4 (left line following)

A0: Trig (ultrasonic)
A1: Echo (ultrasonic)
A2: (IN3) right motor +
A3: (IN4) right motor –
A4: obstacle avoidance right
A5: grey scale


# Please form team of 3 members!


# Thank You!