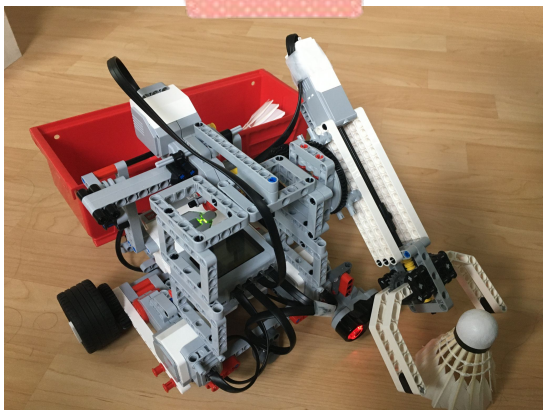
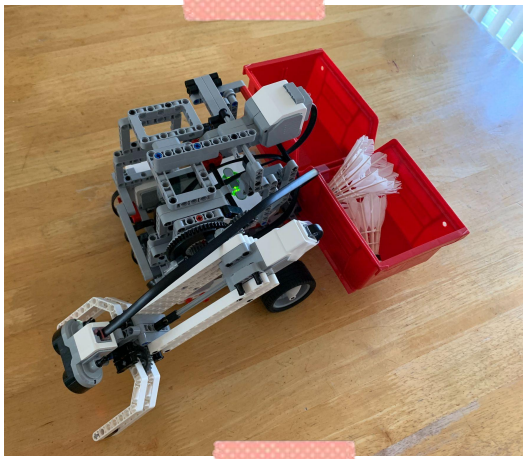
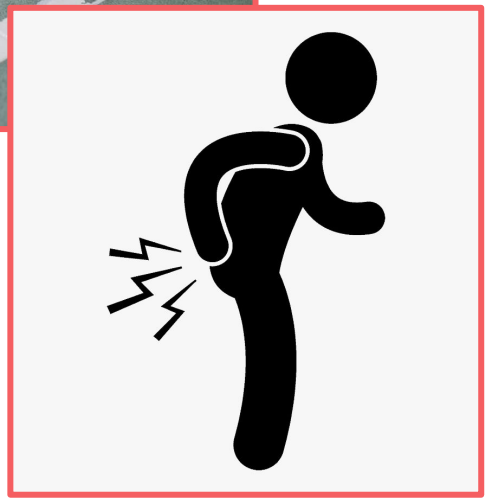


The Shuttle Collector

Maya Ashok & Serena Wen



The Struggle of Playing Badminton



Badminton = Fun Sport!

Picking Up Badminton Birdies = Back Pain

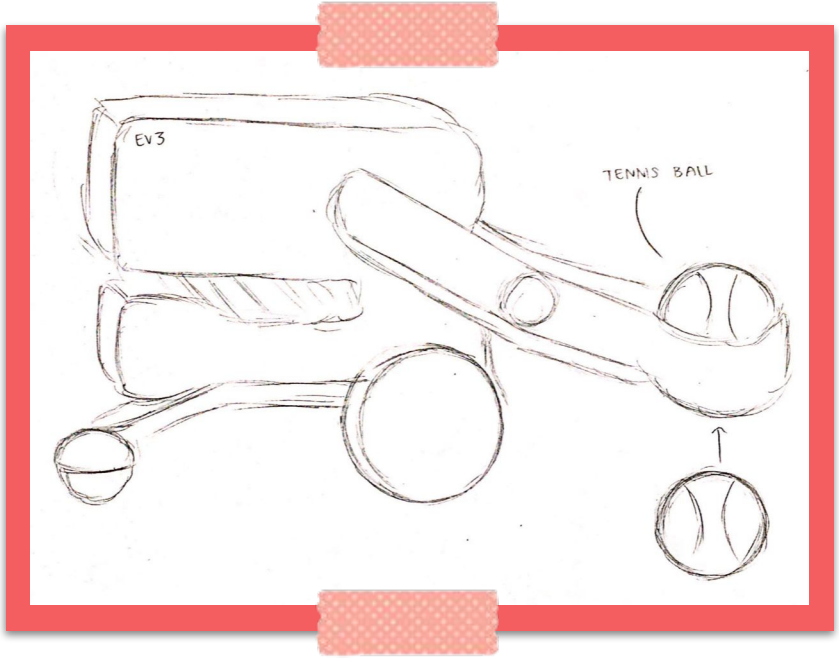
Back Pain = Not Fun

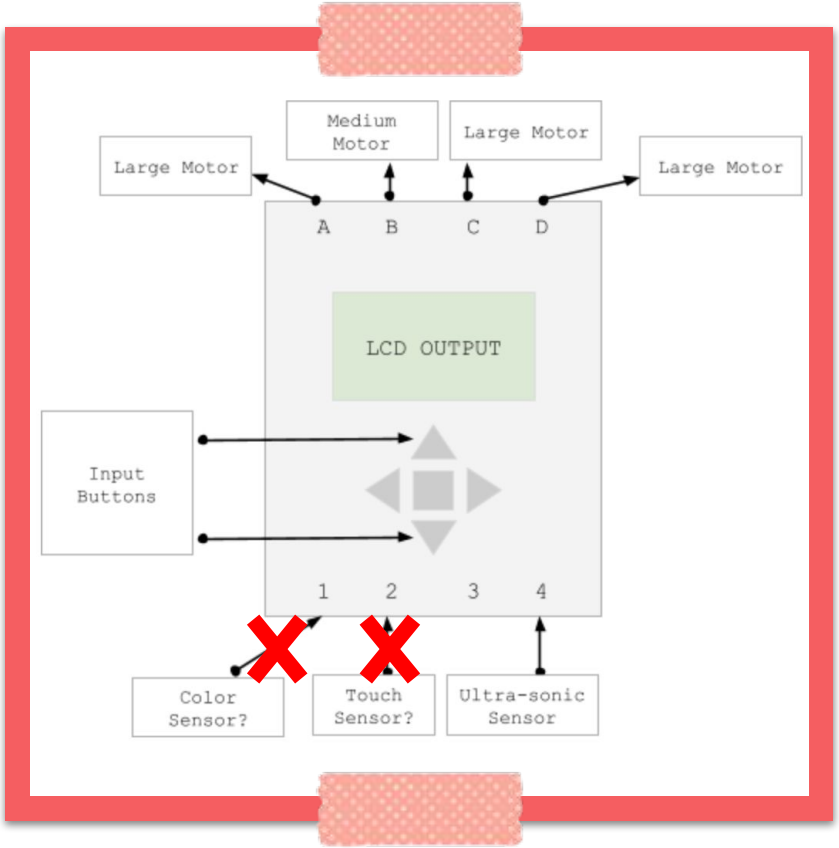
Designing - Initial Robot Goals

A robot that can:

1. **Sense** badminton shuttlecocks and/or tennis balls
2. **Pick up** the shuttlecocks and balls with a claw
3. **Deposit** them into a storage bin off the court

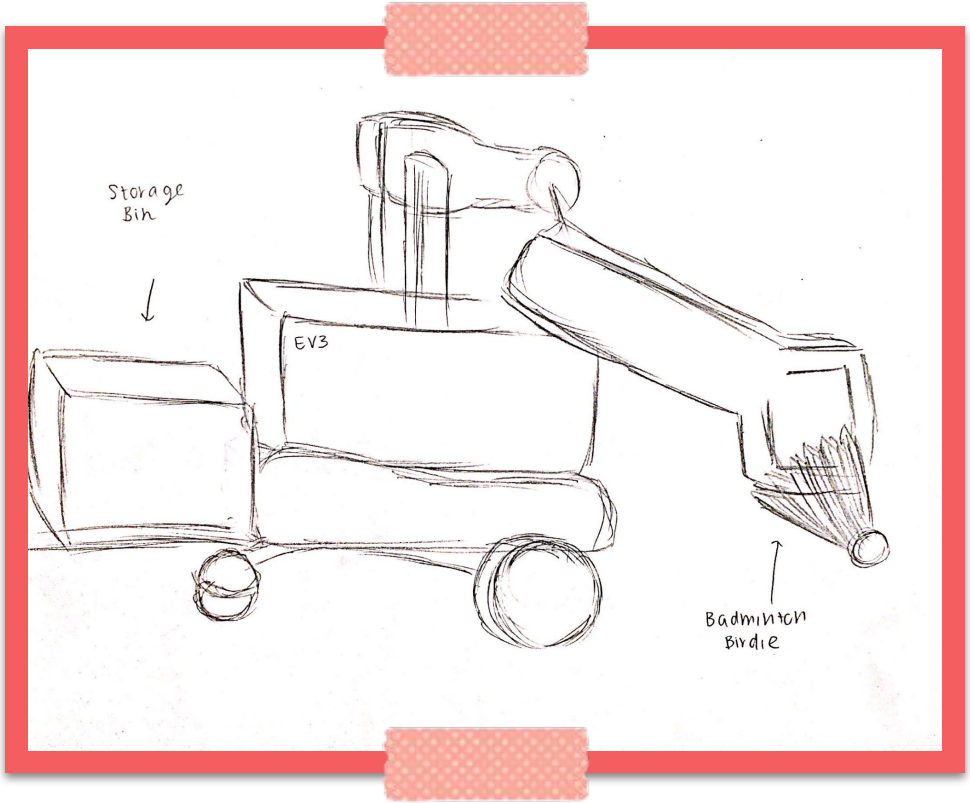
Designing - Preliminary Sketches



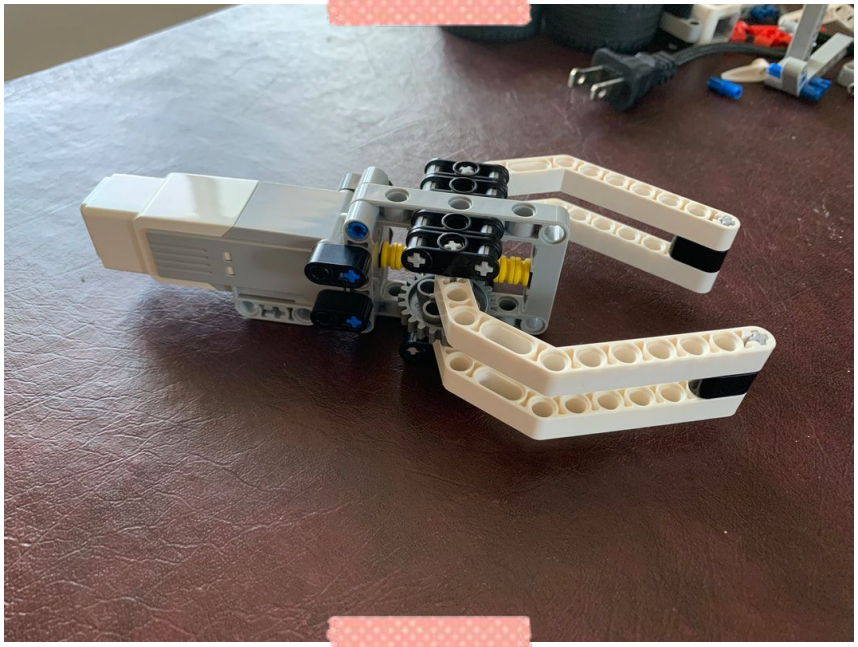


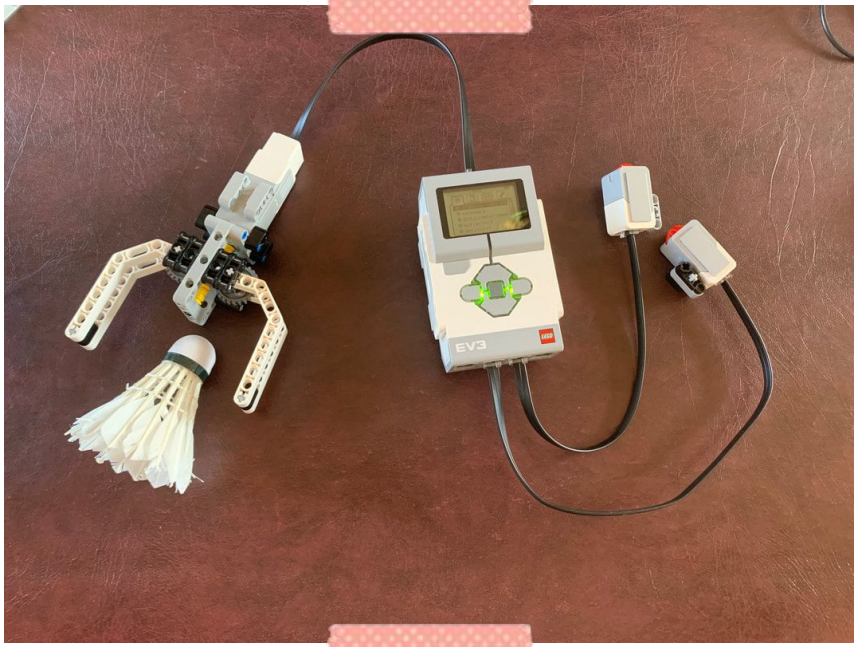
Design Adjustments

1. Only badminton shuttlecocks
2. Deposit the birdies in a bin attached to the robot instead
3. Robot will empty the storage bin whenever full (reach goal)

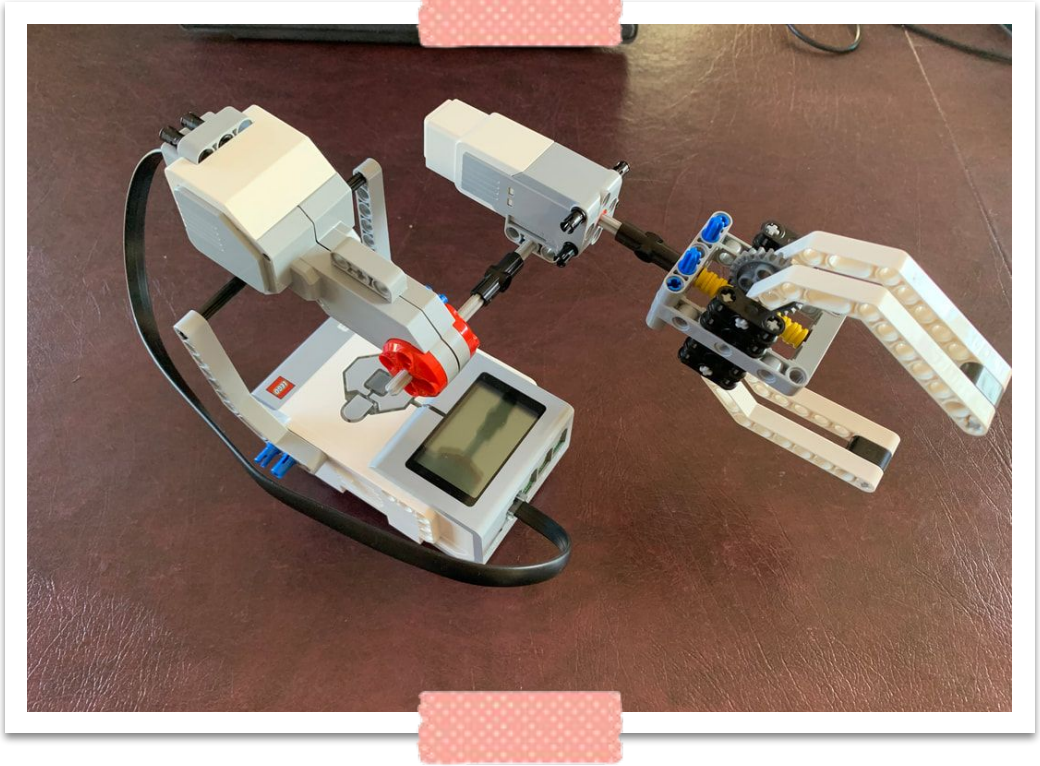


Building the Claw





Arm Rotation and Motors



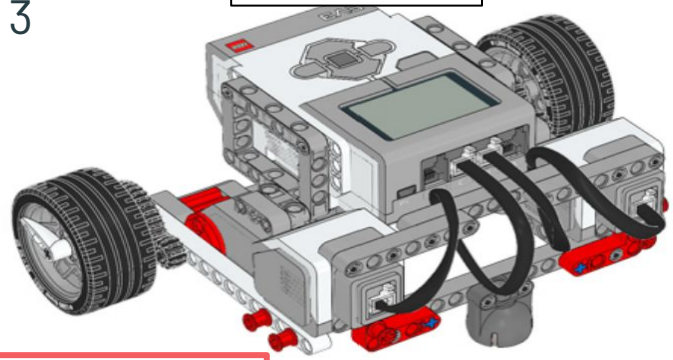
- 180 degree rotation ability
- Collect birds in the front
- Deposit birds in the back
- One motor for rotation
- One motor for claw open/close

The Wheel Base

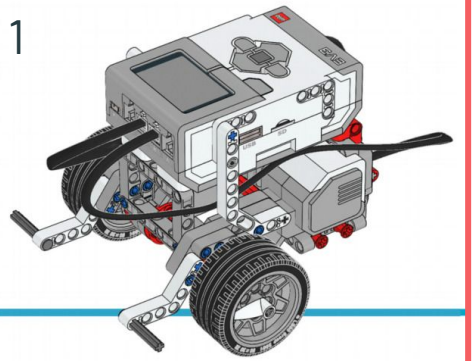
- Deciding between these 3 designs
- Eventually chose the 3rd design

Gear Bot

3

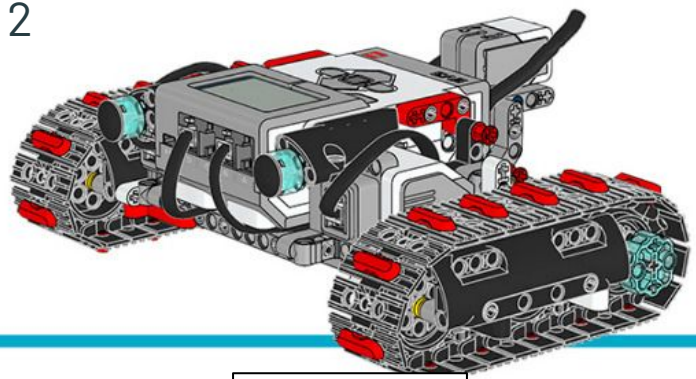


1



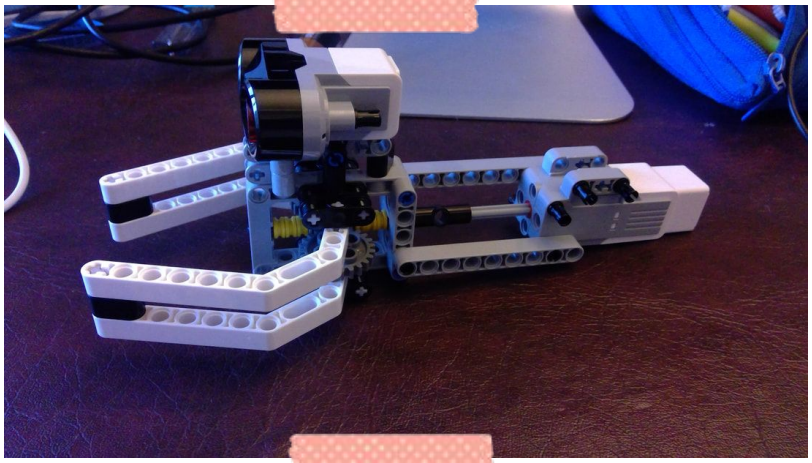
Basic EV3

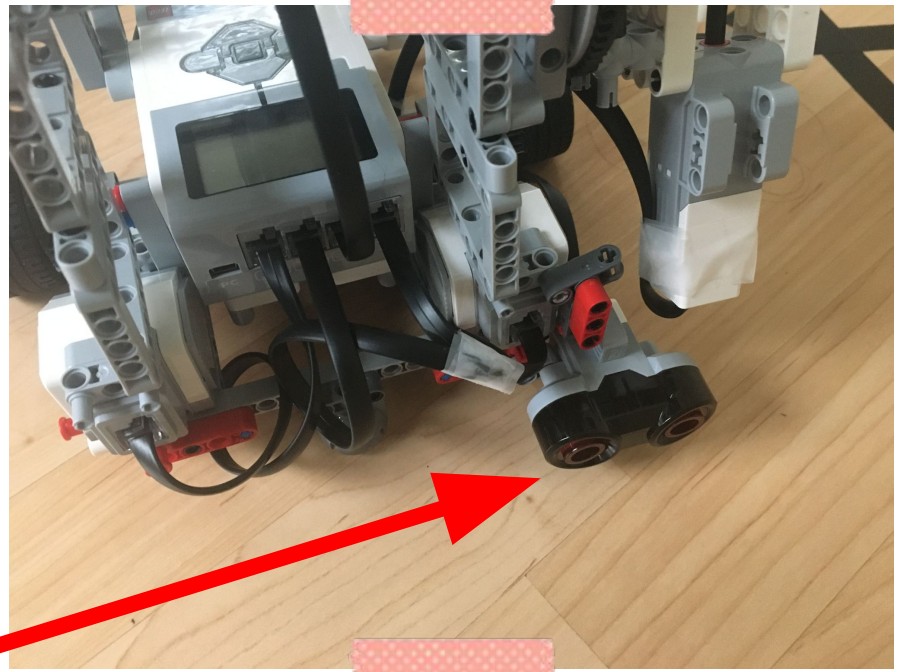
2



Tank Bot

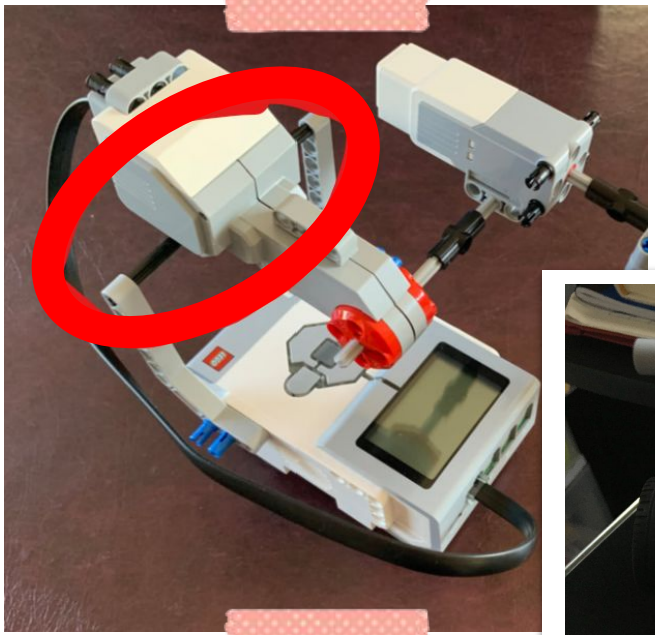
Extending the Arm and Sonar Sensor Attachment

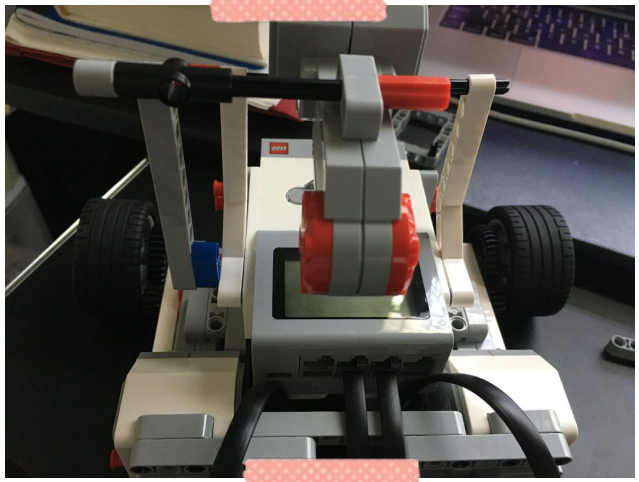


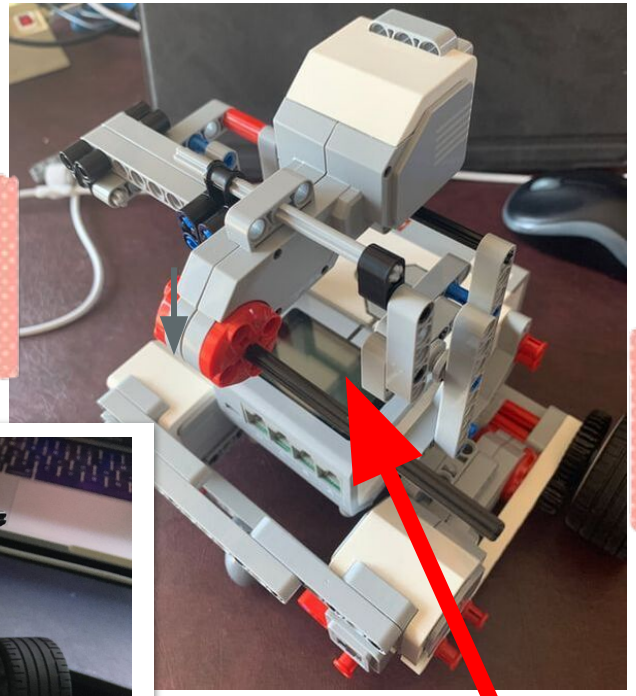


- Extend arm with lego sticks
- Sensor near front of arm
- Sensor position later changed to bottom right of the front of the robot

A Stable Base

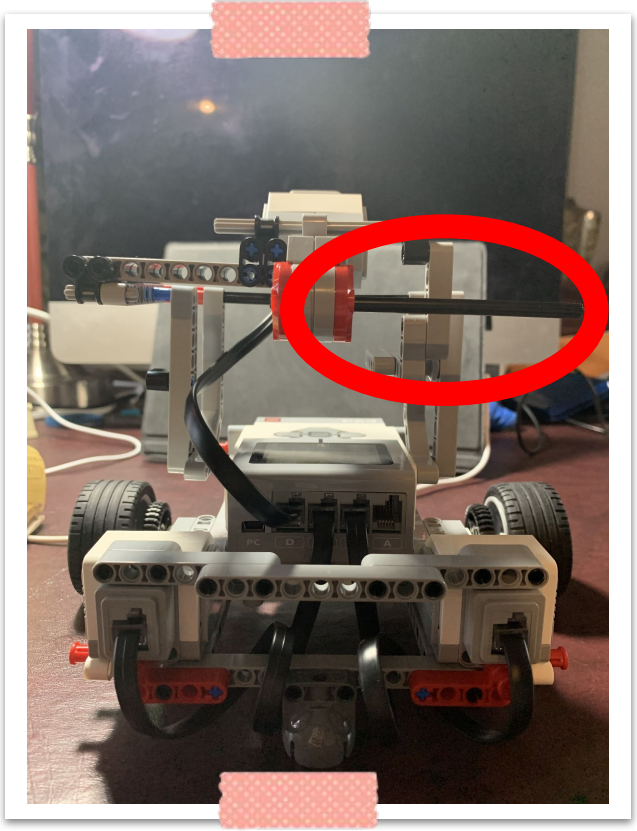




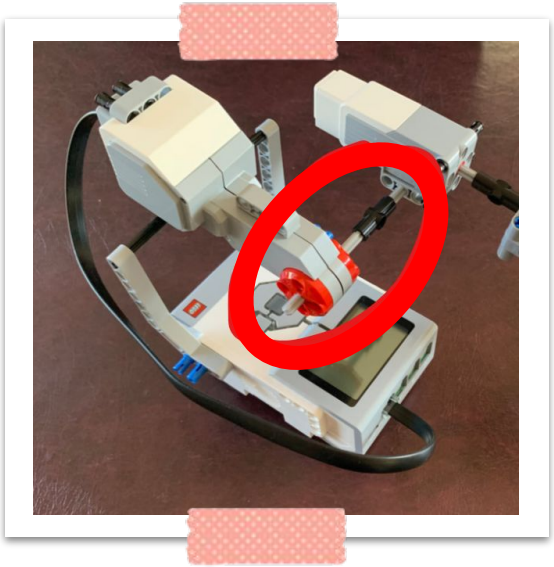


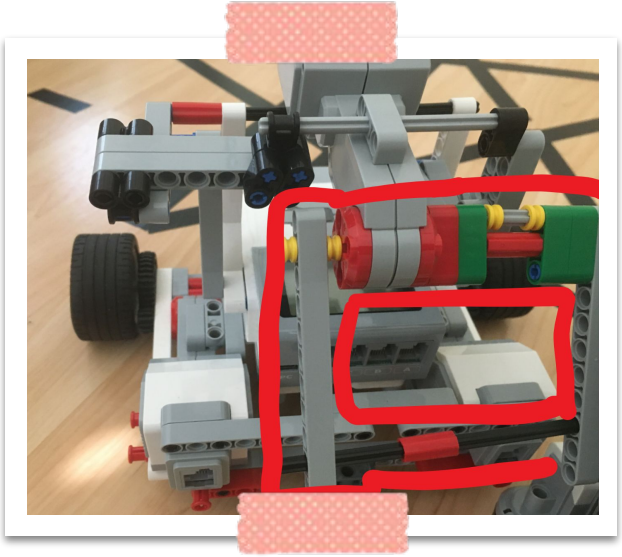
Final Base Design

Arm Attachment 1.0 and 1.1

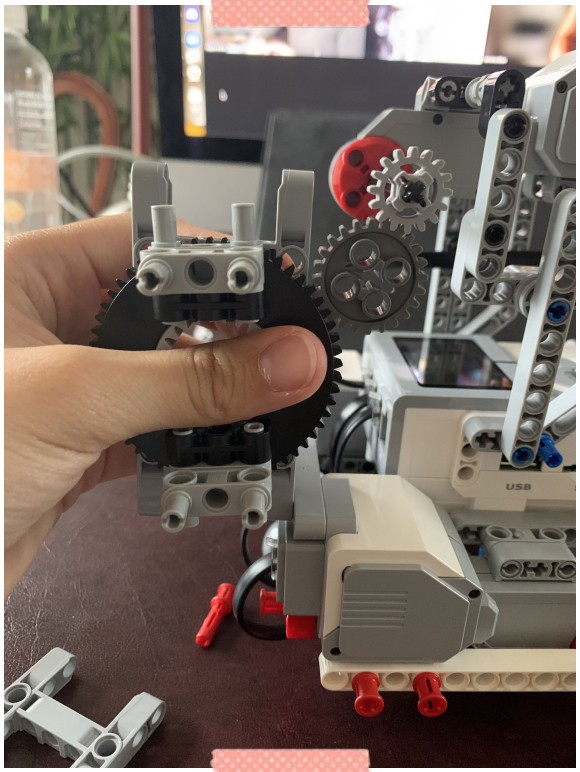


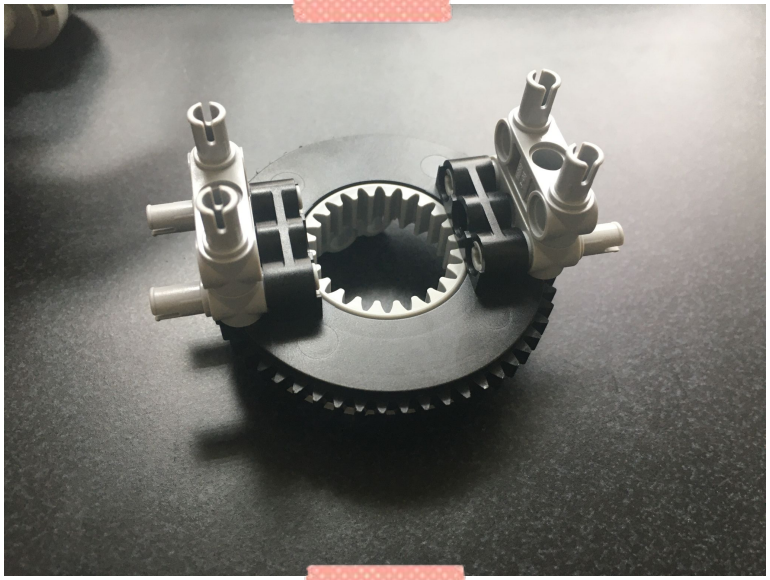
- A weak cross stick
- Claw too heavy
- Other supports didn't work



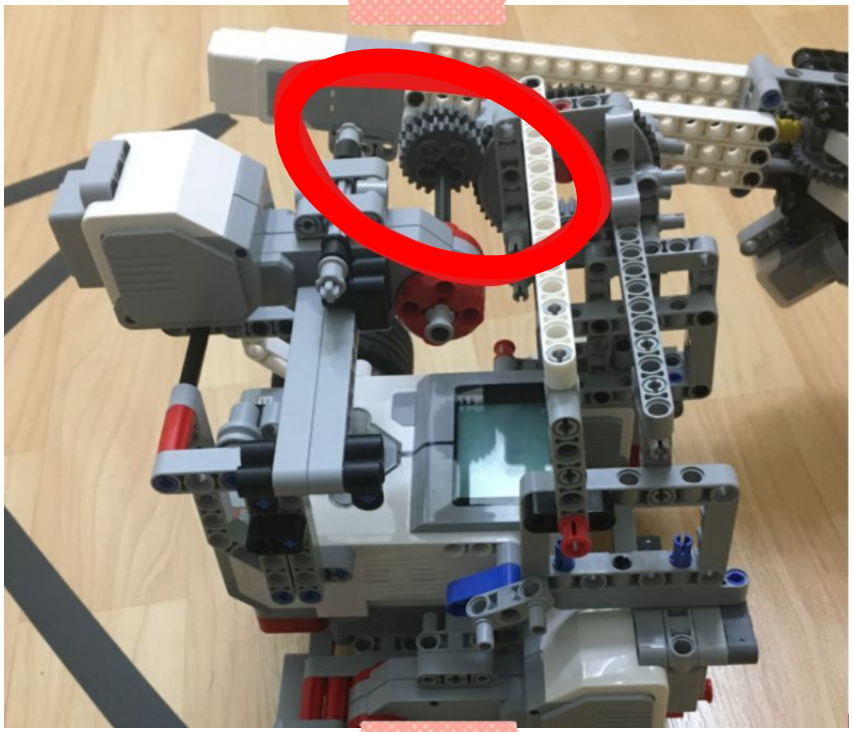


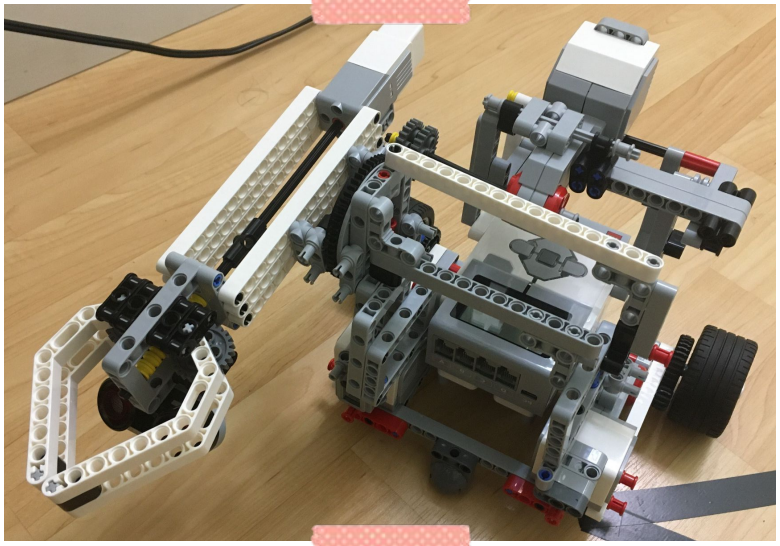
Arm Attachment 2.0



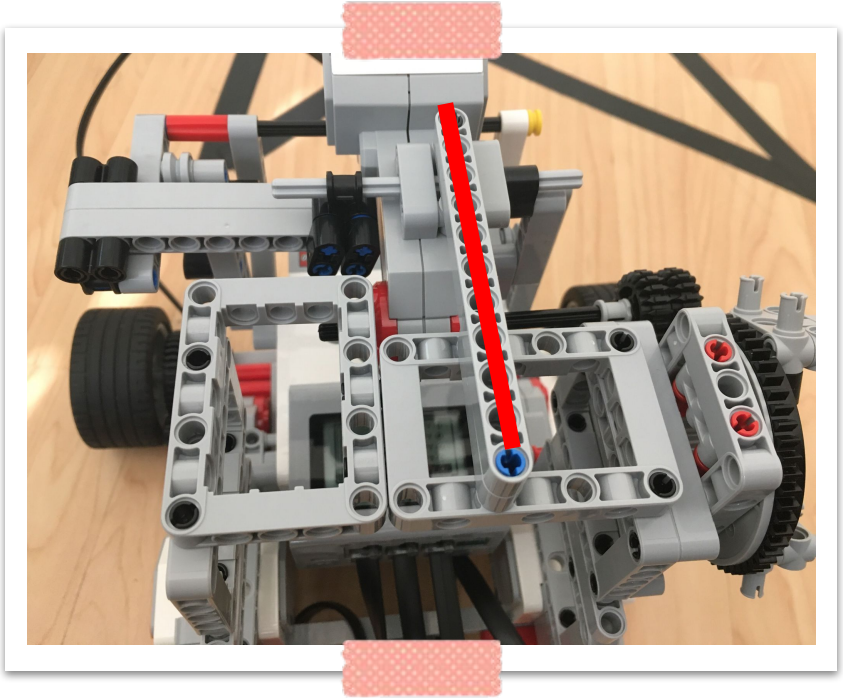


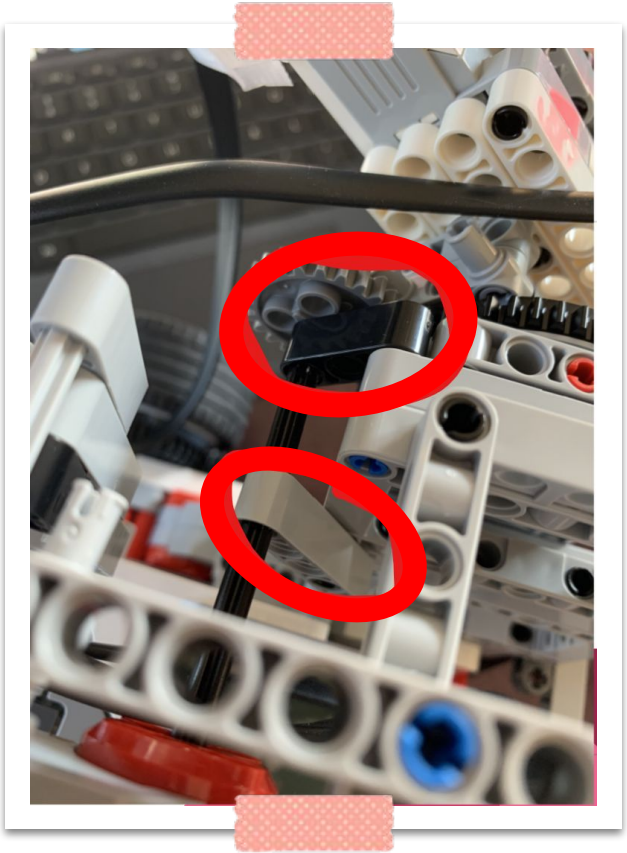
Arm Attachment 2.0 (continued)



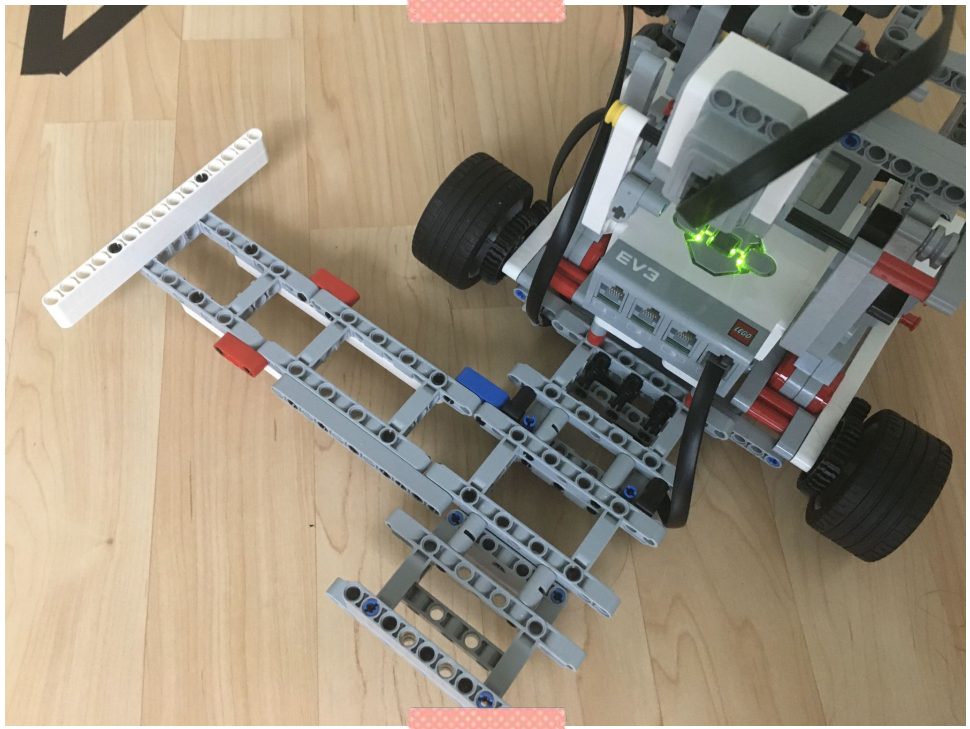


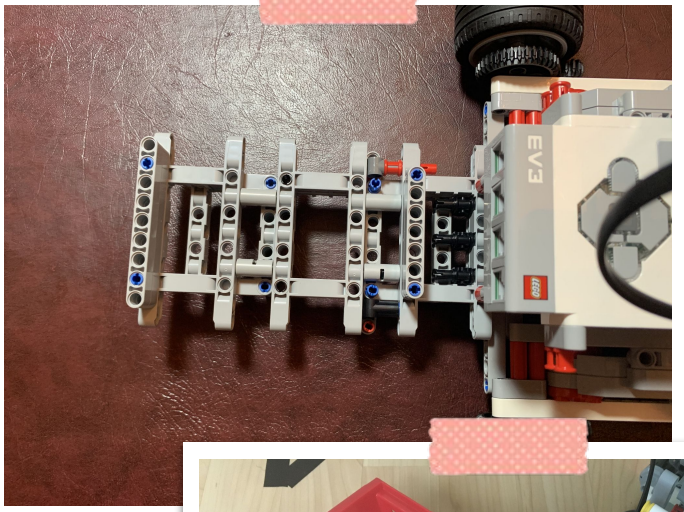
Arm Attachment 2.1





Storage Bin Holder

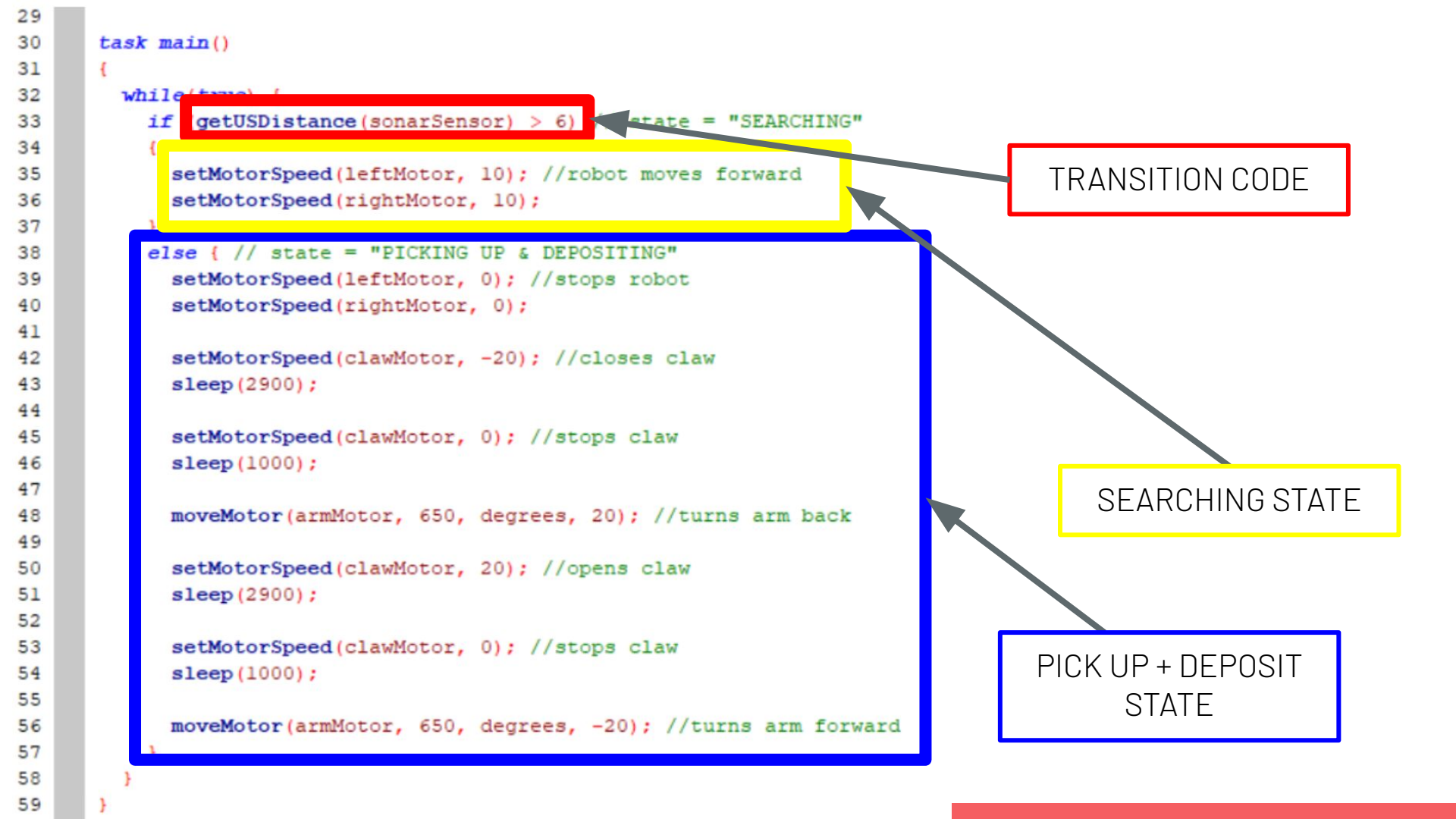


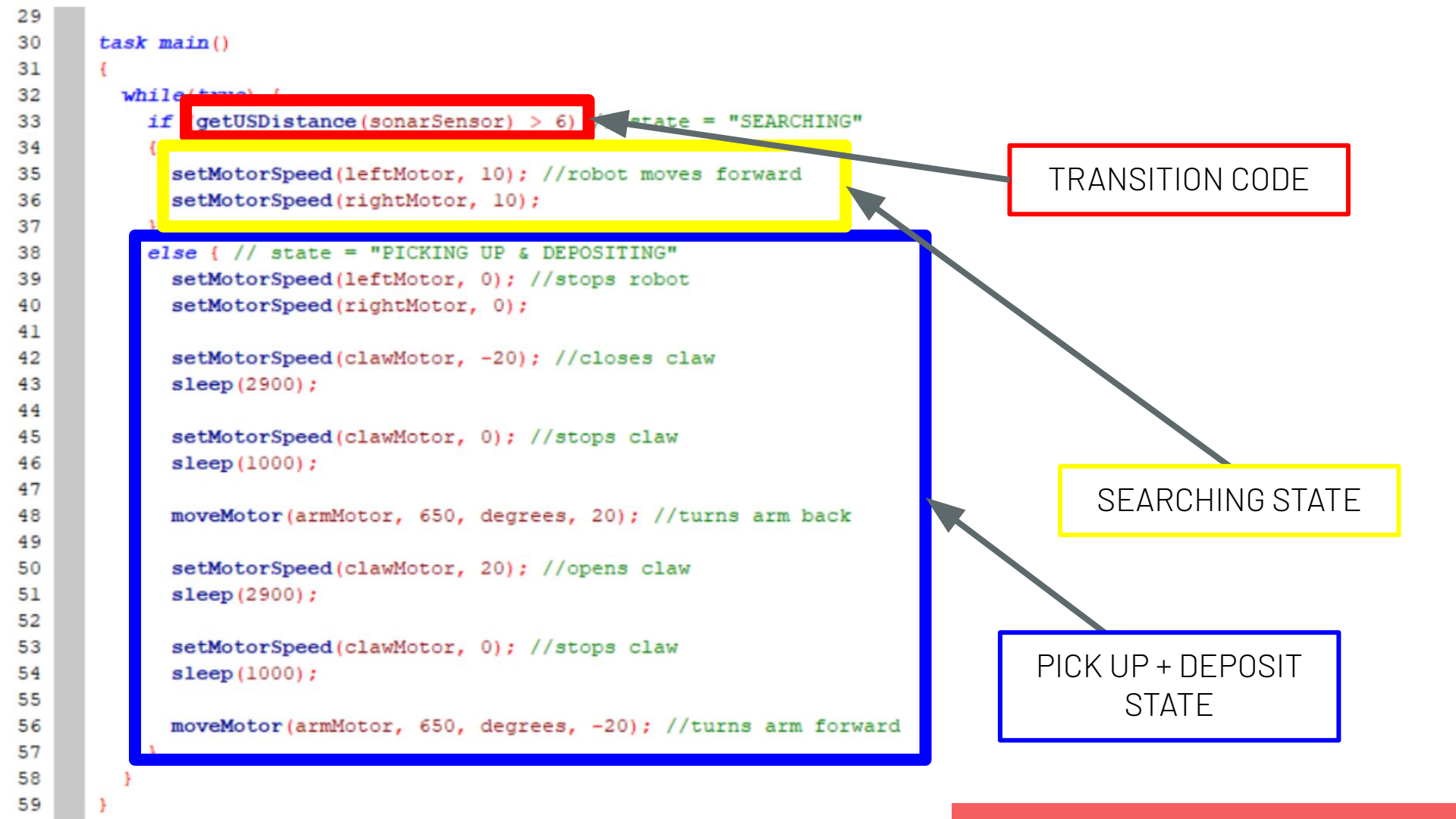


Coding the Robot

```
1  #pragma config(Sensor, S1,     touchSensor,    sensorEV3_Touch)
2  #pragma config(Sensor, S2,     gyroSensor,     sensorEV3_Gyro, modeEV3Gyro_RateAndAngle)
3  #pragma config(Sensor, S3,     colorSensor,    sensorEV3_Color, modeEV3Color_Color)
4  #pragma config(Sensor, S4,     sonarSensor,    sensorEV3_Ultrasonic)
5  #pragma config(Motor,  motorA,          clawMotor,     tmotorEV3_Large, PIDControl, encoder)
6  #pragma config(Motor,  motorB,          armMotor,      tmotorEV3_Large, PIDControl, encoder)
7  #pragma config(Motor,  motorC,          leftMotor,     tmotorEV3_Large, PIDControl, driveLeft, encoder)
8  #pragma config(Motor,  motorD,          rightMotor,    tmotorEV3_Large, PIDControl, driveRight, encoder)
9
```

```
20 //STATE 1: Searching for a shuttle to pick up
21    // Robot moves forward in a straight line
22    // Arm is positioned at [certain angle] with claw facing the ground (in open position)
23
24   //TRANSITION OUT OF STATE 1 OCCURS WHEN:
25    // Ultrasonic sensor senses an object - when distance is less than [specified distance] by a certain factor
26
27 //STATE 2: Picking up + Depositing
28    // (maybe) Arm adjusts angle to position claw right for picking shuttle up, using ultrasonic sensor
29    // Claw closes around the shuttle
30    // Arm rotates 180 degrees around
31    // Claw opens to deposit shuttle
32    // Arm rotates -180 degrees back to normal
33
34   //TRANSITION OUT OF STATE 2
35
```


task main()
{
while(true) {
if (getUSDistance(sonarSensor) > 6) // state = "SEARCHING"
{
setMotorSpeed(leftMotor, 10); //robot moves forward
setMotorSpeed(rightMotor, 10);
}
else { // state = "PICKING UP & DEPOSITING"
setMotorSpeed(leftMotor, 0); //stops robot
setMotorSpeed(rightMotor, 0);
setMotorSpeed(clawMotor, -20); //closes claw
sleep(2900);
setMotorSpeed(clawMotor, 0); //stops claw
sleep(1000);
moveMotor(armMotor, 650, degrees, 20); //turns arm back
setMotorSpeed(clawMotor, 20); //opens claw
sleep(2900);
setMotorSpeed(clawMotor, 0); //stops claw
sleep(1000);
moveMotor(armMotor, 650, degrees, -20); //turns arm forward
}
}
}
TRANSITION CODE
SEARCHING STATE
PICK UP + DEPOSIT STATE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sleep(1000);
moveMotor(armMotor, 650, degrees, -20); //turns arm forward
}
}
}
TRANSITION CODE
SEARCHING STATE
PICK UP + DEPOSIT STATE

Reflection

Challenges at the end:

- Robot wouldn't always pick up the birdie
- Birdie would slip out of the claw grip
- Inconsistency

Reflection (continued)

What We Learned

- Don’t give up
- Feedback from peers + mentors is important