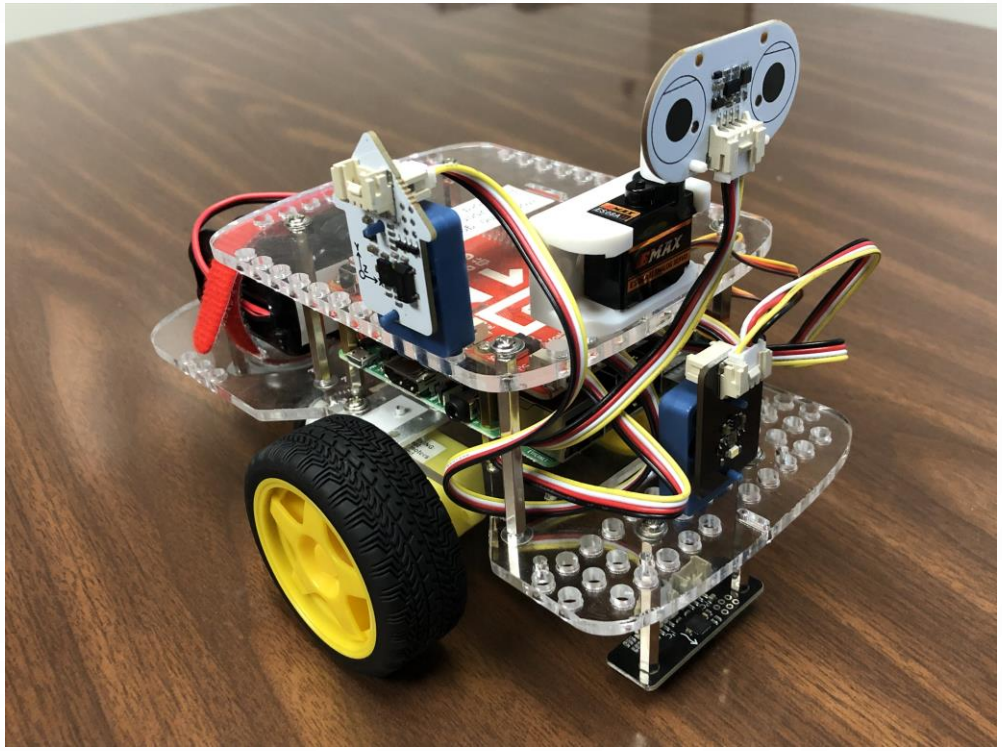
GOPIGO3 SENSORS

ADDITIONAL ACTUATION

- GoPiGo3s offer many ways to alter the state of the robot
  - Wheels
  - LEDs
  - Servo motor
- Simply need to call the right method.
  - Together lets look up different methods for moving the robot.



USING THE SERVO

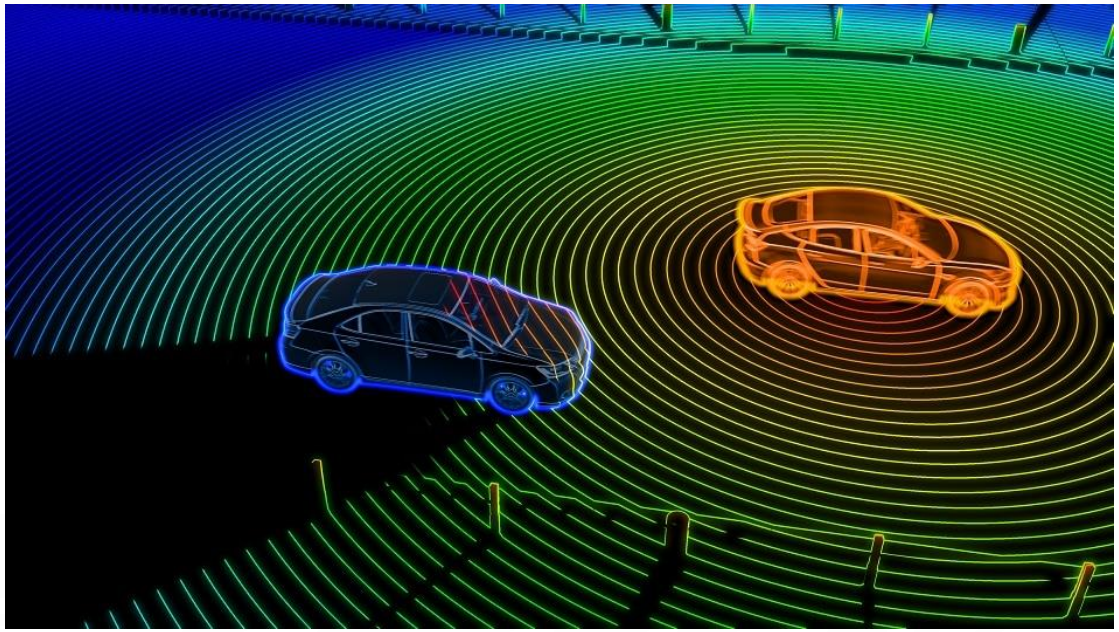
- The servo turns to a particular angle in the range $(0°, 180°)$
  - Note it cannot quite reach that far, more like $(10°, 170°)$
- Remember to initialize with `init_servo()`
- Set the position of the servo with `rotate_servo(x)`, where $x \in (10°, 170°)$
- Return the servo to its middle position with `reset_servo()`

Servo.py

```
1.  from easygopigo3
      import EasyGoPiGo3
2.  robot = EasyGoPiGo3()
3.  servo = robot.init_servo()
4.
5.  servo.rotate_servo(45)
6.
7.  servo.reset_servo()
```

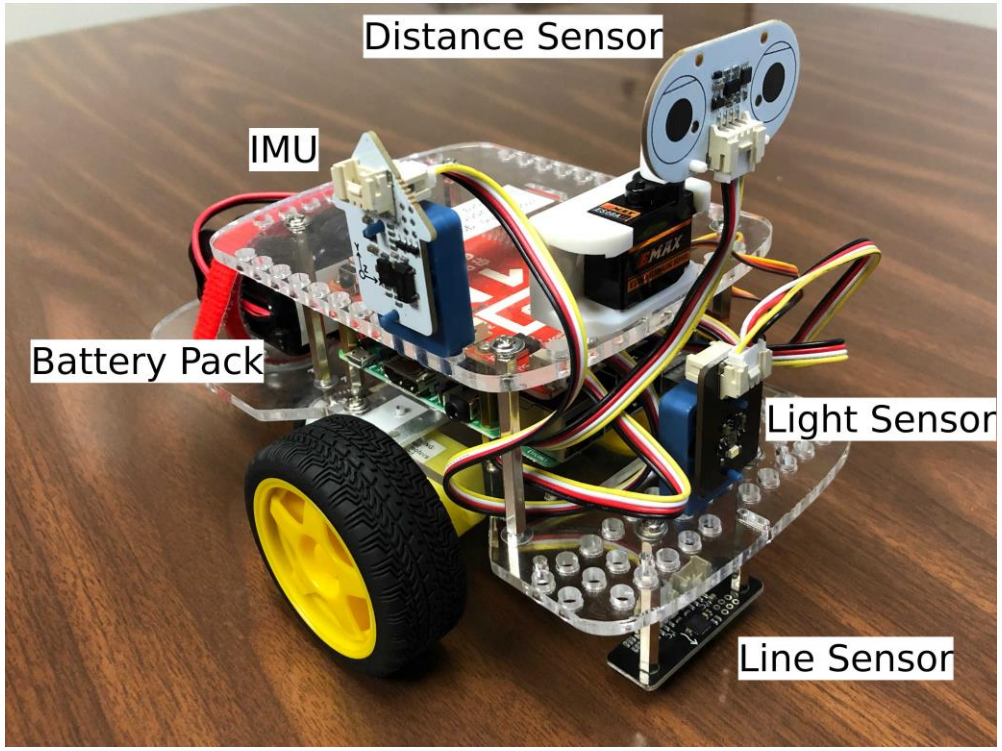
SENSORS

- Sensors gather input data from the physical world
  - Images
  - Distances
  - Temperature
  - Light values
  - Etc.



GOPIGO3 SENSOR SETUP

- Light/Color Sensor
- Line Sensor
- Distance Sensor
- Inertial Measurement Unit (IMU)



USING SENSORS/ACTUATORS

- In the beginning, we will use the "EasyGoPiGo" versions of things. Eventually, around halfway through the semester, we will start using the richer, advanced version "GoPiGo"
- Same it true of sensors
- When using, we need to specify the port that each sensor is connected to. This will always be the same for our purposes.

DISTANCE SENSOR

- The distance sensor determines the distance to whatever is immediately in front of it
- The sensor has a range of 2.3 meters and reports the distance in millimeters

Distnace.py

```
1.  from easygopigo3 import EasyGoPiGo3
2.  robot = EasyGoPiGo3()
3.  distance_sensor = robot.init_distance_sensor()
4.
5.  distance = distance_sensor.read_mm()
```

LIGHT AND COLOR SENSOR

- The light and color sensor simply allows reading of a light intensity value
- The light value is broken down into RGBA components
- This sensor also has an LED that can be turned on and off

LightColor.py

```
1.  from di_sensors.light_color_sensor import LightColorSensor
2.  light_color_sensor = LightColorSensor(bus="GPG3_AD1")
3.
4.  light_color_sensor.set_led(True)
5.  r, g, b, a = light_color_sensor.get_raw_colors()
6.  light_color_sensor.set_led(False)
```

LINE FOLLOWER SENSOR

- The line sensor detects whether the robot sits on top of a black line or not
  - Essentially reads the color of the floor
- Six different values are read by the sensor

LineFollower.py

```
1. from easygopigo3 import EasyGoPiGo3
2. robot = EasyGoPiGo3()
3. Line_follower= robot.init_line_follower()
4.
5. ll, l, lc, rc, r, rr = line_follower.read()
```

INERTIAL MEASUREMENT UNIT

- Inertial Measurement Units (IMUs) measure orientation, velocities, and forces about the state of the sensor
  - Also can measure temperature
- We will always have to calibrate the sensor each time we use it (more on this later)

IMU.py

```
1.  from di_sensors.inertial_measurement_unit
        import InertialMeasurementUnit
2.  imu = InertialMeasurementUnit(bus="GPG3_AD2")
3.
4.  a, b, g = imu.read_euler()
5.  t = imu.read_temperature()
```

EXERCISE

- Write a program that determines and outputs the distance in each "cardinal" direction
  - Let "north" be where the robot originally faces.

- After, work on program 1