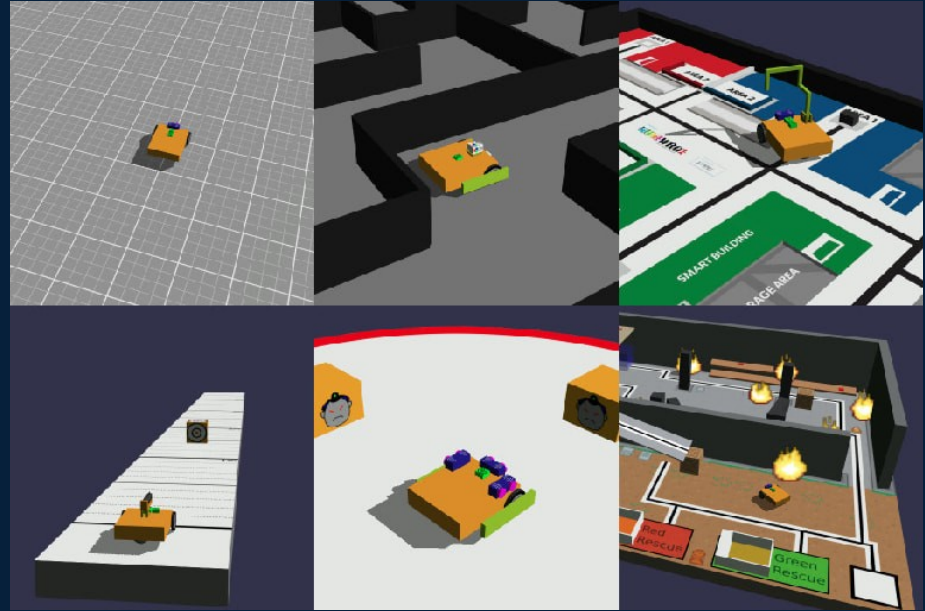


ROBOTICS WITH GEARS

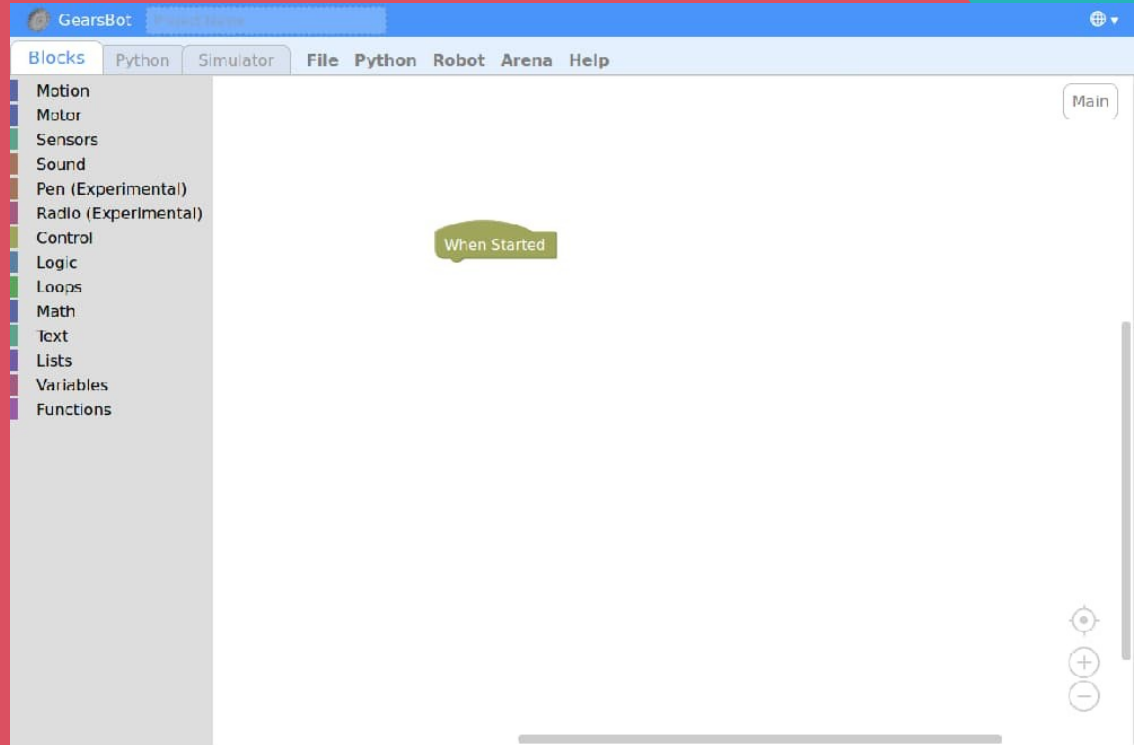
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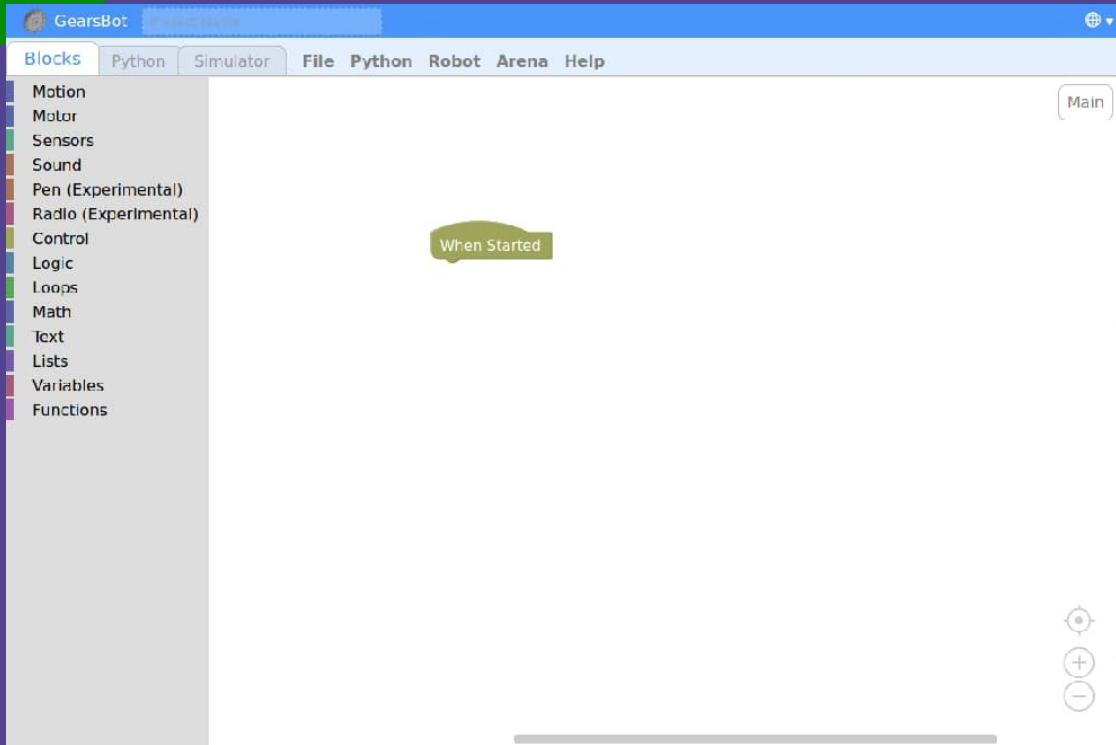


GearsBot

- <http://a9i.sg/gears>
- Contains 3 tabs
 - Blocks
 - Python
 - Simulator

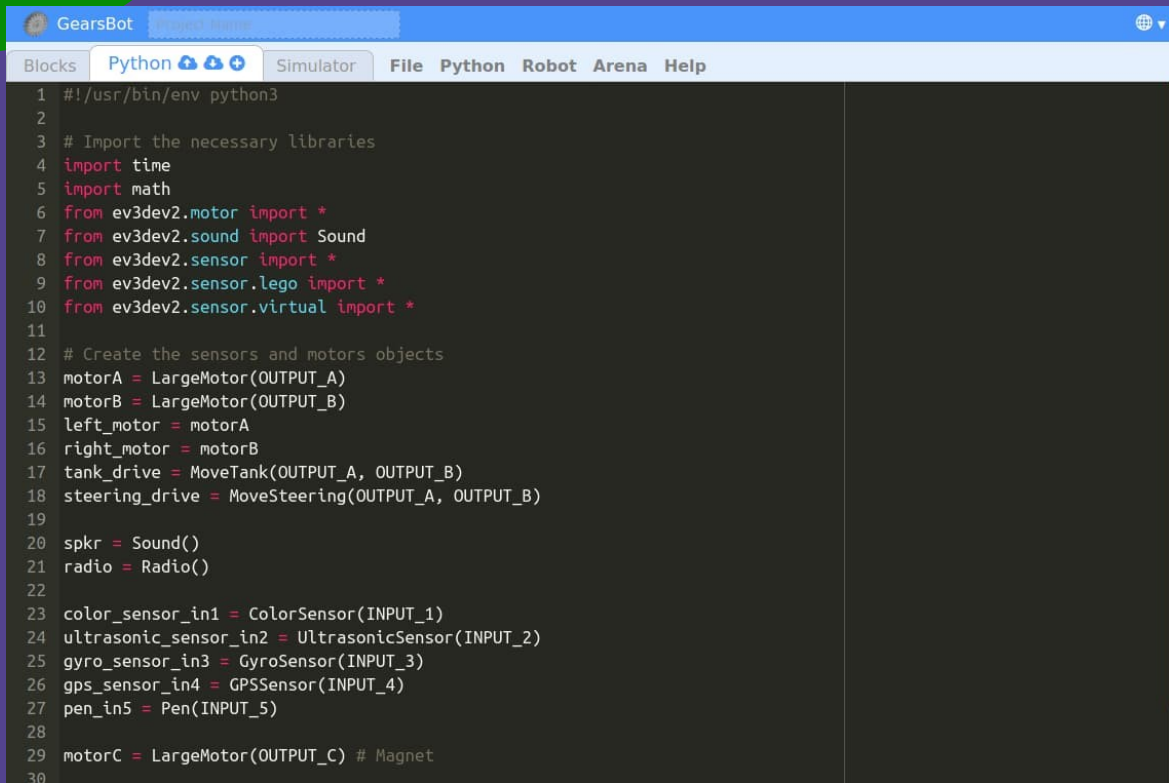


BLOCKS



- Program with blocks similar to Scratch
- Blocks code gets auto-converted to Python

PYTHON

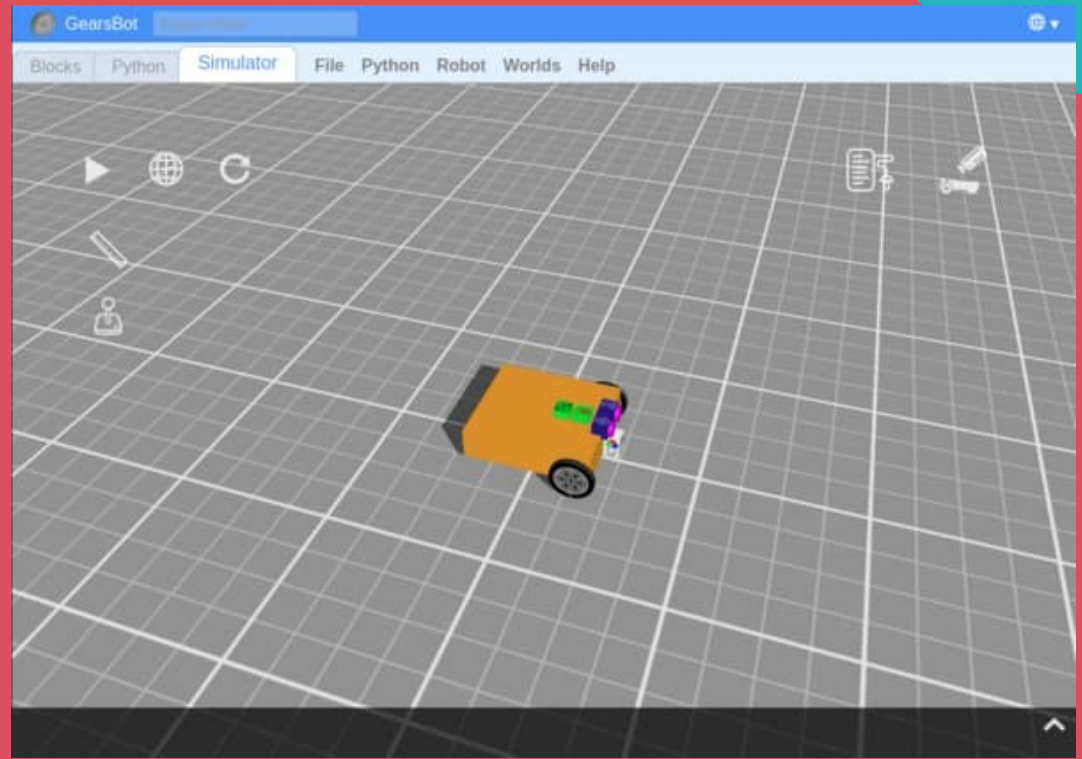


```
1 #!/usr/bin/env python3
2
3 # Import the necessary libraries
4 import time
5 import math
6 from ev3dev2.motor import *
7 from ev3dev2.sound import Sound
8 from ev3dev2.sensor import *
9 from ev3dev2.sensor.lego import *
10 from ev3dev2.sensor.virtual import *
11
12 # Create the sensors and motors objects
13 motorA = LargeMotor(OUTPUT_A)
14 motorB = LargeMotor(OUTPUT_B)
15 left_motor = motorA
16 right_motor = motorB
17 tank_drive = MoveTank(OUTPUT_A, OUTPUT_B)
18 steering_drive = MoveSteering(OUTPUT_A, OUTPUT_B)
19
20 spkr = Sound()
21 radio = Radio()
22
23 color_sensor_in1 = ColorSensor(INPUT_1)
24 ultrasonic_sensor_in2 = UltrasonicSensor(INPUT_2)
25 gyro_sensor_in3 = GyroSensor(INPUT_3)
26 gps_sensor_in4 = GPSSensor(INPUT_4)
27 pen_in5 = Pen(INPUT_5)
28
29 motorC = LargeMotor(OUTPUT_C) # Magnet
30
```

- Can write code directly in Python
- Works with Lego EV3 (running ev3dev)

SIMULATOR

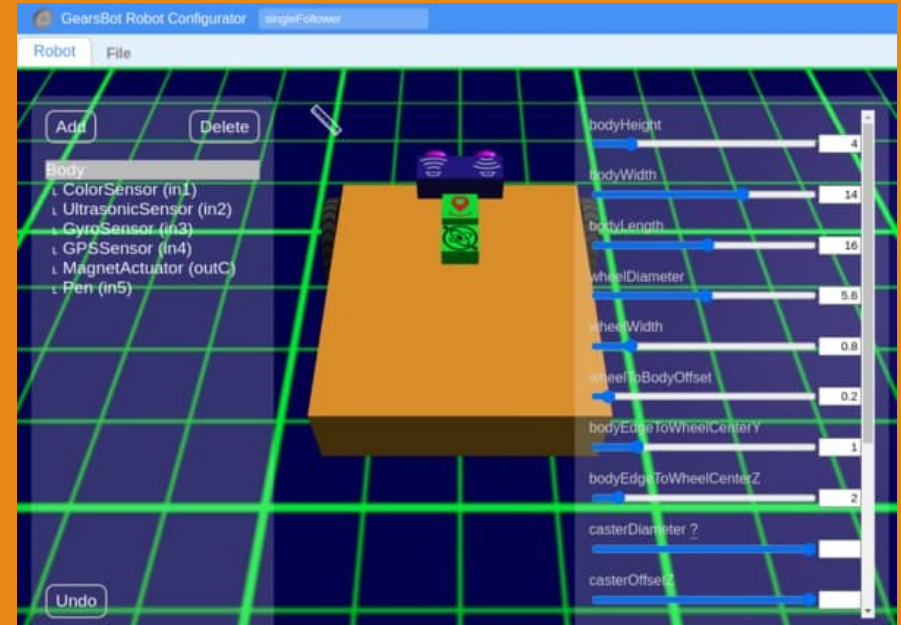
- Click “Play” ▶ to run the code
- Click the “World” icon to change world
- Click “Robot” on the menubar to change robot



Customization



Create a custom world...
(Worlds -> World Builder)



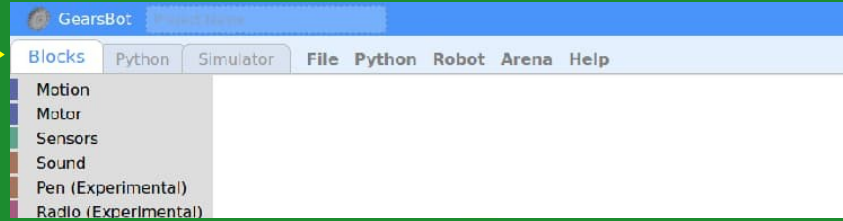
...or a custom Robot
(Robot -> Robot Configurator)

Warm Up Exercises

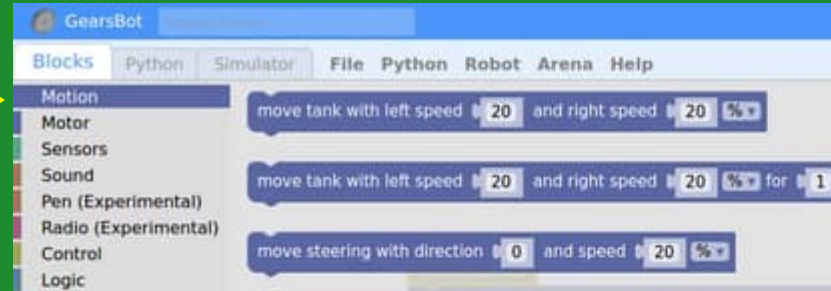
- Moving the Robot
- Using the Sensors

Moving the Robot

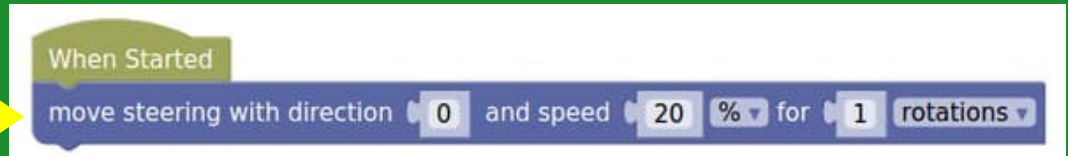
Switch to Blocks Tab



Select Motion

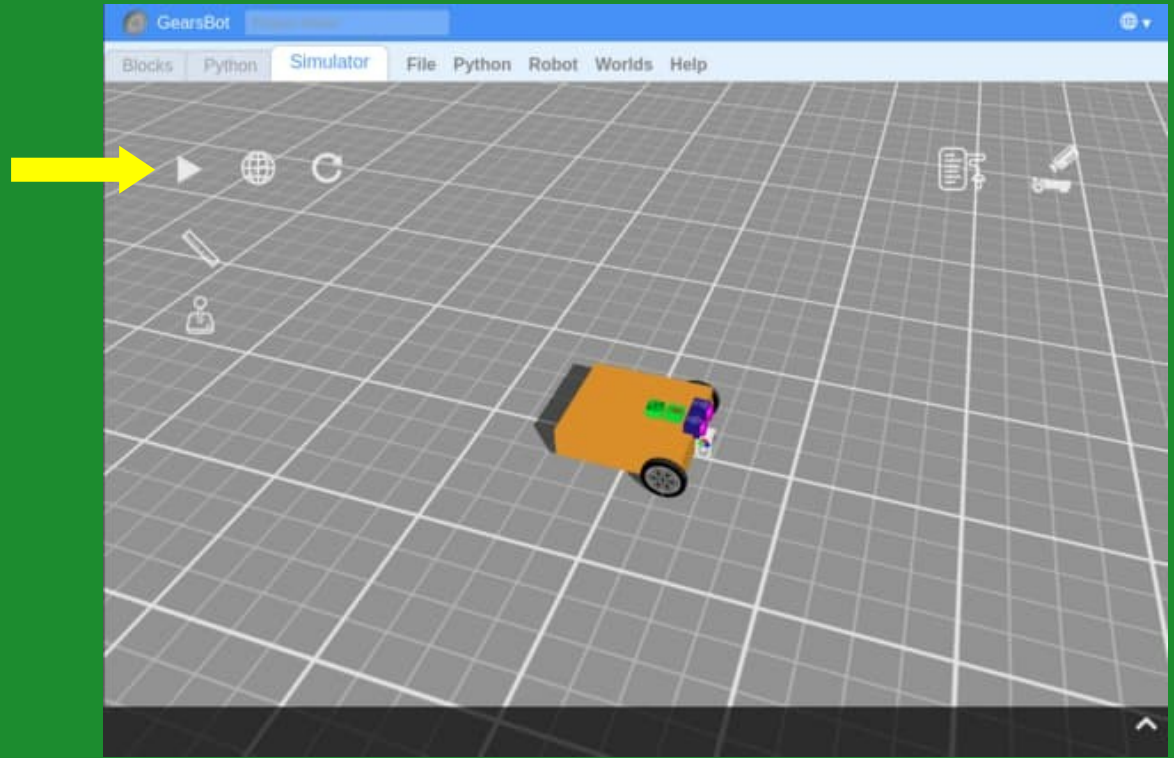


Add a “move steering” block



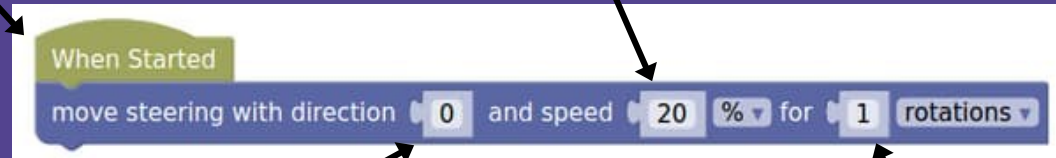
Moving the Robot

Go to Simulator tab and Run!



Understanding the Program

Blocks below "When Started" will run when the play button is clicked



How fast to move

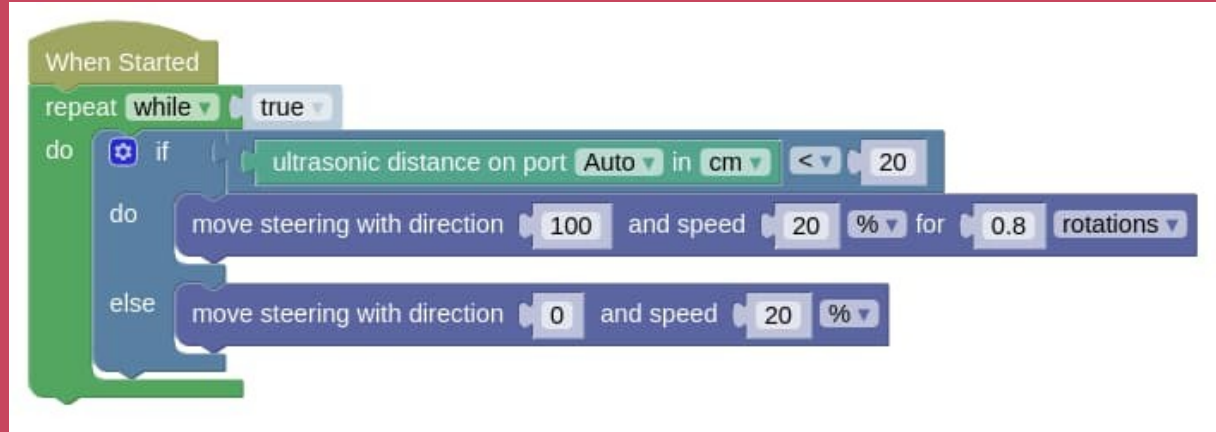
Direction ranges from -100 to 100

How far or long to move

Negative: Turns Left
Positive: Turns Right
Zero: Go Straight

Using the Sensors

Try this program...

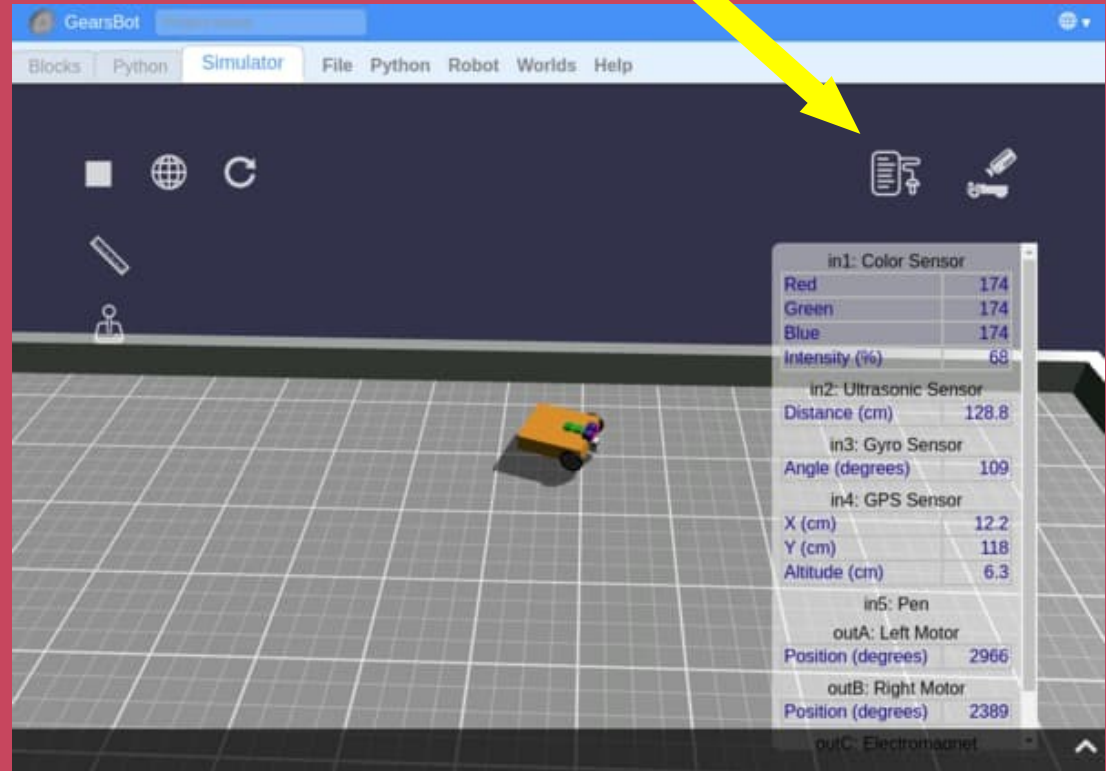


```
When Started
repeat while true
do
  if ultrasonic distance on port Auto in cm < 20
  do
    move steering with direction 100 and speed 20 % for 0.8 rotations
  else
    move steering with direction 0 and speed 20 %
```

The image shows a Scratch code block starting with a 'When Started' trigger. It contains a 'repeat while true' loop. Inside the loop, there is an 'if' block that checks 'ultrasonic distance on port Auto in cm < 20'. If this condition is true, it executes a 'do' block with 'move steering with direction 100 and speed 20 % for 0.8 rotations'. If the condition is false, it executes an 'else' block with 'move steering with direction 0 and speed 20 %'.

Using the Sensors

View the sensors values while running



The screenshot shows the GearsBot simulator interface. A yellow arrow points from the text 'View the sensors values while running' to the sensor data panel on the right. The panel displays the following data:

in1: Color Sensor	
Red	174
Green	174
Blue	174
Intensity (%)	68

in2: Ultrasonic Sensor	
Distance (cm)	128.8

in3: Gyro Sensor	
Angle (degrees)	109

in4: GPS Sensor	
X (cm)	12.2
Y (cm)	118
Altitude (cm)	6.3

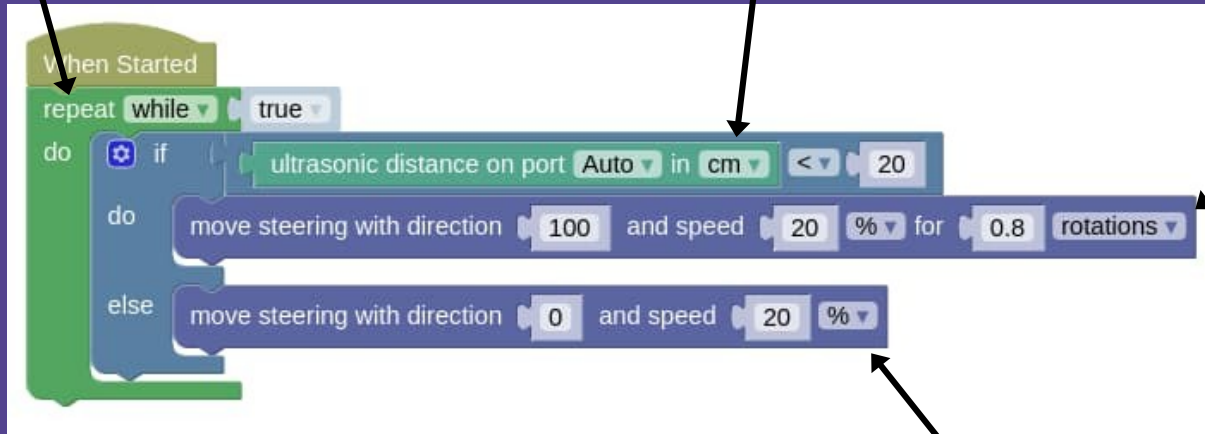
in5: Pen	
outA: Left Motor	
Position (degrees)	2966
outB: Right Motor	
Position (degrees)	2389
outC: Electromagnet	

Understanding the Program

Repeat the blocks inside forever

Check if the ultrasonic distance is less than 20cm

If it is, turn right for 0.8 rotations...



...else move straight

Notice that the move straight block doesn't specify the number of rotations? This block will send the move command to the robot, then immediately continue the program. Try changing it into a block with a number of rotation and see what happens.



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