SPIKE PRIME LESSONS

By the Creators of EV3Lessons

LOOPS

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LESSON OBJECTIVES

- Learn how to repeat an action using loops

REPEATING CODE

- Let us say that you want the robot to repeat an action over and over again.
  - Would you copy the blocks over and over?
  - What if you wanted to repeat the action forever?
- You can use the loops to repeat an action for a number of times or until some exit condition is met
- Loops make repeating a task multiple times easy
- The added benefit is that a loop can end whenever you want (a specific number of times, run forever, a specific condition, etc.)
- There are two types of loops: for loops and while loops

FOR LOOPS

- For loops are used to iterate over a sequence

```
numbers = [1, 4, 9, 13]
for number in numbers:
    print(number)
```

Output:

1

4

9

13

Note:
Remember to indent the code you want to run in the loop

FOR LOOPS WITH RANGE()

- If you want the loop to iterate a certain number of times, you can use the range() function

```
for x in range(4):
    print(x)
```

```
Output:
0
1
2
3
```

- Note that the range function begins at 0. You can also set a start position by doing this
-

```
for x in range(2, 4):
    print(x)
```

```
Output:
2
4
```

- Notice that 4 was not included. The range() function excludes the maximum that you set.
- Finally, you can increment by different values other than 1

```
for x in range(2, 7, 2):
    print(x)
```

Increment

```
Output:
2
4
6
```

WHILE LOOPS

- While loops keeps repeating while a boolean condition returns true
- This is useful for repeating a task until a certain sensor reading
- They can also be used to loop a certain number of times

```
i = 0  Starting point
while (i < 10): Ending point
    i = i + 1  Increment
```

- This loop will run 10 times
- Just like the range() function, you can set the starting point, ending point, and increment
- You can also use while loops to loops forever

```
while True:
```

- By setting the condition to be True always, the loop will repeat forever

USING A WHILE LOOP

In this example, the robot adjusts the speed of the motors based on the Force sensor until the Force sensor is released. This type of loop is different than a wait function since you can perform different actions **while you are waiting**

```
motor_pair = MotorPair('A', 'E')
motor_pair.set_stop_action('brake')
motor_pair.set_default_speed(30)
force = ForceSensor('E')
force.wait_until_pressed()
while (force.is_pressed()):
    motor_pair.start(0, force.get_force_percentage())
motor_pair.stop()
```

Configure your motors and force sensor

Wait until the sensor is first pressed

Keep looping while the sensor is still pressed

Adjust the speed of the motor based on the current force reading each time through the loop.

CHALLENGE: AROUND THE BOX

- Go around the box
- To do this, you will have to move forward 20 cm and turn right
- Repeat this action 4 times till you are all the way around the box
- You will have to remember the lesson on Moving Forward and Turning to complete this challenge
- You repeat those two actions using either of the two types of loops


```
for x in range(4):
```

or

```
i = 0
while (i < 4):
    i = i + 1
```

CHALLENGE SOLUTION

- In previous lessons, you learnt how to configure your robot. The first set of lines sets the movement motors, % Speed, Move CM and sets the motors to hold. (see Configuring Your Robot Lesson). This program has been configured for Droid Bot IV
- Code to move the robot 20cm forward (see Moving Lesson) and Turning 90 degrees (see Turning with Gyro Lesson)

Note:
Remember to import the operator function

```
from spike.operator import greater_than_or_equal_to
motor_pair = MotorPair('A', 'E')
motor_pair.set_stop_action('brake')
motor_pair.set_motor_rotation(17.5, 'cm')
motor_pair.set_default_speed(50)
for x in range(4):
    motor_pair.move(20, 'cm')
    motor_pair.start_tank(20, 0)
    hub.motion_sensor.reset_yaw_angle()
    wait_until(hub.motion_sensor.get_yaw_angle, greater_than_or_equal_to, 90)
motor_pair.stop()
```

CREDITS

- This lesson was created by Arvind Seshan for SPIKE Prime Lessons
- More lessons are available at www.primelessons.org