

Lesson 9: Worksheet 9.1 - Light alarm

In this activity, you will write a program to make your Edison robot sound an alarm when the lights in the room are turned on.

Using Edison's light sensors in programs

Your Edison robot has two light sensors, one on the left and one on the right, which can detect visible light. We can use these sensors to program Edison to respond to light.

In a program, we can have these sensors read the amount of light detected and return this as a digital value.

Look at the following program:

```
1
2 #-----Setup-----
3
4 import Ed
5
6 Ed.EdisonVersion = Ed.V2
7
8 Ed.DistanceUnits = Ed.CM
9 Ed.Tempo = Ed.TEMPO_MEDIUM
10
11 #-----Your code below-----
12
13 while Ed.ReadLeftLightLevel() < 100:
14     pass
15 while True:
16     Ed.PlayBeep()
17
```

This program uses the `Ed.ReadLeftLightLevel()` function in line 13. This function tells the program to read the light level from the left light sensor on Edison and return a value between 0 and 1023.

Because the `Ed.ReadLeftLightLevel()` function returns a value, we can do maths to that value. The first loop in this program uses mathematics to determine what to do. This first loop says to pass (in other words, to do nothing) while the value returned by the `Ed.ReadLeftLightLevel()` function is 'less than' (<) 100.

When the value returned is greater than (>) 100, the program exits the first loop and goes to the next loop, which sounds an alarm continuously.

Your turn:

Write the program and download it to your Edison robot. Place the Edison robot in the dark before you press the play button.

Once you have the lights off or have blocked out Edison's left light sensor, press the play button. When the lights are turned on, or whatever is blocking Edison's left light sensor is removed, the robot will raise the alarm.

Name _____

1. Think of a real-life situation where this type of alarm would be useful. Describe the situation and how the alarm could be used.

2. What changes need to be made to the program to make it a dark alarm?

Lesson 9: Worksheet 9.2 – Automatic lights

In this activity, you will write a program to have your Edison robot turn the two LED lights on when it gets dark.

Look at the following program:

```
1
2 #-----Setup-----
3
4 import Ed
5
6 Ed.EdisonVersion = Ed.V2
7
8 Ed.DistanceUnits = Ed.CM
9 Ed.Tempo = Ed.TEMPO_MEDIUM
10
11 #-----Your code below-----
12 Ed.Drive(Ed.FORWARD, Ed.SPEED_5, Ed.DISTANCE_UNLIMITED)
13
14 while True:
15     if Ed.ReadLeftLightLevel() < 100:
16         activateBothLights(Ed.ON)
17     else:
18         activateBothLights(Ed.OFF)
19
20
21 def activateBothLights(stateOfLed):
22     Ed.LeftLed(stateOfLed)
23     Ed.RightLed(stateOfLed)
24
```

In this program, we are using the 'less than' (<) symbol to determine the path that the program will take.

If the value returned from the `Ed.ReadLeftLightLevel()` function is less than 100, then the `activateBothLights()` function is called with the input parameter of `Ed.ON`. Otherwise, the program moves to the 'else' part of the if statement, which also calls the `activateBothLights()` function, but with the input parameter of `Ed.OFF`.

Your turn:

Write the program and download it to your Edison robot. You will need to create some 'tunnels' for Edison to drive through which will block out the light in order to see Edison's front lights come on.

Run the program with Edison driving in and out of tunnels to see how it works.

Then try experimenting with the value (100) in the if statement in line 15 to see what happens when you run the program with a larger or smaller number.

Name _____

1. What happens when you make the value in the if statement higher?

2. What happens if you make the value in the if statement lower?

Try it!

Will it make a difference if you use the `ReadRightLightLevel()` function instead of the `ReadLeftLightLevel()`? Modify your program with this change and test it to see.

Lesson 9: Worksheet 9.3 – Light following

In this activity, you will write a program so that your Edison robot will follow the light from a torch (flashlight).

Look at the following program:

```

1
2 #-----Setup-----
3
4 import Ed
5
6 Ed.EdisonVersion = Ed.V2
7
8 Ed.DistanceUnits = Ed.CM
9 Ed.Tempo = Ed.TEMPO_MEDIUM
10
11 #-----Your code below-----
12
13 while True:
14     if Ed.ReadRightLightLevel() - Ed.ReadLeftLightLevel() < 0:
15         Ed.Drive(Ed.FORWARD_LEFT, Ed.SPEED_5, Ed.DISTANCE_UNLIMITED)
16     else:
17         Ed.Drive(Ed.FORWARD_RIGHT, Ed.SPEED_5, Ed.DISTANCE_UNLIMITED)
18

```

This program compares the light level between the right light sensor and the left light sensor to determine the flow of the program.

The presence of the torch on either the left or right of the robot will cause the robot to read a higher light level on that side of the robot. The logic of this program says that when the right light level minus the left light level is less than zero, the robot drives left towards the higher source of light, else the robot drives to the right.

Your turn:

Task 1: Trace the program

In worksheet 5.2, you learned about ‘tracing’ a program. When there are lots of calculation and different possible values in a program, it can be useful to trace the program. This allows you to understand the different values that can occur and predict the associated behaviour.

1. Fill out the following tracing table for this program. The expected behaviour should either be ‘drive forward right’ or ‘drive forward left’.

	Right_Light	Left_Light	Expected behaviour
Torch on right	200	100	
Torch on left	100	200	
No torch	100	100	

Task 2: Write and run the program

Write the program and download it to your Edison robot. After you press the play button, shine a torch at Edison. The robot will drive towards the light. Use the torch to control where Edison drives.

2. What happens if you change the 'less than' symbol (<) to a greater than symbol (>) in this program?

What do you think?

The light-following program above demonstrates a robotic behaviour that is very similar to that of a moth attracted to a street light on a warm night.

Is a moth which is attracted to light intelligent? What about a robot with the same behaviour?

Why is an insect that is attracted to light alive, but not a robot?