

A PharoThings Tutorial

Alex Oliveira

November 28, 2018

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Lesson 3 - LED Flowing Lights

Now we can play with the LEDs, turn them on, off, and blink. Let's put 8 LEDs on the breadboard and create a code to turn on/off one at a time. As we did in the last lesson, let's write the first code in playground and then create a class with methods to better control the flow of LED lights.

1.1 What do we need?

We are using the lesson 1 setup, but let's use 8 LEDs and 8 resistors.

Components

- 1 Raspberry Pi connected to your network (wired or wireless)
- 1 Breadboard
- 8 LEDs
- 8 Resistors 330ohms
- Jumper wires

1.2 Experimental procedure

We saw in lesson 1 how to connect the LED and resistors on the breadboard. Now let's do the same, but putting more 7 LEDs and resistors on the breadboard.

- Connect the Ground PIN from Raspberry in the breadboard blue rail (-).

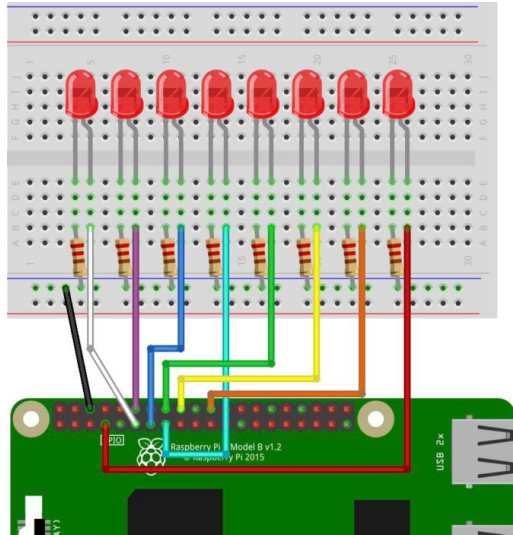


Figure 1-1 Schema connection 8 LEDs.

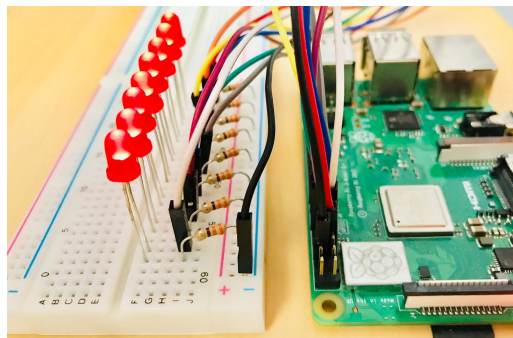


Figure 1-2 Physical connection 8 LEDs.

- Then connect the 8 resistors from the blue rail (-) to a column on the breadboard, as shown below;
- Now push the LED legs into the breadboard, with the long leg (with the kink) on the right;
- And insert the jumper wires connecting the right column of each LED to GPIO from 0 to 7, as shown in the Picture 1-1.

The Figure 1-2 shows how the electric connection is made:

Connecting remotely

Through your local Pharo image, let's connect in the Pharo image by running on Raspberry, enable the auto-refresh feature of the inspector, and open the inspector.

Run this code in your local playground:

```
remotePharo := TlpRemoteIDE connectTo: (TCPAddress ip: #[193 51 236
    212] port: 40423)
GTInspector enableStepRefresh.
remoteBoard := remotePharo evaluate: [ RpiBoardBRev1 current].
remoteBoard inspect.
```

1.3 Experimental code

In your inspect window (Inspector on a PotRemoteBoard), let's create an array and initialize the 8 LEDs, putting each one in a position of the array. This way we can send messages more easily to all objects. Look at the third line, we set the GPIOs to beDigitalOutput only using the method do: to move through the entire array:

```
gpioArray := { gpio0. gpio1. gpio2. gpio3. gpio4. gpio5. gpio6.
    gpio7 }.
gpioArray do: [ :item | item beDigitalOutput ].
```

To change the value of the object (led value), let's call the method toggleDigitalValue, as we saw previously. Let's put a Delay after changing the led value, to wait a bit time before to change the next LED value. To do this fast and simple, let's use again the method do: to send the parameters to all objects on the array. Let's also put this inside a process using forkNamed:

```
[
    gpioArray do: [ :item | item toggleDigitalValue. (Delay
        forSeconds: 0.3) wait ].
] forkNamed: 'FlowingProcess'.
```

Execute this code and... cool! Now your LEDs are on by flowing an ordering!

Change the value of the method forSeconds: to wait less time between toggling it. This will cause the line LEDs to turn on faster. The Figure 1-3 and 1-4 shows the code and the LEDs turn On.

1.4 Improving the code

Every time you run this code, the LEDs toggles the state, from Off to On or vice versa. Let's reduce the delay time and add the timesRepeat: method, as we did in the last lesson, to repeat the alternation as many times as we want:

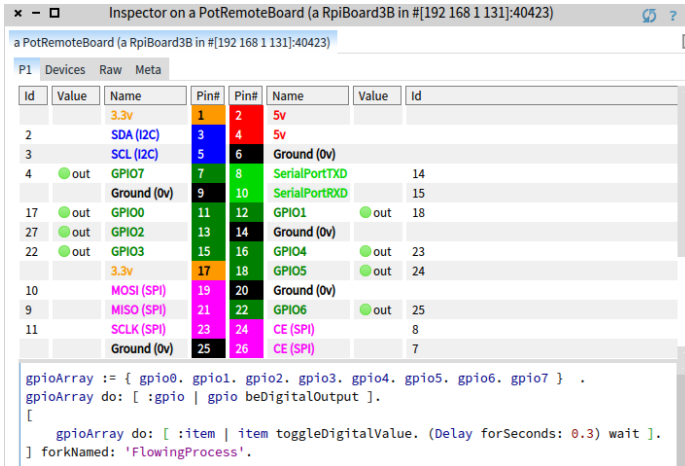


Figure 1-3 Code on Inspector

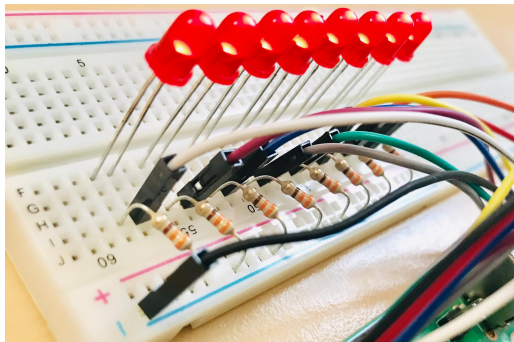


Figure 1-4 LEDs turn On.

```
[ 2 timesRepeat: [
  gpioArray do: [ :item | item toggleDigitalValue. (Delay
    forSeconds: 0.1) wait ].
] ] forkNamed: 'FlowingProcess'.
```

Execute this code and... cool! Now your LEDs are flowing On and Off!

1.5 Reversing the flow

We can have more fun with this experiment by changing the order of where to start changing the value of LEDs. To do this is very easy, just call the method `reverseDo:` and it will solve it all for you:

1.6 Going and backing the flow

```
[ 2 timesRepeat: [
  gpioArray reverseDo: [ :item | item toggleDigitalValue. (Delay
    forSeconds: 0.1) wait ].
] ] forkNamed: 'FlowingProcess'.
```

Execute this code and... cool! Now your LEDs are flowing on reverse order!

1.6 Going and backing the flow

To finish this experiment, let's combine the flowing On and Off with the Reverse!

```
[ 2 timesRepeat: [
  gpioArray do: [ :item | item toggleDigitalValue. (Delay
    forSeconds: 0.1) wait ].
  gpioArray reverseDo: [ :item | item toggleDigitalValue. (Delay
    forSeconds: 0.1) wait ].
] ] forkNamed: 'FlowingProcess'.
```

Execute this code and... cool! Now your LEDs are flowing On and Off and on normal and reverse order!

1.7 Terminating the process

As we saw in the Blinking LED lesson, you can finish this process remotely, case you don't wait it finish. To do this, call the Remote Process Browser:

```
[ remotePharo openProcessBrowser.
```

Search the FlowingProcess and terminate it, like in 1-5, using one of these options:

- selecting the process and using the shortcut "Cmd + T";
- selecting the process and using the button Terminate;
- or right-click and select Terminate.

1.8 In the next lesson

In this tutorial, you learned how to use an Array and control 8 objects at the same time by typing some code in the remote inspector. But with Pharo we can do more!

And in the next lesson, let's use object-oriented programming, OOP to create a simple program, using these codes, to control the flow like as we want.

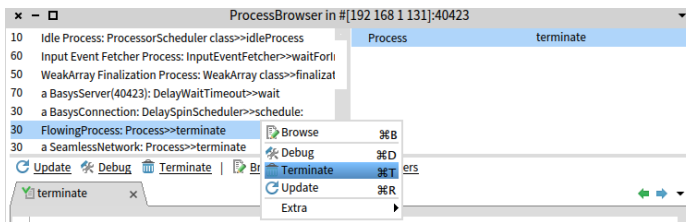


Figure 1-5 Process Browser terminate.