nustem

Envirocorn

Measure stuff about the world, then make ludicrous colours out of it.

Ingredients

Platform:	Raspberry Pi / Raspbian Python3
Components:	ScrollpHAT HD
Libraries:	GUIzero

EnviroPHAT

Pimoroni's EnviroPHAT is a neat little board which contains a good range of environment sensors, along with four handy analogue inputs (see the Analogue Input worksheet for another way of doing that sort of thing). We're going to use some of its simpler functions, and map their outputs to the 16x16 colour LED UnicornHAT HD display.

The two HATs are attached to the same Pi via a breakout board on a ribbon cable. You'll need to move the breakout around a bit at times – do so with care!

Load `enviro-1.py` in Thonny, have a look through it, and run it.

It'll print out a set of values. The first three, in brackets, represent the colour of the light falling on the EnviroPHAT sensor. Try placing your finger or one of the coloured gels over the light sensor.

The last figure is the compass heading. Try rotating the breakout board and watch the values change.
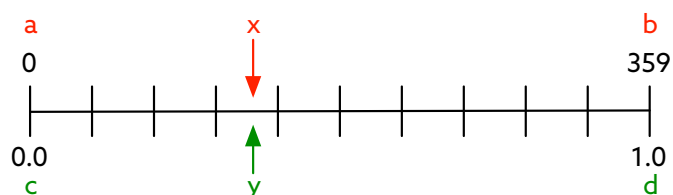
UnicornHAT HD

Load `unicorn-1.py` in Thonny, look through, and run it. The LED array should turn red for a few seconds.

Colours for the UnicornHAT are represented as red, green and blue values, each between 0 and 255. So full red is (`255, 0, 0`). Try changing the colour in the code and see what happens.

Envirocorn

Load envirocorn-1.py in Thonny, and have a good look through. Can you work out what's going to happen when you run it? The `map_values` function may be a bit weird; it converts an input value within a given range to the corresponding value in another range. This diagram might help. Or... not.

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Envirocorn-2

Of all the worksheet examples, this is the one which most made Jonathan's head hurt. He's still not entirely sure he understands how it works, even though he wrote it.

Open and run `envirocorn-2.py`, and you'll find:

1. The UnicornHAT colour reflects the object above the EnviroPHAT sensor. This isn't always entirely obvious.

2. The UnicornHAT draws a graph which represents compass angle over time. Rotate the whole thing and you should see the bar graph change.

The challenge here, really, is to see how far through this you can stagger while still thinking it makes sense. Or, maybe, to think about better ways of doing something similar.

Or – and this is much more accessible – to think about what other use 256 shiny coloured pixels could be put, when connected to an environment sensor.

Enviro+

Pimoroni have a new environment sensor out, the Enviro+:

`https://shop.pimoroni.com/products/enviro-plus`

It's not cheap, but it covers a much wider range of sensing than the Enviro-PHAT. In particular, you can connect to it a particulate matter sensor:

`https://shop.pimoroni.com/products/pms5003-particulate-matter-sensor-with-cable`

...which is very nifty indeed.

What could you do with that?

Documentation

It's worth exploring the documentation and example code for the two HATs used in this worksheet. Example code is in `~/Pimoroni/`, and docs are here:

`http://docs.pimoroni.com/envirophat/`

`http://docs.pimoroni.com/unicornhathd/`

One thing we noticed: the `unicornhathd.setall()` method isn't documented. This is the sort of thing that's surprisingly common in the Raspberry Pi world, and absolutely infuriating.