@title

Crash landing - part 1

@standfirst

Survive a crash landing in the jungle using a Raspberry Pi and Python – intoducing the SenseHat

@introduction

You were travelling on holiday with your trusty bag of technology including a Raspberry Pi, SenseHat and micro:bits. Half way there you crash land in the jungle. You will need to use your wits, cunning and programming skills to survive your time in the jungle.

No bugs will get eaten.

@requirements

* Raspberry Pi with SenseHat or SenseHat emulator
* Sense HAT emulator on trinket
* Python 3

@Age range and lesson type

11-13 years

Programming

Science enquiry and investigation

Cross-curricular Science activity

These activities can also be carried out as an independent project or in a club setting

@illustration

The Sense HAT emulator from Raspberry Pi and trinket

@illustration caption

If you don’t have access to a SenseHAT your can use the SenseHAT emulator on the Raspberry Pi. You can also use the trinket SenseHAT emulator here https://trinket.io/sense-hat

@The challenge

In this part we will learn how to take some environmental measurements and then use them to respond to the readings.

* Measure the temperature of the surroundings
* Measure the air pressure and detect if it is changing
* Predict if there is a storm coming

@The activities

Our first two tasks help us explore the SenseHAT and start to take some measurements of the environment. Depending on whether your are using the physical HAT or the emulator you will need to change the first line of the code.

If you are using the physical SenseHAT on a Raspberry Pi or trinket start the code with

```python

from sense\_hat import SenseHat

```

If you are using the SenseHAT emulator you will need to start the code with

```python

from sense\_emu import SenseHat

```

@box

@lesson plan information for teachers

These activities can be used in both computer science lessons or in a cross-curricular science project. The activities will give students opportunities to take real world measurements with the SenseHat.

Activity 1 introduces students to taking measuremets from the SenseHat and formatting the results to make them more readable. The activitity also gives students an opportunity to use if … then … statements to respond to the measurements.

Actrivity 2 builds on the first task and takes measurements of atmospheric pressure and displays them in a useful format as a barchart on the SenseHat LED matrix.

@activity 1 – How hot is it in the jungle?

We want to find out the temperature of the jungle so we can fetch the current temperature value and print it out.

```python

sense=SenseHat()

temp = sense.temp

print(temp)

```

What do you notice about the temperature?

We need to change the temperature and make it more readable by removing the extra digits after the decimal point.

```python

temp = round (temp,2))

print (temp)

```

Now we have an accurate measurement of the temperature in the jungle we need to know if it going to be safe for us to survive.

If your body temperature gets higher than 38.3 oC you will enter hyperthermia and if it drops below 10 oC you run the risk of hypothermia.

```python

if temp < 10:

print ("Warning too cold - risk of hypothermia")

elif temp >38:

print ("Warning too hot - risk of hyperthermia")

else:

print ("Safe temperature")

```

@Extending the task

Measuring the tempature once is useful but why don’t we read it every 5 minutes?

@task

Create a loop to repeat the tempature measurement

Add a delay of 300 seconds

@activity 2 – it is going to rain?

Weather forcasters use air pressure as a way of predicting the weather. You might have seen a barometer before or even have one at home. In this task we are going to use the Raspberry Pi to log the air pressure and predict if a storm is coming.

@illustration – a barometer / weather map

Start a new Python3 file and this time we will be collecting the air pressure

```python

from sense\_emu import SenseHat

sense = SenseHat()

while True:

pressure = sense.pressure

print (pressure)

```

Run the code and watch the long list of air pressures dissapear infront of you – this is not going to be the simplest way to observe a change in air pressure.

The SenseHAT can measure a pressure range from around 250 mbar to 1250 mbar. We can use the pixels on the SenseHAT to show the pressure as a bar chart.

```phython

from sense\_hat import SenseHat

from time import sleep

sense = SenseHat()

r=[255,0,0]

sense.clear()

while True:

for c in range (0,7):

pressure = sense.pressure

print (pressure)

graph\_pressure = int(pressure / 150)

print (graph\_pressure)

for i in range(graph\_pressure):

sense.set\_pixel(c,i,r)

print (c)

sleep(300)

sense.clear()

```

The actual value of the pressure is divided by 150 to give a value between 0 and 8 which can be displayed on the SenseHAT pixels as a bar. Every 10 minutes a new value is taken and the next bar is displayed. After all 8 bars are displayed the loop restarts.

Over the hour you can monitor the weather by looking at the air pressure.

If the air pressure is high we can predict clear skies, light winds and bright weather.

If the air pressure is low we can predict we are in for cloudy and wet weather.

If the air pressure starts to drop we can predict a change in the weather and we might need to get out our rain coat or umbrella.

@assessment

* How would you change the colour of the bars to show a drop in air pressure?
* Could you trigger an alert if the pressure drops dramatically in a short space of time