Enabling the
AstroPi mission

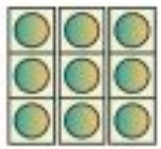
Sense Hat

Python 3 Cheatsheet

To add **Sense HAT** functionality to your python programs add the following lines to import the library for the Sense HAT library:

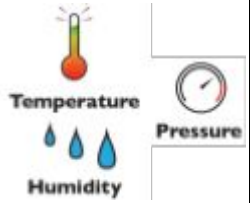
```
from sense_hat import SenseHat
sense = SenseHat()
```

From that point forwards you can use any of the set of functions from the Sense HAT Library.



`sense.set_pixel(0, 0, 255, 0, 0)`	Sets the top left LED to the colour red.
`sense.show_letter("J", 0, 0, 255)`	Displays the letter "J" on the screen in blue.
`sense.show_message("msg", text_colour=[0, 255, 0])`	Displays the message "msg" on the matrix in green.
`sense.load_image( "creeper.png", redraw=True)`	Load an 8x8 image "creeper.png" image and display it.
`sense.clear()`	Clears the LED and switches them all off.
`sense.set_rotation(r=0)`	Sets the rotation of the LED matrix.
`sense.set_pixels(pixelList)`	Uses pixellist to draw a picture, each item is an [R,G,B] list

`yaw,pitch,roll = sense.get_orientation().values()`	Gets the orientation data and stores their values as **yaw, pitch, roll**
`m_x, m_y, m_z = sense.get_compass_raw().values()`	Gets the compass data and stores as **m_x, m_y, m_z**
`x, y, z = sense.get_accelerometer_raw().values()`	Gets the accelerometer data and stores as **x ,y, z**
`g_x,g_y,g_z = sense.get_gyroscope_raw().values()`	Gets the orientation data and stores as **g_x, g_y, g_z**



t = sense.get_temperature_from_humidity()	Uses the humidity sensor to get temperature and stores it as **t**.
t = sense.get_temperature_from_pressure()	Uses the pressure sensor to get temperature and stores it as **t**.
h = sense.get_humidity()	Measures the humidity and stores it as **h**.
p = sense.get_pressure()	Measures the pressure and stores it as **p**.

There are a number of ways to capture the input from the joystick. You could use the either the **pygame** or **curses** library. However for this example we're going to use the evdev system, which you'll need to install using "sudo pip3 install evdev"

```
from evdev import InputDevice, ecodes,list_devices
from select import select

devices = [InputDevice(fn) for fn in list_devices()]
for dev in devices:
    if dev.name == "Raspberry Pi Sense HAT Joystick":
        js = dev

while True:
    r, w, x = select([dev.fd], [], [],0.01)
    for fd in r:
        for event in dev.read():
            if event.type == ecodes.EV_KEY:# and event.value == 1:
                if event.code == ecodes.KEY_UP:
                    print("up")
                elif event.code == ecodes.KEY_LEFT:
                    print("left")
                elif event.code == ecodes.KEY_RIGHT:
                    print("right")
                elif event.code == ecodes.KEY_DOWN:
                    print("down")
                else:
                    print("enter")
```

The code on the left looks through the available input devices and finds the Sense-HAT joystick.

It then continually check the joystick device and creates a list of events call **r.**

For each event in the list it checks whether it was a keyboard style event.

It then compares the the key code to the values for up, down, left and right and pirnts a corresponding message

Scrolling Message

```
from sense_hat import SenseHat

sense = SenseHat()

while True:
    sense.show_message("Spaaaaaaace!!", scroll_speed=0.05, text_colour=[255,255,0], back_colour=[0,0,255])
```

Environmental Sensing

```
from sense_hat import SenseHat

sense = SenseHat()

while True:
    t = sense.get_temperature()
    p = sense.get_pressure()
    h = sense.get_humidity()

    t = round(t,1)
    p = round(p,1)
    h = round(h,1)

    msg = "Temp = %s, Pressure=%s,
Humidity=%s" % (t,p,h)


sense.show_message(msg,scroll_speed=0.05)
```

Rotating letter “J”

```
from sense_hat import SenseHat
import time

sense = SenseHat()

sense.show_letter("J")

while True:
  x, y, z = sense.get_accelerometer_raw().values()

  x = round(x, 0)
  y = round(y, 0)

  if x == -1:
      sense.set_rotation(180)
  elif y == -1:
      sense.set_rotation(90)
  elif y == 1:
      sense.set_rotation(270)
  else:
      sense.set_rotation(0)

  time.sleep(0.1)
```

Reaction Game

```
from sense_hat import SenseHat
import time
import random

sense = SenseHat()

# set up the colours (white, green, red, empty)

w = [150,150,150]
g = [0,255,0]
r = [255,0,0]
e = [0,0,0]

# create three different coloured arrows
arrow = [e,e,e,w,w,e,e,e,
    e,e,w,w,w,w,e,e,
    e,w,e,w,w,e,w,e,
    w,e,e,w,w,e,e,w,
    e,e,e,w,w,e,e,e,
    e,e,e,w,w,e,e,e,
    e,e,e,w,w,e,e,e,
    e,e,e,w,w,e,e,e]

arrow_red = [e,e,e,r,r,e,e,e,
    e,e,r,r,r,r,e,e,
    e,r,e,r,r,e,r,e,
    r,e,e,r,r,e,e,r,
    e,e,e,r,r,e,e,e,
    e,e,e,r,r,e,e,e,
    e,e,e,r,r,e,e,e,
    e,e,e,r,r,e,e,e]

arrow_green = [e,e,e,g,g,e,e,e,
    e,e,g,g,g,g,e,e,
    e,g,e,g,g,e,g,e,
    g,e,e,g,g,e,e,g,
    e,e,e,g,g,e,e,e,
    e,e,e,g,g,e,e,e,
    e,e,e,g,g,e,e,e,
    e,e,e,g,g,e,e,e]
```

```
pause = 3
score = 0
angle = 0
play = True

sense.show_message("Keep the arrow pointing up", text_colour=[100,100,100])

while play == True:
    last_angle = angle
    while angle == last_angle:
      angle = random.choice([0,90,180,270])
    sense.set_rotation(angle)
    sense.set_pixels(arrow)
    time.sleep(pause)

    x, y, z = sense.get_accelerometer_raw().values()
    x = round(x, 0)
    y = round(y, 0)

    if x == -1 and angle == 180:
      sense.set_pixels(arrow_green)
      score = score + 1
    elif x == 1 and angle == 0:
      sense.set_pixels(arrow_green)
      score = score + 1
    elif y == -1 and angle == 90:
      sense.set_pixels(arrow_green)
      score = score + 1
    elif y == 1 and angle == 270:
      sense.set_pixels(arrow_green)
      score = score + 1
    else:
      sense.set_pixels(arrow_red)
      play = False

    pause = pause * 0.95
    time.sleep(0.5)

msg = "Your score was %s" % (score)
sense.show_message(msg, scroll_speed=0.05, text_colour=[100,100,100])
```