## Computer Systems Assignment 2 – Overview

The object of this project is to adapt the temperature sensor built into Sense Hat to monitor temperature in animal housing, with the intention of alerting a user to extreme swings in temperature, which are likely to cause pneumonia in livestock.

Temperature readings will be taken daily at 10 minute intervals, and the Maximum and Minimum temperatures for the previous 12 hours will be recorded. If the Maximum temperature exceeds the Minimum temperature by a factor of more than 300%, an alert is sent to the user’s Twitter feed.

## Process:

The RPi monitors the temperature every 10 minutes via the temperature sensor on Sense Hat, using a python program called *temp-report.py* (see code below). This is then read to a Thing Speak channel called *ReadSensePi*, with temperature being read into Field 1.

The *MATLAB Analysis* facility in Thing Speak is then used to extract the Minimum and Maximum temperature in the previous 12 hours as well as calculating the Maximum/Minimum ratio.

These are then written out to another Thing Speak channel called *SensePiReport*. A *React* is then set up on the *SensePiReport* channel to send a message to a nominated Twitter account if the Maximum/Minimum ratio exceeds 300%.

### temp-report.py

import urllib2

import json

import time

from sense\_hat import SenseHat

WRITE\_API\_KEY = 'RYFEEFDFC08XU990'

baseURL = 'https://api.thingspeak.com/update?api\_key=%s' % WRITE\_API\_KEY

sense=SenseHat()

def writeData(temp):

#Sending the data to thingspeak in the query string

conn = urllib2.urlopen(baseURL + '&field1=%s' % (temp))

print(conn.read())

#Closing the connection

conn.close

while True:

temp=round(sense.get\_temperature(),2)

writeData(temp)

sense.show\_message("Temp is " + str(temp)+"C")

time.sleep(600)

The *ReadSensePi*  ThingSpeak Channel can be found at:

<https://thingspeak.com/channels/666520>

The *SensePiReport* Channel can be found at:

<https://thingspeak.com/channels/666020>

The *MATLAB* Code used to perform the analysis:

% Read temperature data from a ThingSpeak channel over the past 12 hours

% to calculate the high and low temperatures and and temperature changes and write to another channel.

% Channel ID to read data from

readChannelID = 666520;

% Temperature Field ID

TemperatureFieldID = 1;

% Channel Read API Key

% If your channel is private, then enter the read API Key between the '' below:

readAPIKey = 'NLGLDYBT7ABF5UV6';

% Read temperature data for the last 12 hours from the MathWorks weather

% station channel. Learn more about the thingSpeakRead function by going to

% the Documentation tab on the right side pane of this page.

[tempC,timeStamp] = thingSpeakRead(readChannelID,'Fields',TemperatureFieldID, ...

'numMinutes',720,'ReadKey',readAPIKey);

% Calculate the maximum and minimum temperatures

[maxTempC,maxTempIndex] = max(tempC);

[minTempC,minTempIndex] = min(tempC);

[tempChangeC]=max(tempC)/min(tempC);

% Select the timestamps at which the maximum and minimum temperatures were measured

timeMaxTemp = timeStamp(maxTempIndex);

timeMinTemp = timeStamp(minTempIndex);

display(maxTempC,'Maximum Temperature for the past 12 hours is');

display(minTempC,'Minimum Temperature for the past 12 hours is');

display(tempChangeC, 'Daily Temperature Change in past 12 hours is');

%fprintf(['Note: To write data to another channel, assign the write channel ID \n',...

% 'andAPI Key to ''writeChannelID'' and ''writeAPIKey'' variables. Also \n',...

% 'uncomment the line of code containing ''thingSpeakWrite'' \n',...

% '(remove ''%%'' sign at the beginning of the line.)']);

% To store the maximum temperature, write it to a channel other than

% the one used for reading data. To write to a channel, assign the write

% channel ID to the 'writeChannelID' variable, and the write API Key to the

% 'writeAPIKey' variable below. Find the write API Key in the right side pane

% of this page.

% Replace the [] with channel ID to write data to:

writeChannelID = [666020];

% Enter the Write API Key between the '' below:

writeAPIKey = 'MF9I4V3RRBA7GTOW';

% Learn more about the thingSpeakWrite function by going to the Documentation tab on

% the right side pane of this page.

%thingSpeakWrite(writeChannelID,[maxTempC, minTempC,tempChangeC],'timestamp',timeMaxTemp,'Writekey',writeAPIKey);

thingSpeakWrite(writeChannelID,[maxTempC, minTempC,tempChangeC],'Writekey',writeAPIKey);

Details of the React/ThingTweet are at:

<https://thingspeak.com/apps/reacts/45582>

A walk through of the project can be found at:

<https://youtu.be/VSiW4qIGvfk>