Matlab Visualization Using ThinkSpeak

ThingSpeak has integrated support from the MATLAB. It allows ThingSpeak users to analyze and visualize live data using MATLAB without any MATLAB license from Mathworks. You can access the MATLAB tools from your ThingSpeak channel.

MATLAB Analysis and Visualization tools can show relationships, patterns, and trends in data, and can visualize it in plots, charts, and gauges.

Using the MATLAB analysis, you can:

Convert the data units, combine different data, and calculate new data.
Schedule calculations to run at a specific time.
Visually understand relationships in data using built-in plotting functions.
Combine data from multiple channels to build a more sophisticated analysis.

We assume the DHT11 sensor has been interfaced to the Raspberry Pi .
(Please refer to the code discusses in the last class)
The temperature and Humidity data captured is sent to the ThinkSpeak Channel.

Now, as the sensor data is streaming over the ThingSpeak channel, we will use the MATLAB Analysis tool to calculate the Dew point using the temperature and humidity data. It reads the temperature and humidity data from the Weather Station channel. After calculating the Dew point, write this data to a new channel along with temperature and humidity data.

For MATLAB analysis, go to the Apps tab, and click MATLAB Analysis.
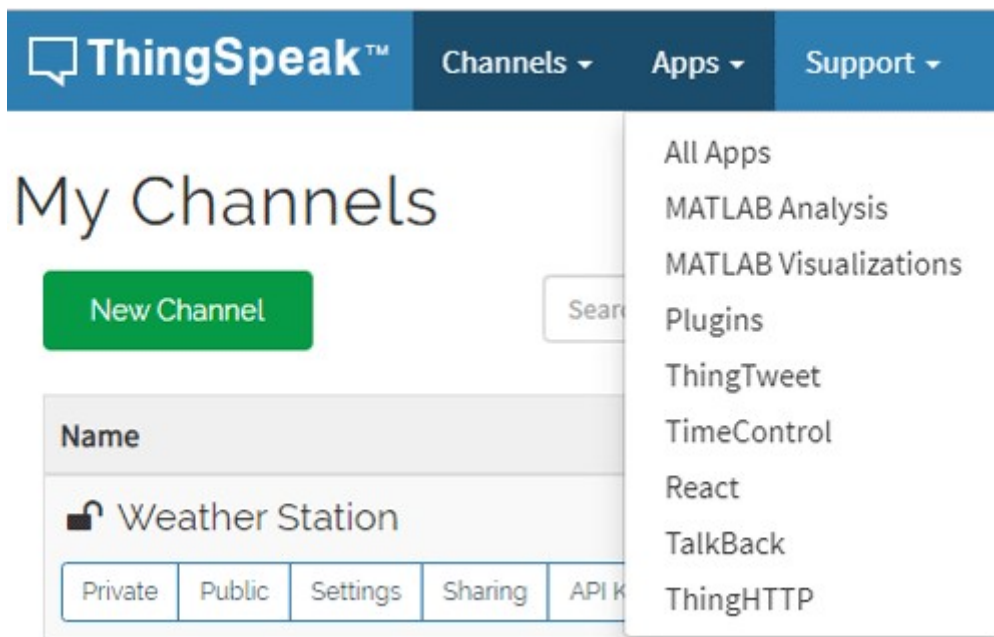
Now click on 'New.' Then select the Custom template, and click on 'Create.' In the Name field, enter your project name.

 ThingSpeak MATLAB Analysis :

Dewpoint Equation
This equation is so complex that for easier calculation, we split it into 2 parts.

$$N = \frac{\ln\left(\frac{RH}{100}\right) + \left[\frac{(17.27 \cdot T)}{(237.3+T)}\right]}{17.27}$$

$$D = \frac{(237.3 \cdot N)}{(1-N)}$$

ln means natural logarithm
T = Air Temperarure (Celsius)
RH = Relative Humidity
D = Dewpoint Temperature (Celsius)
www.1728.com

```
readChannelID = 762208;         % Channel ID from which you are reading the data
readAPIKey = 'GXBL8OUK85WI36UR'; % Channel read API key from which you are
                                   reading the data
TemperatureFieldID = 1;         % Temperature Field ID
HumidityFieldID = 2;            % Humidity Field ID

[temp,time] = thingSpeakRead(readChannelID,'Fields',TemperatureFieldID, ...

'NumPoints',1,'ReadKey',readAPIKey);            % Read the temperature data

humidity = thingSpeakRead(readChannelID,'Fields',HumidityFieldID, ...

'NumPoints',1,'ReadKey',readAPIKey);            % Read the humidity data

tempC = (5/9)*(temp-32);
b = 17.62;                      % constant for water vapor (b)
c = 243.5;                      % constant for barometric pressure (c).
gamma = log(humidity/100)+b*tempC./(c+tempC);
dewPoint = c*gamma./(b-gamma)
dewPointF = (dewPoint*1.8) + 32;
display(dewPointF,'Dew Point is');


writeChannelID = 899642;                 % Write channel ID
writeAPIKey = '5VI7OCQWBB86DK77';        % Write channel API Key
thingSpeakWrite(writeChannelID,[temp,humidity,dewPointF],'Fields',
[1,2,3],'timestamp',time,'WriteKey',writeAPIKey);
```
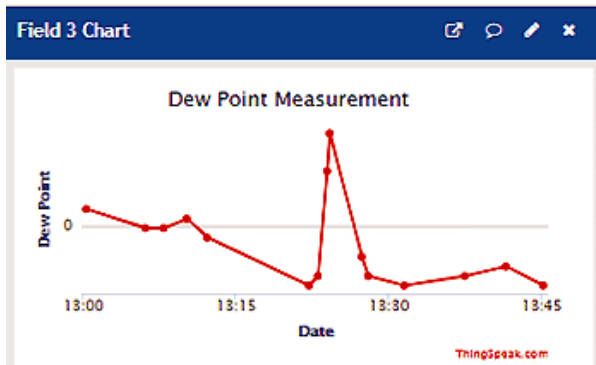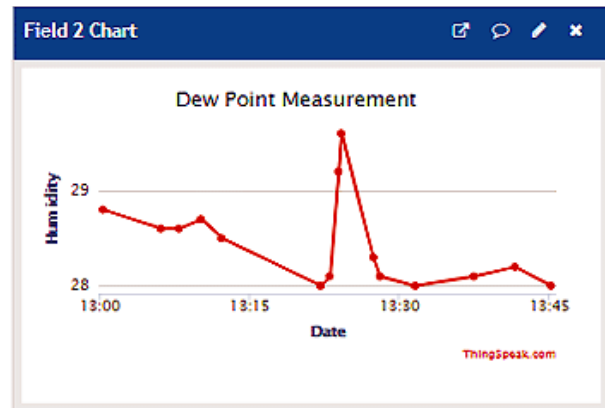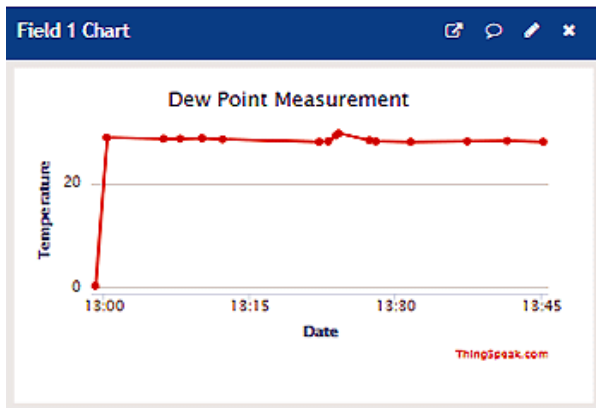
Now click on 'Save and Run' and check the output field. Now check the Dew point Measurement channel.

This analysis runs only when we click on 'Save and Run.' To schedule the analysis, you can use the 'Time Control App.' You can find the 'Time Control' option at the bottom of the page.

ThingSpeak MATLAB Visualization

After calculating the Dew point using MATLAB Analysis, now we will use the MATLAB Visualizations tool to visualize the measured data, i.e. dew point, temperature, and humidity.

For Visualization Go to Apps and then click on MATLAB Visualizations. After that, click on 'New' to create a visualization.

MATLAB code for Visualization :

```
readChId = 899642
readKey = 'FGONJCQYKNSZ5PSQ';
[dewPointData,timeStamps] = thingSpeakRead(readChId,'fields',[1,2,3],...
    'NumPoints',100,'ReadKey',readKey);
plot(timeStamps,dewPointData);
xlabel('TimeStamps');
ylabel('Measured Values');
title('Dew Point Measurement');
legend({'Temperature','Humidity','Dew Point'});
grid on;
```

Now click on 'Save and Run' and check the output field. Output plot looks like this: