809T Assignment 1

The assignment is to read the data from imudata.txt file and plot the graphs for them with differing number of points in the moving averages. The code for the Assignment is given below.

Code:

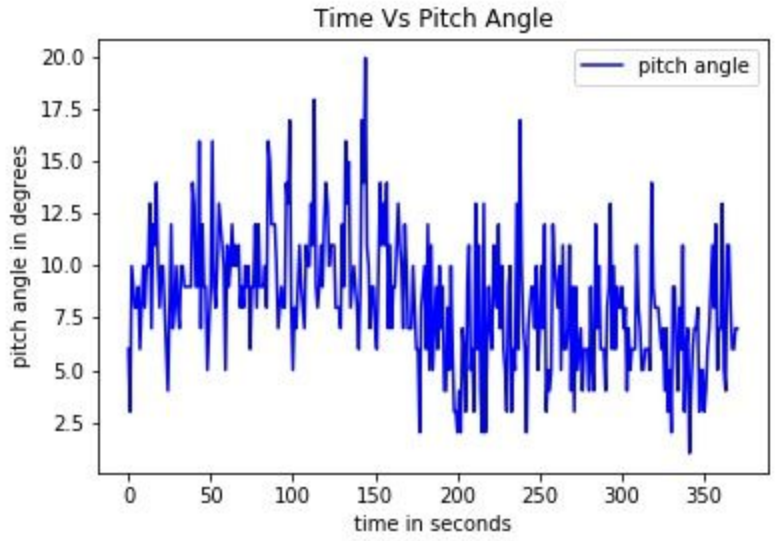
```
import numpy as np
import matplotlib.pyplot as plt


# In[13]:


#Plot function for matplot lib for all the plots
def plot_graph(data,data1 = None,mean=None,std=None,avg_no=None):
    if data1 ==  None:
        plt.plot(data,"b-",label = "pitch angle")
        plt.legend()
        plt.xlabel("time in seconds")
        plt.ylabel("pitch angle in degrees")
        plt.title("Time Vs Pitch Angle")
        plt.savefig("out_1.jpg")
        plt.plot(data,"go",label = "pitch angle")
        plt.savefig("out_pts.jpg")
        plt.show()
    else:
        #plot functions for data with moving averages
        plt.plot(data,"b-",label = "pitch angle")
        plt.plot(data1,"r-",label = "average value for %s points"%avg_no)
        plt.xlabel("time in seconds")
        plt.ylabel("pitch angle in degrees")
        plt.title("Time Vs Pitch Angle %s"%avg_no)
        plt.text(1,1,"Mean = %s"%(mean),horizontalalignment = "left",verticalalignment =
"bottom")
        plt.text(0.65,0.75,"STD = %s"%(std),horizontalalignment = "left",verticalalignment =
"top")
```

```
        plt.legend()
        plt.savefig("number_of_pts%s.jpg"%avg_no)
        plt.show()



# In[4]:


#Moving average calculator with the number of points and data as input
def moving_average_filter(number_points,data):
    count = 0
    averages = []
    while count != (len(data)-number_points+1):
        new_data = data[count:count+number_points]
        #convert to int
        new_data = [int(x) for x in new_data]
        avg =  np.sum(np.asarray(new_data))/len(new_data)
        averages.append(avg)
        count = count +1
    mean = np.mean(averages)
    std = np.std(averages)
    return averages,mean,std


# In[24]:


def main():
    ## Import the data from txt file with a separation of a space as splitting factor for the
columns
    data = np.genfromtxt("../hw1/imudata.txt", delimiter= ' ')
    cols5 = data[:,][:,4]
    for i in range(8):
        if i == 0:
            #plot the raw data in matplotlib
            plot_graph(cols5)
        else:
            #plot the data  and the moving averages window
```

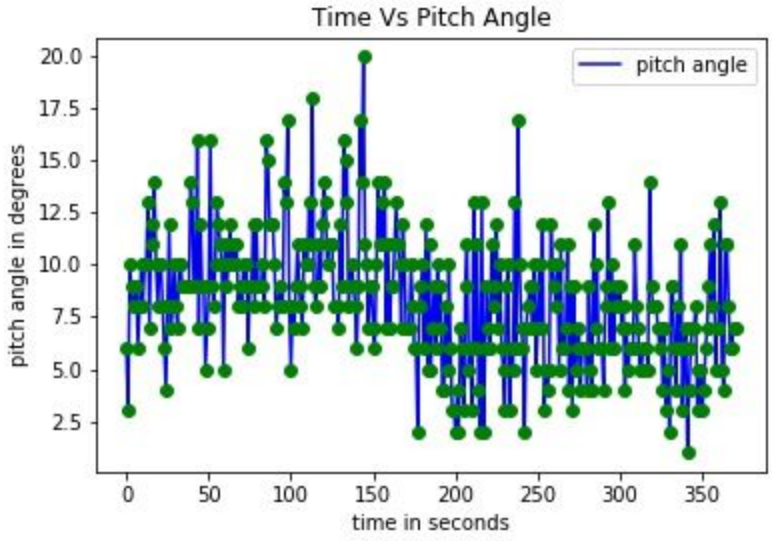
```
        n = 2**i
        average_vals,mean_vals,std_vals = moving_average_filter(n,cols5)
        plot_graph(cols5,average_vals,mean_vals,std_vals,n)


# In[26]:


#runs the main function
if __name__ == "__main__":
    main()
```

Graphs:

The Graph plot of the raw data is shown below. The normal graph is shown in the graph below and the points for the graph with the graph is shown below it.

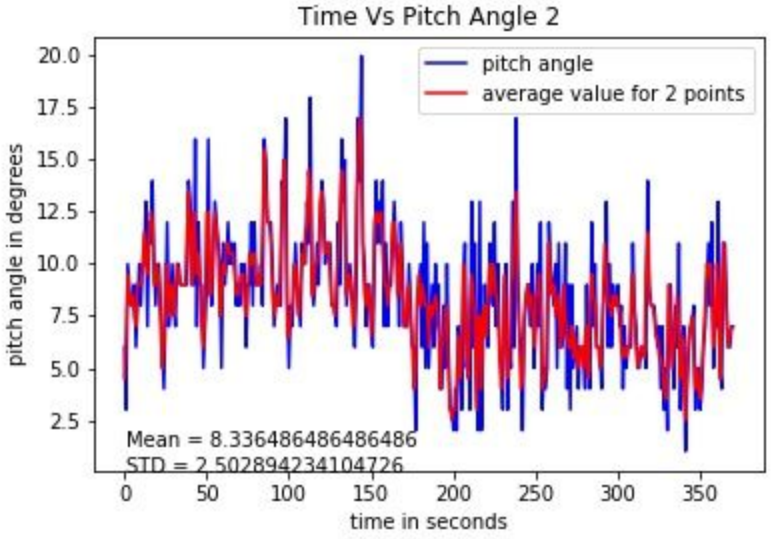


The Green dots are the points in the below image.

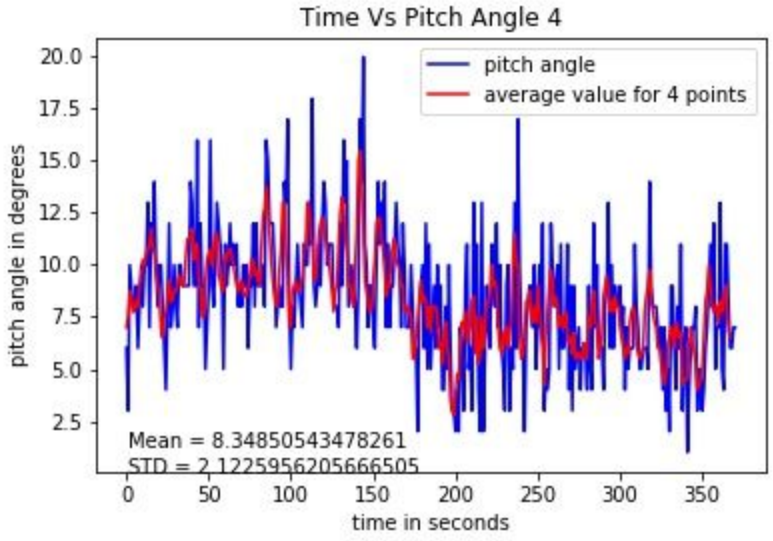


The Graphs with the Moving averages and their corresponding mean and standard deviations are shown in the below graph:

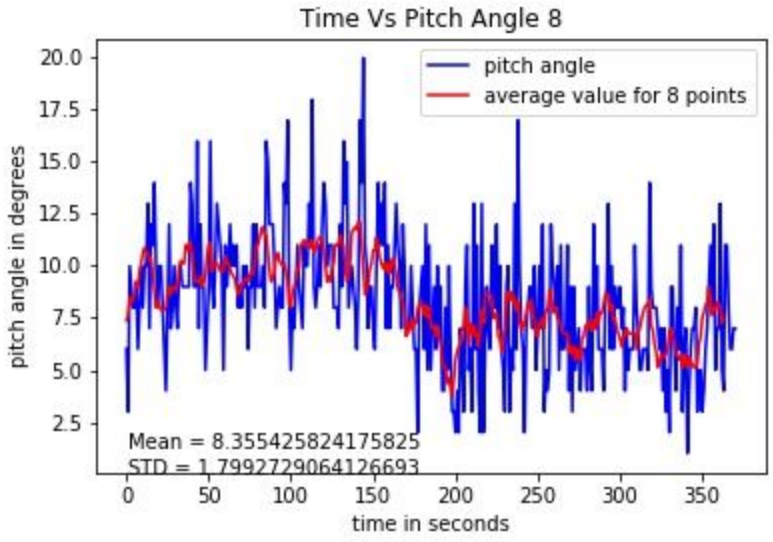
Moving Averages for 2 Points :



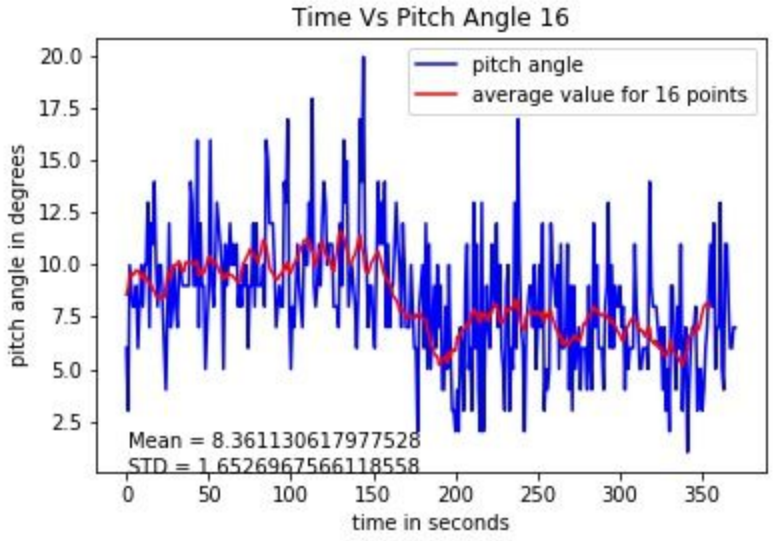
Moving Average for 4 points:



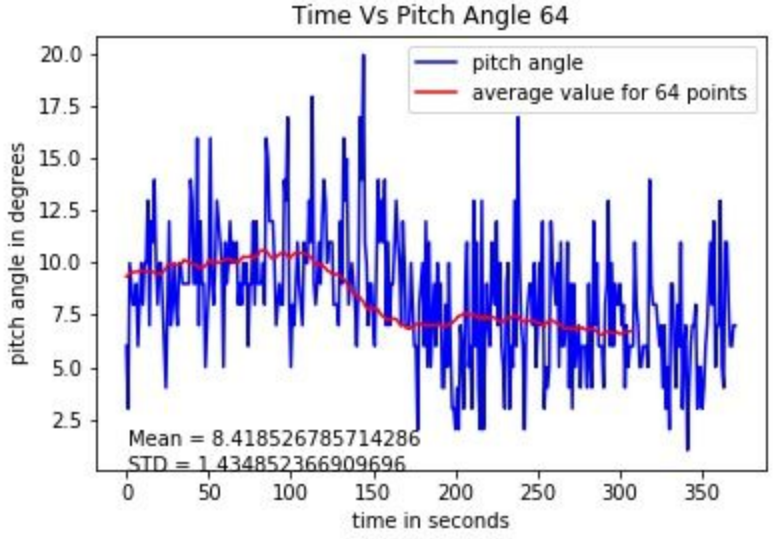
Moving Average for 8 points:



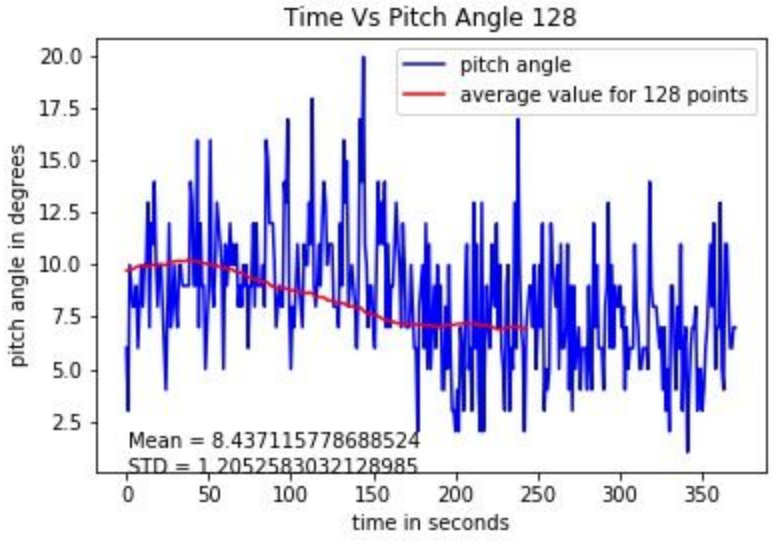
Moving Averages for 16 points:



Moving averages for 64 points:



Moving Averages for 128 points:



The red lines in the images shows the averages of the points chosen and the blue line is a graph of the raw data points in them. The mean and the STD are shown in the bottom right corner in the image