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


######################################################################
# Load 5th entry of each row data into numpy array
# 5th entry = Pitch angle in degrees
######################################################################



readings = open('imudata.txt','r')
lines = readings.readlines()
# print(lines)

pitch_angles_list = []
row_number_list = []

line_number = 0
for line in lines:
  # print(line)

  # remove spaces at start and end of line
  line.strip()

  # get 5th reading
  pitch_angle = int(line.split(' ')[4])
  print(pitch_angle)

  pitch_angles_list.append(pitch_angle)
  row_number_list.append(line_number)


  line_number += 1

print(pitch_angles_list)
print(row_number_list)

readings.close()
```

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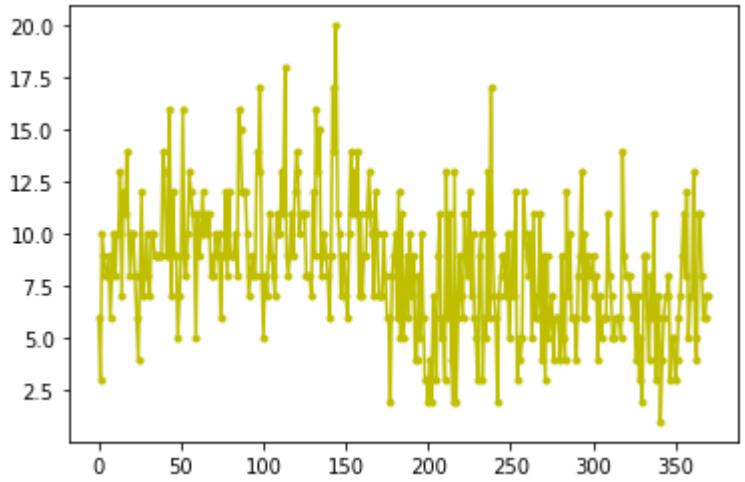
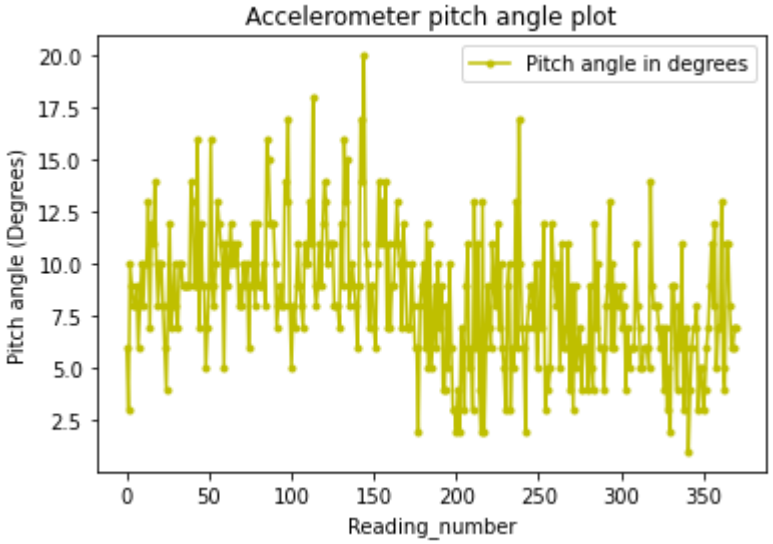
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21,
```

```
######################################################################
# Plotting data
######################################################################
# plot pitch angle on y axis and row number on x axis with point marker (.)
# solid style line (-) and yellow colour (y)
plt.plot(row_number_list, pitch_angles_list,'.-y')
```

```
plt.show()
```




```
#########################################################################
# Label axes, add title, legend
#########################################################################
# plot pitch angle on y axis and row number on x axis with point marker (.)
# solid style line (-) and yellow colour (y)
plt.plot(row_number_list, pitch_angles_list,'.-y', label = 'Pitch angle in degrees')
plt.xlabel('Reading_number')
plt.ylabel('Pitch angle (Degrees)')
plt.title('Accelerometer pitch angle plot')
plt.legend(loc = "upper right")
plt.show()
```




```
########################
# Moving average filter function

data_list = [1,2,3,4,5]

def moving_average(window_length, data_list ):
```

```
reading_index = 0
moving_average_list = []

number_of_moving_averages = len(data_list) - window_length + 1
print("number_of_moving_averages is: " , number_of_moving_averages)

while reading_index <  number_of_moving_averages:

  current_window = data_list[reading_index:reading_index+window_length]

  window_sum_total = 0
  for i in current_window:
    window_sum_total = window_sum_total + i


  current_window_average = window_sum_total/ window_length

  # print(current_window_average)
  moving_average_list.append(current_window_average)

  reading_index = reading_index + 1



#### mean

sum_averaged_data = 0
for j in moving_average_list:
      sum_averaged_data = sum_averaged_data + j

mean_of_averaged_data = sum_averaged_data/ len(moving_average_list)
print("Mean is:" , mean_of_averaged_data)


#### std deviation
sum_std = 0
for x in moving_average_list:
  square_term = (x - mean_of_averaged_data) ** 2
  sum_std = sum_std + square_term

variance_data = sum_std/len(moving_average_list)

std_dev_averaged_data = variance_data**0.5

print("Standard deviation is",std_dev_averaged_data )


#### plot

plt.plot(row_number_list, pitch_angles_list,'.-y', label = 'Pitch angle in degrees'
# plt.xlabel('Reading_number')
```

```
    # plt.ylabel('Pitch angle (Degrees)')
    # plt.title('Accelerometer pitch angle plot')
    # plt.legend(loc = "upper right")

    size = len(row_number_list) - window_length + 1
    # print(moving_average_list)
    # print("len",len(moving_average_list))

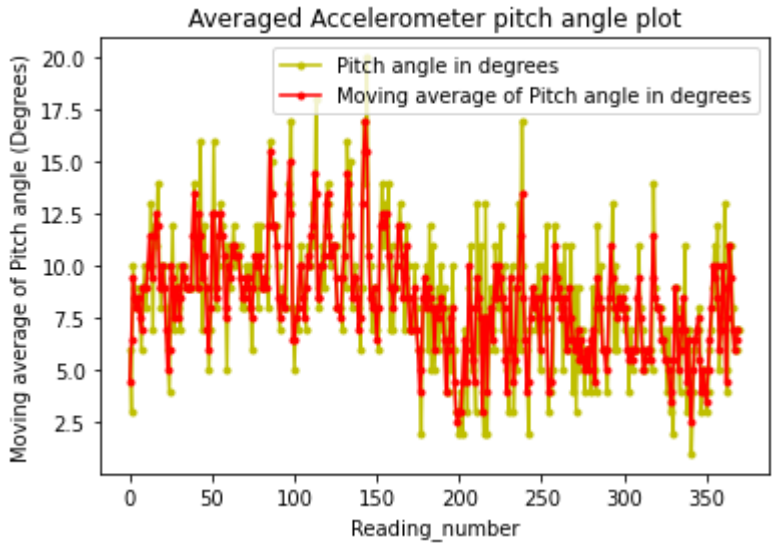
    plt.plot(row_number_list[0:size], moving_average_list,'.-r', label = 'Moving averag
    # plt.plot(row_number_list, moving_average_list,'.-r', label = 'Moving average of P
    plt.xlabel('Reading_number')
    plt.ylabel('Moving average of Pitch angle (Degrees)')
    plt.title('Averaged Accelerometer pitch angle plot')
    plt.legend(loc = "upper right")
    plt.show()

    return moving_average_list, mean_of_averaged_data, std_dev_averaged_data




moving_average(2, pitch_angles_list)
```

```
number_of_moving_averages is:  370
Mean is: 8.336486486486486
Standard deviation is 2.502894234104727
```

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moving_average(4, pitch_angles_list)
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