In [5]:
```
import numpy as np
import matplotlib.pyplot as plt
from matplotlib.pyplot import figure
plt.rcParams['figure.figsize'] = [15, 10]
import os
%matplotlib inline
```

Reading Sensory Data from the Given Text File

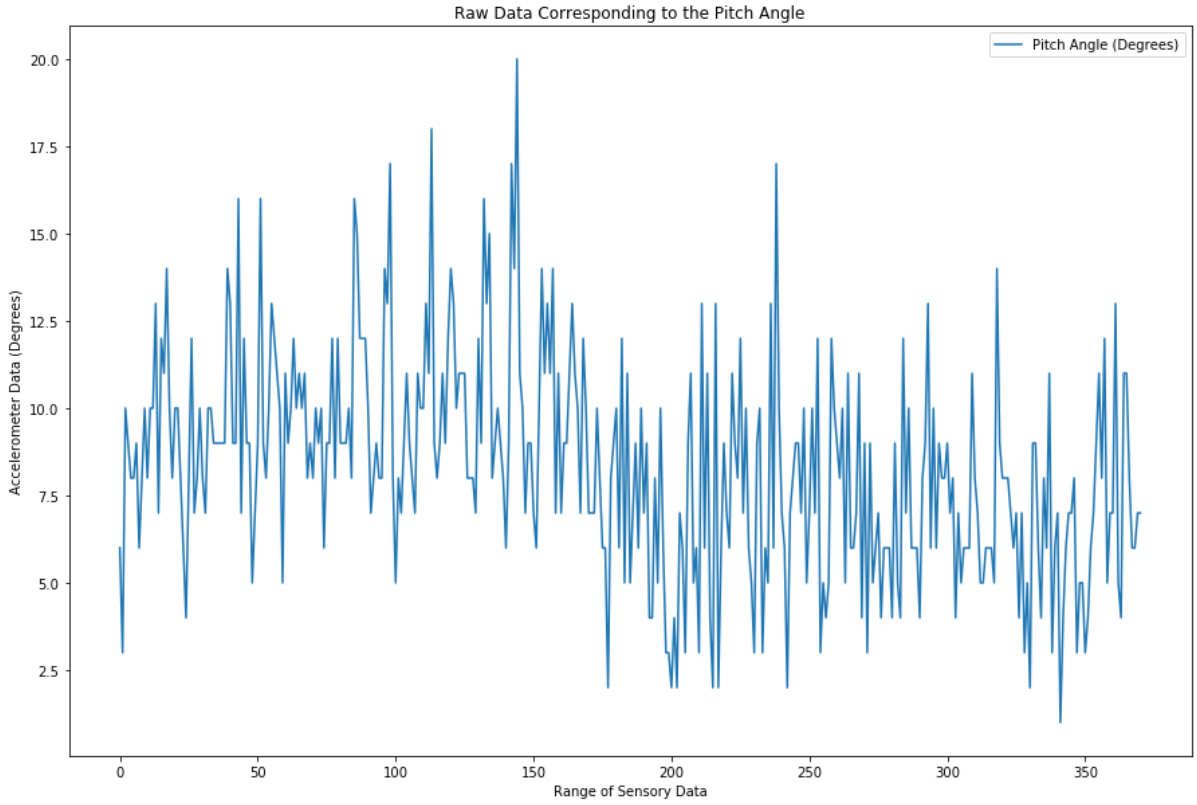
In [51]:
```
sensor_readings = []
Open_Data=open('./imudata.txt')
for line in Open_Data:
#     print(line)
    line=line.rstrip()
    line=line.split()
    sensor_readings.append(int(line[4]))
    # print(sensor_readings)

# print(sensor_readings)
sens_arr = np.asarray(sensor_readings)
print(sens_arr)
```

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

Plotting the raw data

In [52]:
```
# plt.subplot(331)
x=np.arange(0,371,1)
plt.plot(x,sens_arr,label='Pitch Angle (Degrees)')
plt.xlabel('Range of Sensory Data')
plt.ylabel('Accelerometer Data (Degrees)')
plt.title('Raw Data Corresponding to the Pitch Angle')
plt.legend()
plt.show()
```



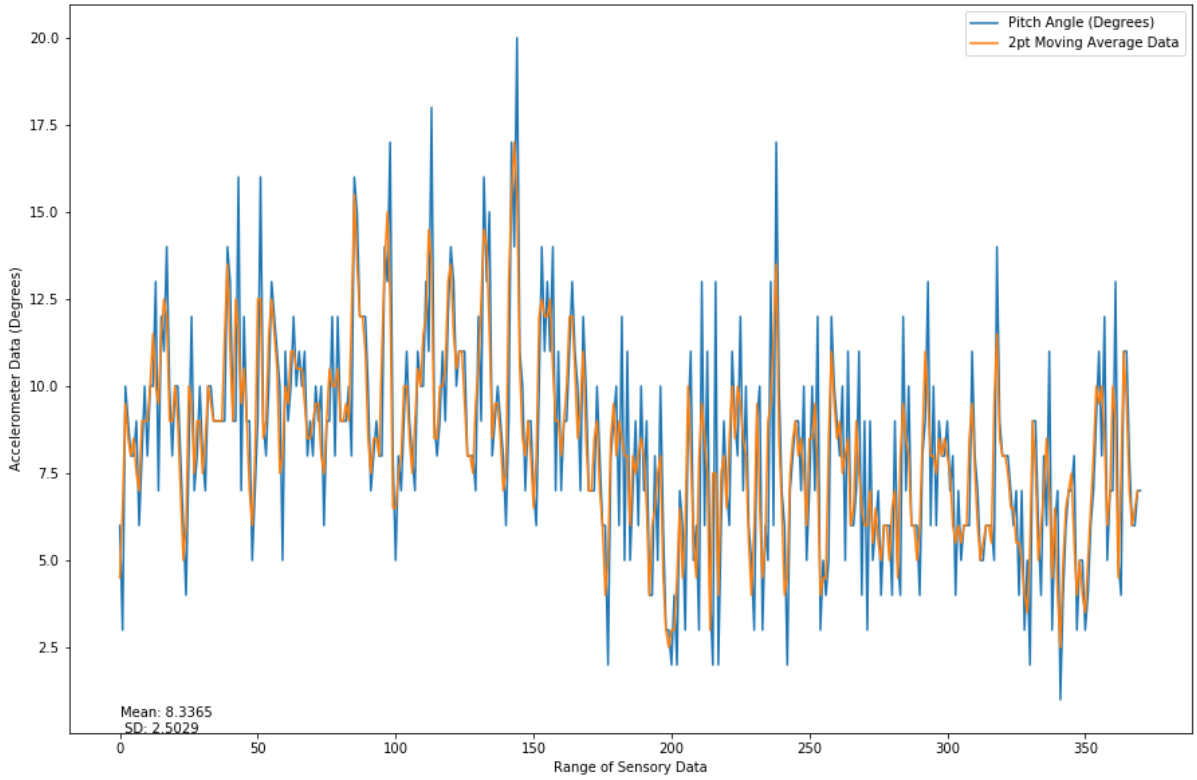
Moving Point Averages

In [53]:
```
def mov_avg(array,window_size):
    es=[]
    size=window_size-1
    for i in range(len(array)-size):
        data=array[i:i+window_size]
        avg_mean=np.mean(data)
        es.append(avg_mean)
    return es, i
```

2POINT WEIGHTED AVERAGE

In [54]:
```
# plt.subplot(332)
x=np.arange(0,371,1)
plt.plot(x,sens_arr,label='Pitch Angle (Degrees)')
plt.xlabel('Range of Sensory Data')
plt.ylabel('Accelerometer Data (Degrees)')
# plt.title('Raw Data Corresponding to the Pitch Angle')
ps1, i1 = mov_avg(sens_arr,2)
# print(len(ps1))
msd_1 = 'Mean: {0:.4f} \n SD: {1:.4f}'.format(np.mean(ps1), np.std(ps1))
plt.annotate(msd_1,xy=(0.05,0.05))
x1 = np.arange(0, i1 + 1, 1)
# plt.figure( figsize=(8, 6), dpi=80, facecolor='w', edgecolor='k')
plt.plot(x1, ps1,label='2pt Moving Average Data')
plt.legend()
```

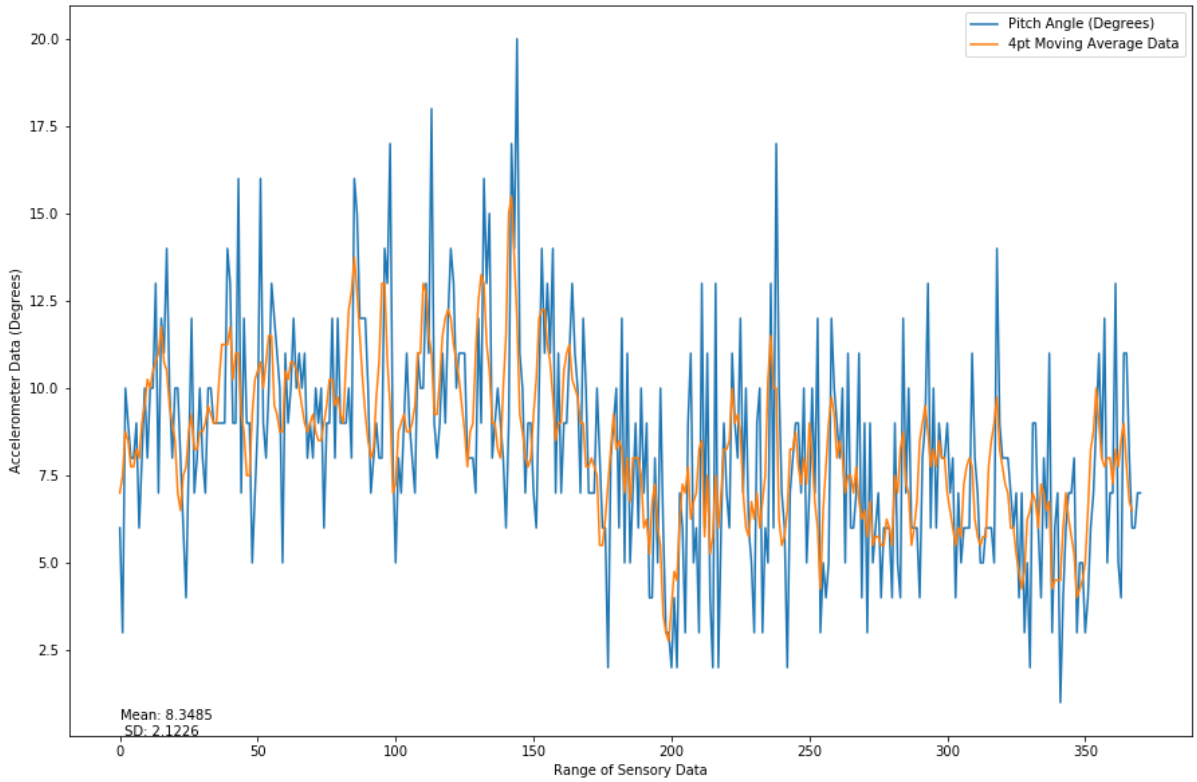
Out[54]: <matplotlib.legend.Legend at 0x7f82d624f550>



4 POINT WEIGHTED AVERAGE

In [55]:
```
# plt.subplot(333)
x=np.arange(0,371,1)
plt.plot(x,sens_arr,label='Pitch Angle (Degrees)')
plt.xlabel('Range of Sensory Data')
plt.ylabel('Accelerometer Data (Degrees)')
# plt.title('Raw Data Corresponding to the Pitch Angle')
ps2, i2 = mov_avg(sens_arr,4)
# print(len(ps2))
msd_2 = 'Mean: {0:.4f} \n SD: {1:.4f}'.format(np.mean(ps2), np.std(ps2))
plt.annotate(msd_2,xy=(0.05,0.05))
x2=np.arange(0,i2+1,1)
plt.plot(x2,ps2,label='4pt Moving Average Data', )
plt.legend()
```

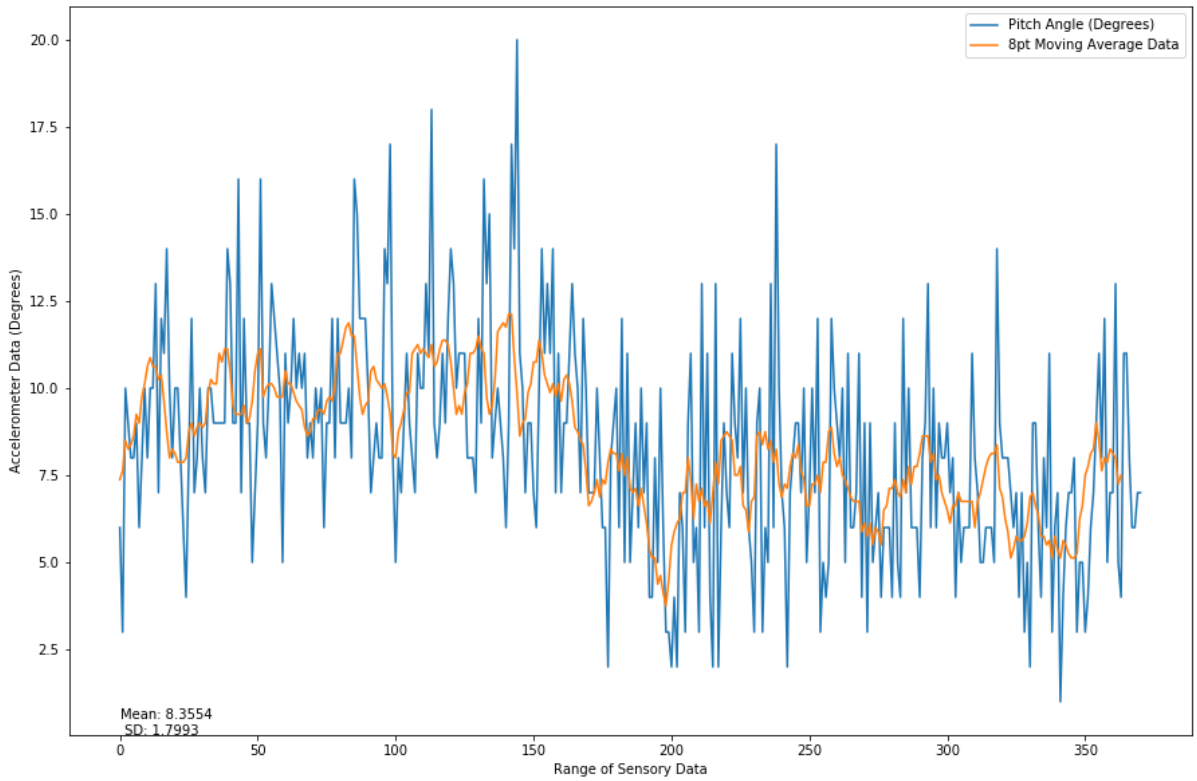
Out[55]: <matplotlib.legend.Legend at 0x7f82d67655c0>



8 POINT WEIGHHTED AVERAGE

In [56]:
```
# plt.subplot(334)
x=np.arange(0,371,1)
plt.plot(x,sens_arr,label='Pitch Angle (Degrees)')
plt.xlabel('Range of Sensory Data')
plt.ylabel('Accelerometer Data (Degrees)')
# plt.title('Raw Data Corresponding to the Pitch Angle')
ps3, i3 = mov_avg(sens_arr,8)
# print(len(ps3))
msd_3 = 'Mean: {0:.4f} \n SD: {1:.4f}'.format(np.mean(ps3), np.std(ps3))
plt.annotate(msd_3,xy=(0.05,0.05))
x3=np.arange(0,i3+1,1)
plt.plot(x3,ps3,label='8pt Moving Average Data')
plt.legend()
```

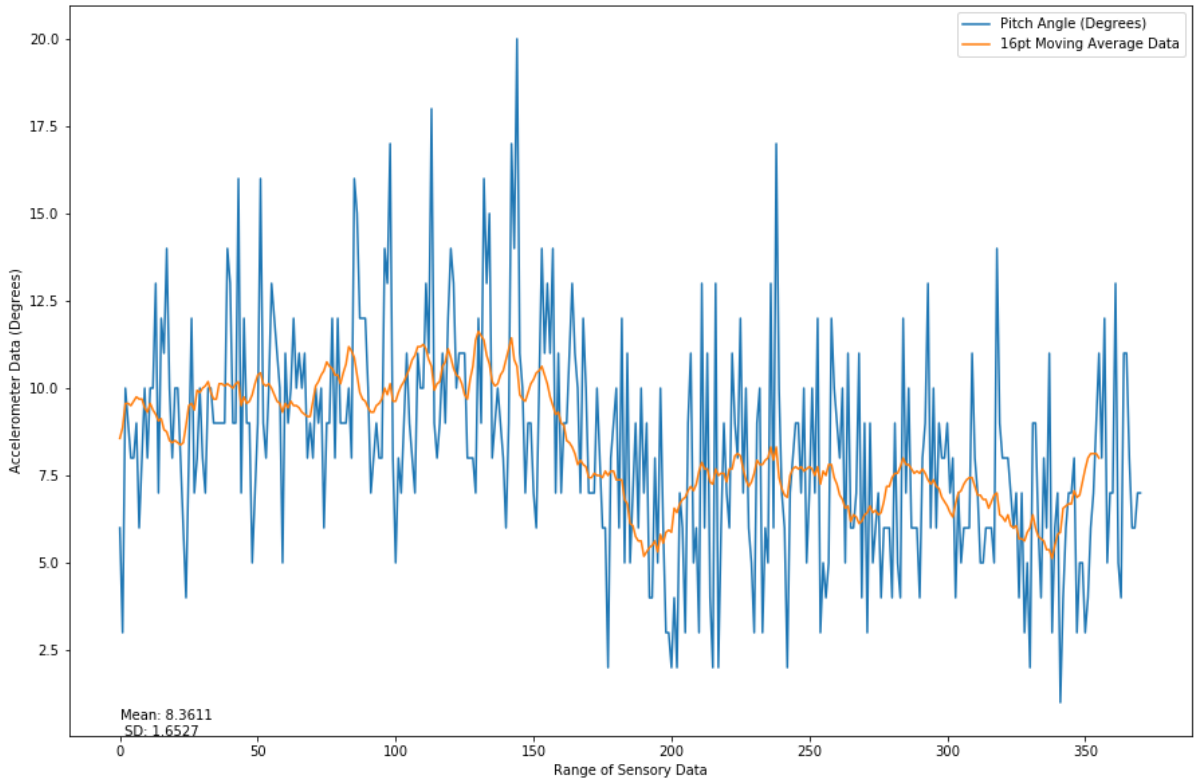
Out[56]: <matplotlib.legend.Legend at 0x7f82d61c6908>



16 POINT WEIGHTED AVERAGE

In [57]:
```
# plt.subplot(335)
x=np.arange(0,371,1)
plt.plot(x,sens_arr,label='Pitch Angle (Degrees)')
plt.xlabel('Range of Sensory Data')
plt.ylabel('Accelerometer Data (Degrees)')
# plt.title('Raw Data Corresponding to the Pitch Angle')
ps4, i4 = mov_avg(sens_arr,16)
# print(len(ps4))
msd_4 = 'Mean: {0:.4f} \n SD: {1:.4f}'.format(np.mean(ps4), np.std(ps4))
plt.annotate(msd_4,xy=(0.05,0.05))
x4=np.arange(0,i4+1 ,1)
plt.plot(x4,ps4,label='16pt Moving Average Data')
plt.legend()
```

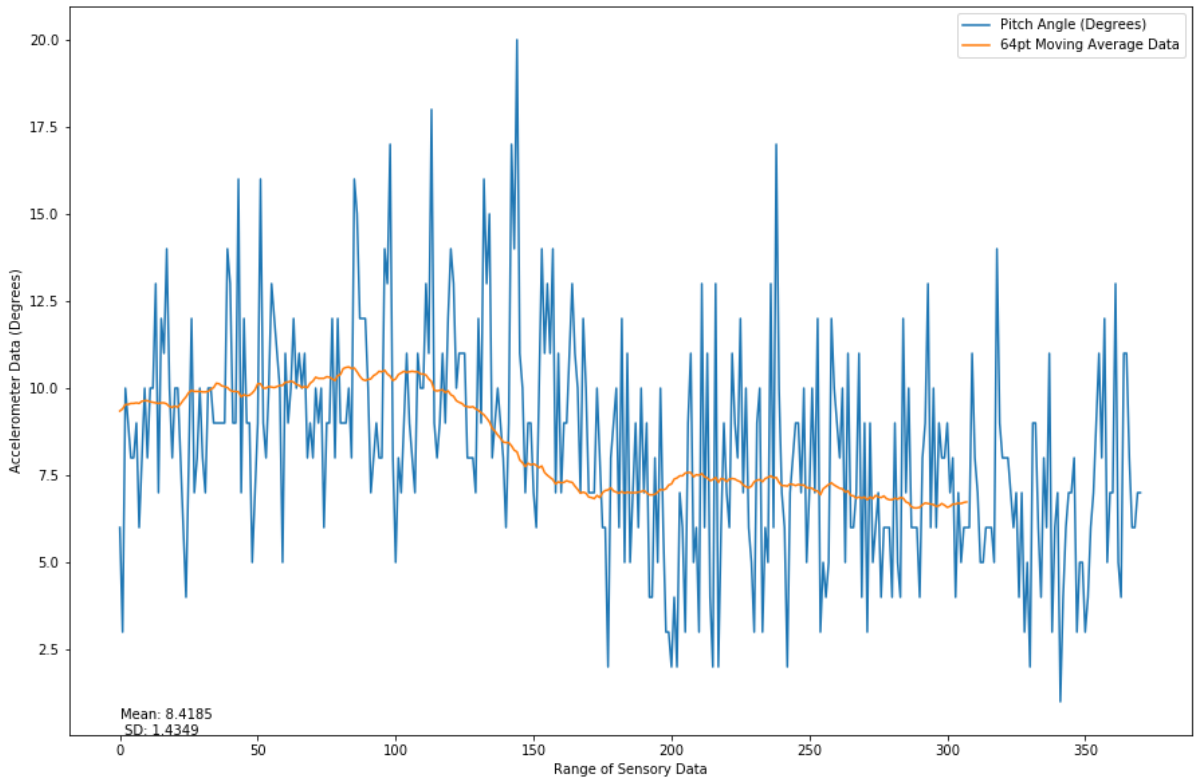
Out[57]: <matplotlib.legend.Legend at 0x7f82d61a8ac8>



64 POINT WEIGHTED AVERAGE

In [58]:
```
# plt.subplot(336)
x=np.arange(0,371,1)
plt.plot(x,sens_arr,label='Pitch Angle (Degrees)')
plt.xlabel('Range of Sensory Data')
plt.ylabel('Accelerometer Data (Degrees)')
# plt.title('Raw Data Corresponding to the Pitch Angle')
ps5, i5 = mov_avg(sens_arr,64)
# print(len(ps5))
msd_5 = 'Mean: {0:.4f} \n SD: {1:.4f}'.format(np.mean(ps5), np.std(ps5))
plt.annotate(msd_5,xy=(0.05,0.05))
x5=np.arange(0,i5+1,1)
plt.plot(x5,ps5,label='64pt Moving Average Data')
plt.legend()
```

Out[58]: <matplotlib.legend.Legend at 0x7f82d5ef5e10>



128 POINT WEIGHTED AVERAGE

In [59]:
```
# plt.subplot(337)
x=np.arange(0,371,1)
plt.plot(x,sens_arr,label='Pitch Angle (Degrees)')
plt.xlabel('Range of Sensory Data')
plt.ylabel('Accelerometer Data (Degrees)')
# plt.title('Raw Data Corresponding to the Pitch Angle')
ps6, i6 = mov_avg(sens_arr,128)
# print(len(ps6))
msd_6 = 'Mean: {0:.4f} \n SD: {1:.4f}'.format(np.mean(ps6), np.std(ps6))
plt.annotate(msd_6,xy=(0.05,0.05))
x6=np.arange(0,i6+1,1)
plt.plot(x6,ps6,label='128pt Moving Average Data')
plt.legend()
```

Out[59]: <matplotlib.legend.Legend at 0x7f82d5eed710>