soc_us06

April 19, 2018

```
In [1]: %matplotlib inline
        import matplotlib.pyplot as plt
        import pandas as pd



        file = r'../data/US06/SP2_0C_US06/02_26_2016_SP20-2_0C_US06_80SOC.xls'
        xls = pd.ExcelFile(file)
        df = pd.read_excel(xls, 'Channel_1-006')

        # df = pd.read_excel(open(file,'rb'), sheet_name='Channel_1-006')



        # get colum names
        # print(list(df))


        #
```
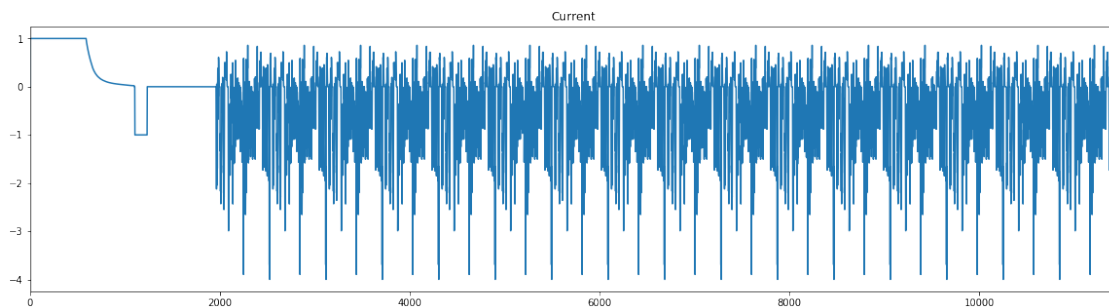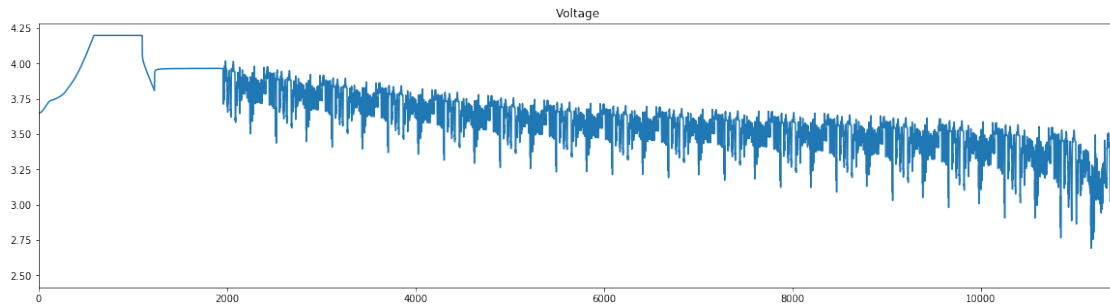
```
In [2]: df['Current(A)'].plot(title='Current', figsize=(20, 5))
```

```
Out[2]: <matplotlib.axes._subplots.AxesSubplot at 0x7f16b4000490>
```



```
In [3]: df['Voltage(V)'].plot(title='Voltage', figsize=(20, 5))
```
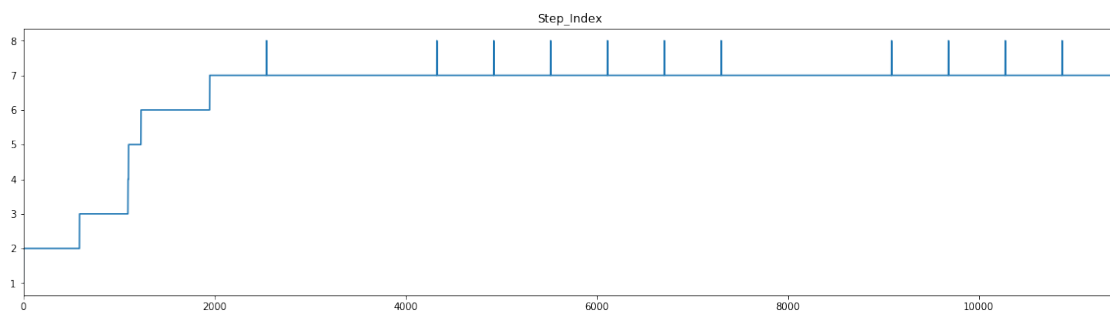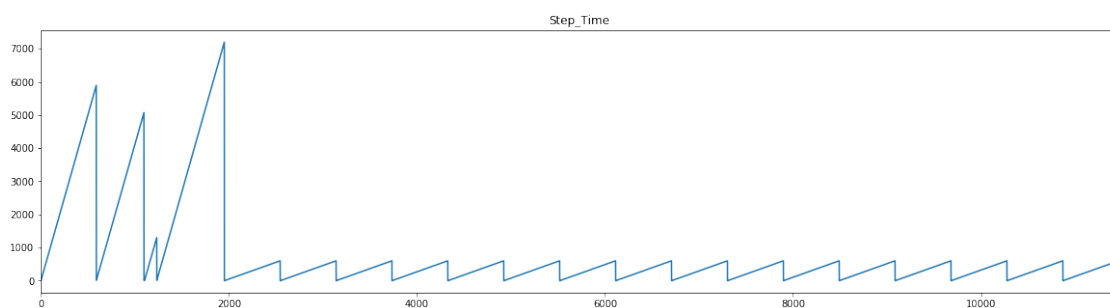
```
Out[3]: <matplotlib.axes._subplots.AxesSubplot at 0x7f16b3f99890>
```

In [4]: df['Step_Index'].plot(title='Step_Index' , figsize=(20, 5))

Out[4]: <matplotlib.axes._subplots.AxesSubplot at 0x7f16f498b190>
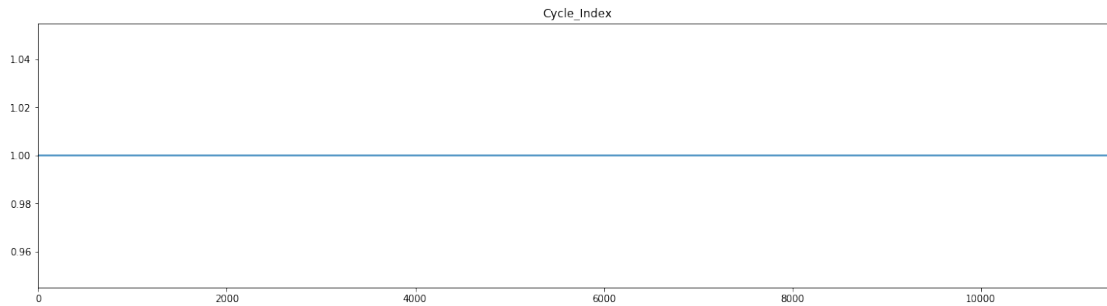

In [5]: df['Step_Time(s)'].plot(title='Step_Time' , figsize=(20, 5))

Out[5]: <matplotlib.axes._subplots.AxesSubplot at 0x7f16b4292c10>

In [6]: df['Cycle_Index'].plot(title='Cycle_Index' , figsize=(20, 5))

Out[6]: <matplotlib.axes._subplots.AxesSubplot at 0x7f16b3ef9ad0>

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Cycle_Index

In [7]: df['Test_Time(s)'].plot(title='Test_Time(s)' , figsize=(20, 5))

Out[7]: <matplotlib.axes._subplots.AxesSubplot at 0x7f16b3f682d0>

Test_Time(s)
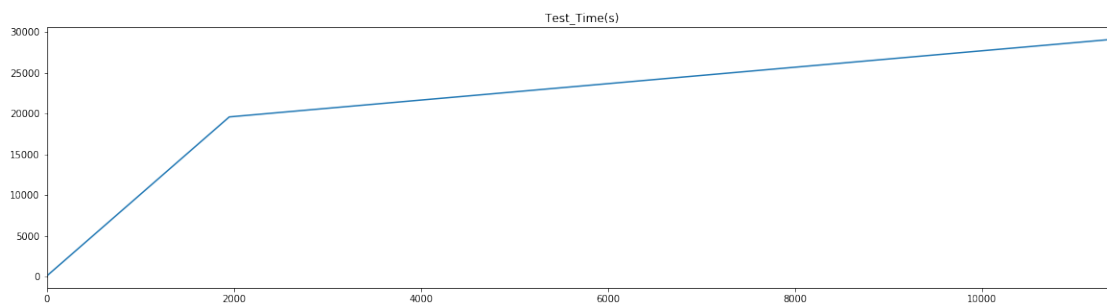
In [8]: df['Charge_Capacity(Ah)'].plot(title='Charge_Capacity(Ah)' , figsize=(20, 5))

Out[8]: <matplotlib.axes._subplots.AxesSubplot at 0x7f16acdd7e10>
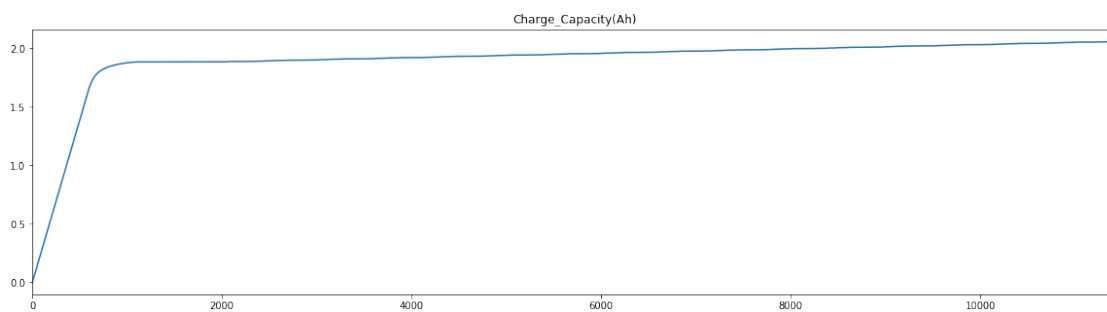
Charge_Capacity(Ah)

In [9]: df['Discharge_Capacity(Ah)'].plot(title='Discharge_Capacity(Ah)' , figsize=(20, 5))

Out[9]: <matplotlib.axes._subplots.AxesSubplot at 0x7f16acd47910>

Discharge_Capacity(Ah)
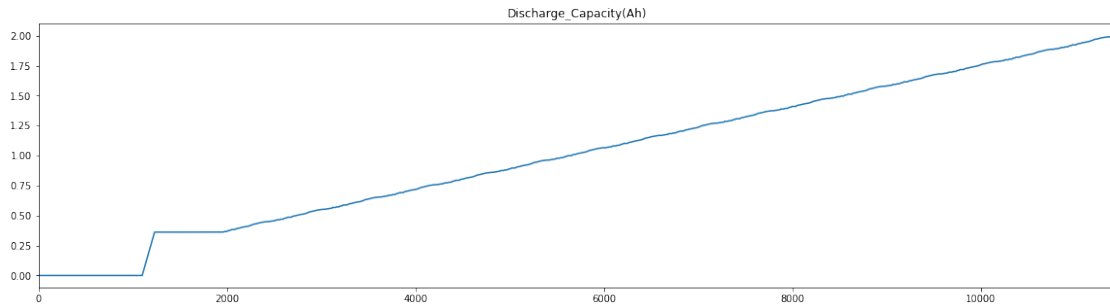
In [10]: df['Charge_Energy(Wh)'].plot(title='Charge_Energy(Wh)' , figsize=(20, 5))

Out[10]: <matplotlib.axes._subplots.AxesSubplot at 0x7f16acd0bcd0>
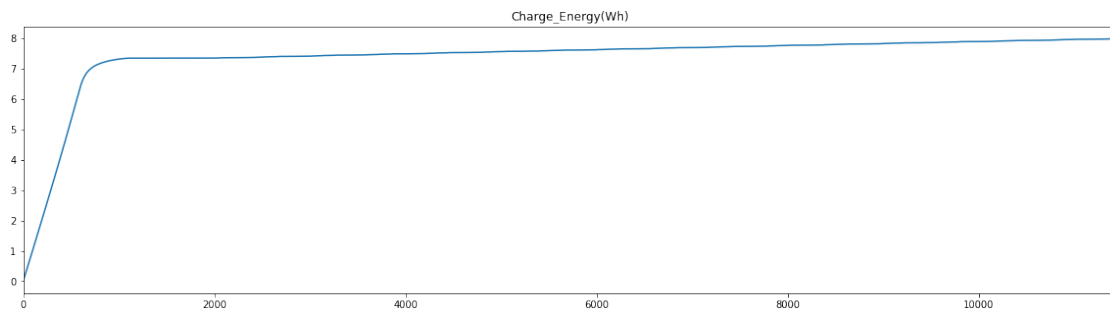
Charge_Energy(Wh)

In [11]: df['Discharge_Energy(Wh)'].plot(title='Discharge_Energy(Wh)' , figsize=(20, 5))

Out[11]: <matplotlib.axes._subplots.AxesSubplot at 0x7f16acd3c210>

Discharge_Energy(Wh)
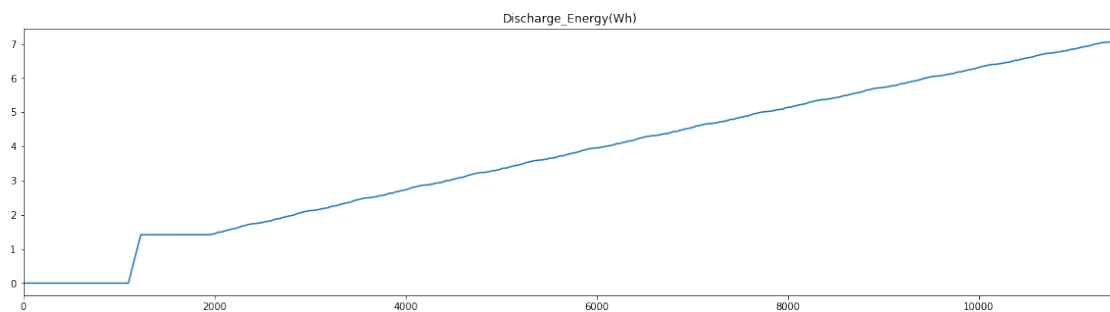
In [12]: current = df['Current(A)']
         voltage = df['Voltage(V)']

```python
import numpy as np

df_soc = df[['Current(A)','Voltage(V)']]

# df_soc['SOC'] = pd.Series([soc_init], index=df.index)
df_soc = df_soc.assign(SOC=pd.Series(np.ones(len(df.index))).values)

df_soc
```

Out[12]:
	Current(A)	Voltage(V)	SOC
0	0.000000	3.446318	1.0
1	0.999713	3.627587	1.0
2	0.999533	3.634876	1.0
3	0.999713	3.639574	1.0
4	0.999713	3.643138	1.0
5	0.999713	3.645082	1.0
6	0.999533	3.646864	1.0
7	0.999893	3.648322	1.0
8	0.999893	3.648808	1.0
9	0.999533	3.649780	1.0
10	0.999533	3.650428	1.0
11	0.999893	3.650913	1.0
12	0.999713	3.651075	1.0
13	0.999713	3.651237	1.0
14	0.999533	3.651723	1.0
15	0.999533	3.651723	1.0
16	0.999713	3.652047	1.0
17	0.999893	3.652371	1.0
18	0.999713	3.652533	1.0
19	0.999893	3.652695	1.0
20	0.999533	3.653019	1.0
21	0.999533	3.653181	1.0
22	0.999353	3.653343	1.0
23	0.999893	3.653667	1.0
24	0.999713	3.653829	1.0
25	0.999713	3.654477	1.0
26	0.999713	3.654639	1.0
27	0.999713	3.654963	1.0
28	0.999713	3.655287	1.0
29	0.999713	3.655773	1.0
...	...	...	...
11415	-1.220297	3.151007	1.0
11416	-1.559678	3.069364	1.0
11417	-1.688160	2.997925	1.0
11418	-1.688160	2.956131	1.0
11419	-0.039843	3.083619	1.0
11420	0.442416	3.245449	1.0

```
11421     0.456632    3.348313  1.0
11422     0.379795    3.395453  1.0
11423     0.251492    3.407926  1.0
11424     0.145503    3.404362  1.0
11425     0.047432    3.395291  1.0
11426     0.000106    3.388163  1.0
11427    -0.000074    3.386705  1.0
11428     0.000106    3.387515  1.0
11429    -0.000254    3.388649  1.0
11430    -0.000254    3.389621  1.0
11431    -0.000254    3.390755  1.0
11432    -0.000254    3.392051  1.0
11433     0.000106    3.393347  1.0
11434    -0.002773    3.393995  1.0
11435    -0.610635    3.315915  1.0
11436    -1.251608    3.194259  1.0
11437    -1.954302    3.042959  1.0
11438    -1.745743    2.981402  1.0
11439    -1.991191    2.907372  1.0
11440    -3.692054    2.650615  1.0
11441    -1.655410    2.787336  1.0
11442    -1.910755    2.758664  1.0
11443    -3.444446    2.544673  1.0
11444    -3.444446    2.499477  1.0

[11445 rows x 3 columns]
```

In [13]: # SOC calculation
         for i in range(1, len(df_soc)):
             df_soc.loc[i, 'SOC'] = df_soc.loc[i-1, 'SOC'] + df_soc.loc[i-1, 'Current(A)']/7200

         df_soc

Out[13]:   Current(A) Voltage(V)   SOC
         0   0.000000   3.446318 1.000000
         1   0.999713   3.627587 1.000000
         2   0.999533   3.634876 1.000139
         3   0.999713   3.639574 1.000278
         4   0.999713   3.643138 1.000417
         5   0.999713   3.645082 1.000555
         6   0.999533   3.646864 1.000694
         7   0.999893   3.648322 1.000833
         8   0.999893   3.648808 1.000972
         9   0.999533   3.649780 1.001111
         10   0.999533   3.650428 1.001250
         11   0.999893   3.650913 1.001388
         12   0.999713   3.651075 1.001527
         13   0.999713   3.651237 1.001666

```
14      0.999533    3.651723    1.001805
15      0.999533    3.651723    1.001944
16      0.999713    3.652047    1.002083
17      0.999893    3.652371    1.002222
18      0.999713    3.652533    1.002360
19      0.999893    3.652695    1.002499
20      0.999533    3.653019    1.002638
21      0.999533    3.653181    1.002777
22      0.999353    3.653343    1.002916
23      0.999893    3.653667    1.003055
24      0.999713    3.653829    1.003193
25      0.999713    3.654477    1.003332
26      0.999713    3.654639    1.003471
27      0.999713    3.654963    1.003610
28      0.999713    3.655287    1.003749
29      0.999713    3.655773    1.003888
...         ...         ...         ...
11415  -1.220297    3.151007    0.352801
11416  -1.559678    3.069364    0.352631
11417  -1.688160    2.997925    0.352415
11418  -1.688160    2.956131    0.352180
11419  -0.039843    3.083619    0.351946
11420   0.442416    3.245449    0.351940
11421   0.456632    3.348313    0.352002
11422   0.379795    3.395453    0.352065
11423   0.251492    3.407926    0.352118
11424   0.145503    3.404362    0.352153
11425   0.047432    3.395291    0.352173
11426   0.000106    3.388163    0.352179
11427  -0.000074    3.386705    0.352179
11428   0.000106    3.387515    0.352179
11429  -0.000254    3.388649    0.352179
11430  -0.000254    3.389621    0.352179
11431  -0.000254    3.390755    0.352179
11432  -0.000254    3.392051    0.352179
11433   0.000106    3.393347    0.352179
11434  -0.002773    3.393995    0.352179
11435  -0.610635    3.315915    0.352179
11436  -1.251608    3.194259    0.352094
11437  -1.954302    3.042959    0.351920
11438  -1.745743    2.981402    0.351649
11439  -1.991191    2.907372    0.351406
11440  -3.692054    2.650615    0.351130
11441  -1.655410    2.787336    0.350617
11442  -1.910755    2.758664    0.350387
11443  -3.444446    2.544673    0.350122
11444  -3.444446    2.499477    0.349643
```

```
            [11445 rows x 3 columns]
```

In [14]: df_soc['SOC'].plot(title='SOC' , figsize=(20, 10))

Out[14]: <matplotlib.axes._subplots.AxesSubplot at 0x7f16acbe5710>
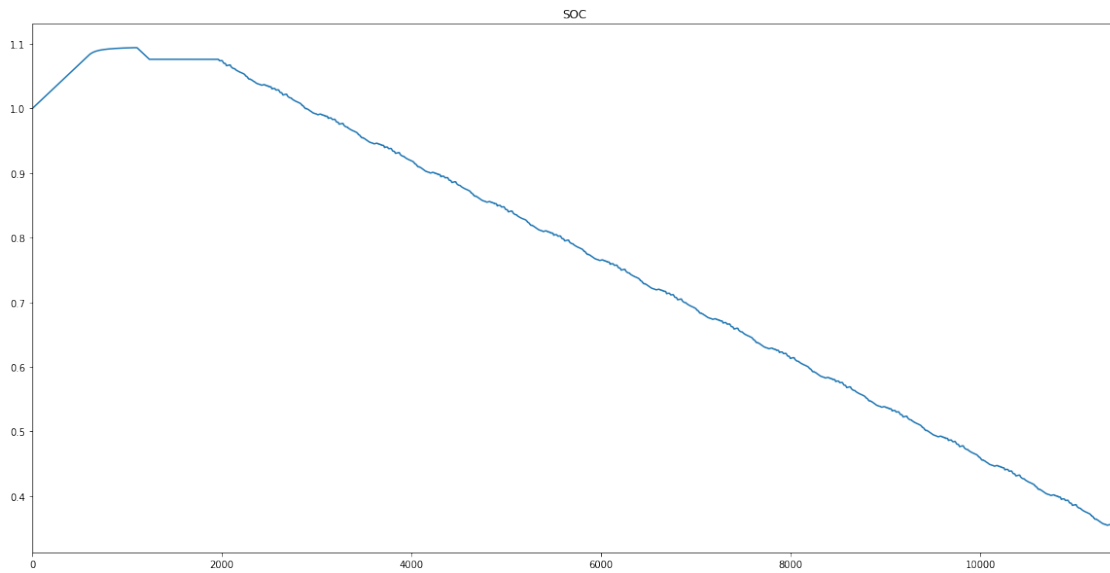
In [15]: df_soc.plot(title='Current and Voltage' , figsize=(20, 20))

Out[15]: <matplotlib.axes._subplots.AxesSubplot at 0x7f16acb96c50>

Current and Voltage