```
 1 import pandas as pd
 2 import numpy as np
 3 from scipy.stats.mstats import hmean
 4
 5 data_frame = pd.read_csv('/Users/
   artyomkholodkov/Downloads/1014/
   cleaned_data_2014.csv')
 6 data_frame = data_frame.drop(['Unnamed: 0'],
   axis=1)
 7
 8 def speed_resampler(array):
 9     return hmean(array)
10
11 def headway_resampler(array):
12     return np.mean(array)/1000 #in seconds
13
14 data_frame.DIRECTION = pd.Categorical(
   data_frame.DIRECTION,categories=['SOUTHBOUND'
   , 'NORTHBOUND'], ordered=True)
15 df = data_frame.rename_axis('IDX').
   sort_values(by=['DIRECTION', 'IDX'])
16
17 df_southbound = df[df['DIRECTION'] == '
   SOUTHBOUND']
18 df_northbound = df[df['DIRECTION'] == '
   NORTHBOUND']
19 print(df_southbound)
20
21 time_south = pd.to_datetime(df_southbound['
   TIME'])
22 time_north = pd.to_datetime(df_northbound['
   TIME'])
23
24 #WEST
25 aggr_5_speed_south = pd.Series(df_southbound[
   'SPEED'].values, index=time_south).resample('
   5Min').apply(speed_resampler)
26
27 aggr_headway_5_south = pd.Series(
```

```
27 df_southbound['HEADWAY'].values, index=
   time_south).resample('5Min').apply(
   headway_resampler)
28
29 #ыщгер 5 min
30 final_data_5_south = pd.concat([
   aggr_5_speed_south, aggr_headway_5_south],
   axis=1)
31 final_data_5_south.columns = ['SPEED(km/h)',
   'TEMPORAL_HEADWAY(s)']
32 final_data_5_south['SPACE_HEADWAY(m)'] =
   final_data_5_south['SPEED(km/h)'] / 3.6 *
   final_data_5_south['TEMPORAL_HEADWAY(s)']
33 final_data_5_south['DENSITY(veh/km)'] = 1000
   / final_data_5_south['SPACE_HEADWAY(m)']
34 final_data_5_south['FLOW(veh/h)'] =
   final_data_5_south['DENSITY(veh/km)'] *
   final_data_5_south['SPEED(km/h)']
35 final_data_5_south.to_csv('
   aggregated_1014_south_5.csv')
36
37 #EAST
38 aggr_5_speed_north = pd.Series(df_northbound[
   'SPEED'].values, index=time_north).resample('
   5Min').apply(speed_resampler)
39
40 aggr_headway_5_north = pd.Series(
   df_northbound['HEADWAY'].values, index=
   time_north).resample('5Min').apply(
   headway_resampler)
41
42 #west 5 min
43 final_data_5_north = pd.concat([
   aggr_5_speed_north, aggr_headway_5_north],
   axis=1)
44 final_data_5_north.columns = ['SPEED(km/h)',
   'TEMPORAL_HEADWAY(s)']
45 final_data_5_north['SPACE_HEADWAY(m)'] =
   final_data_5_north['SPEED(km/h)'] / 3.6 *
```

```
45 final_data_5_north['TEMPORAL_HEADWAY(s)']
46 final_data_5_north['DENSITY(veh/km)'] = 1000
   / final_data_5_north['SPACE_HEADWAY(m)']
47 final_data_5_north['FLOW(veh/h)'] =
   final_data_5_north['DENSITY(veh/km)'] *
   final_data_5_north['SPEED(km/h)']
48 final_data_5_north.to_csv('
   aggregated_1014_north_5.csv')
49
```