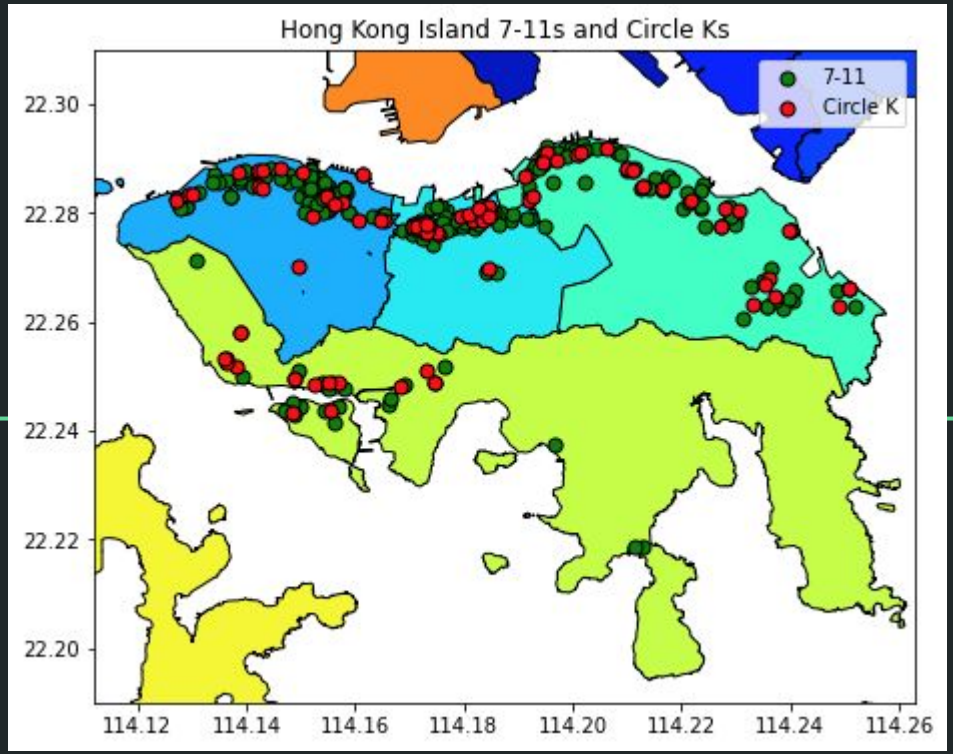


Mapping of 7-11s and Circle Ks in HK Island

By: Chan, Cheuk Hang 3035559725

Calculate the Distance between the Closest User Selected Store and Competing Store while checking Opening Hours

1. Packages and Libraries
2. Web-scrape all 7-11 and Circle K stores in HK Island
3. Put them in a Pandas DataFrame to organize and manipulate
4. Use Google Maps API to find the coordinates of all the stores
    a. Manually edit if necessary
5. Plot them all on an HK Shapefile map
6. Find the distance between closest competing stores
7. Ask user which store they want to compare
8. Show map of closest stores and output whether or not they have the same opening hours

Packages and Libraries

- **Pandas (import pandas as pd)**
  - Pandas used to store and manipulate data
- **Selenium (from selenium import webdriver)**
  - Also selenium.webdriver.common.by import By
  - Used to scrape data from 7-11 and Circle K website
- **Requests (import requests)**
  - To request Google Maps for coordinates from an address
- **Geopy (from geopy.distance import geodesic)**
  - To calculate distance between two coordinates
- **Matplotlib (import matplotlib.pyplot as plt)**
  - To plot points and draw lines on a map
- **Geopandas (import geopandas as gpd)**
  - To read and plot HK shapefile
- **Shapely.geometry (from shapely.geometry import Point)**
  - To quickly plot points on HK shapefile map

Code to call functions to run Program

```
# Chrome Webdriver
driver_path = r'/Users/XFlazer/Documents/HKU/FBE/Finance/FINA 2390/Web Scraping/chromedriver'

browser = webdriver.Chrome(executable_path=driver_path)

path = r'/Users/XFlazer/Documents/HKU/FBE/Finance/FINA 2390/Project 3'
seven_11_df = scrapeSeven11()
circle_k_df = scrapeCircleK()
seven_11_df = coordinatesStore(seven_11_df)
circle_k_df = coordinatesStore(circle_k_df)

# Manually input missing coordinates
seven_11_df.to_csv(path + os.sep + '7_11_scraped.csv', index=False)
circle_k_df.to_csv(path + os.sep + 'circle_k_scraped.csv', index=False)

browser.quit()

seven_11_df, circle_k_df = compareDistance(seven_11_df, circle_k_df)
seven_11_df = pd.read_csv('7_11_scraped.csv')
circle_k_df = pd.read_csv('circle_k_scraped.csv')
plotMapAll(seven_11_df, circle_k_df)
main(seven_11_df, circle_k_df)
```

Web-scraping 7-11

- Initialize browser

```
# Chrome Webdriver
driver_path = r'/Users/XFlazer/Documents/HKU/FBE/Finance/FINA 2390/Web Scraping/chromedriver'

browser = webdriver.Chrome(executable_path=driver_path)
```

- Function to scrape 7-11
- Initial Columns
- Open Website
- .Click() to show only HK Island stores

```
def scrapeSeven11():

    '''
    This function is used to scrape the 7-11 stores website to find the location,
    address, whether or not it's 24 hours, opening hours from mon-fri and sat
    if not 24 hours
    '''
    columns = ['Location', 'Address', '24 Hours', 'Mon-Fri', 'Sat', 'Latitude', 'Longitude']
    website_path = 'https://www.7-eleven.com.hk/en/store'
    browser.get(website_path)
    # Only take Hong Kong Island 7-11s
    browser.find_element(By.XPATH, '/html/body/div/div[2]/div/section/div/div/div/div/div[2]/div[2]/div[2]/div/div/div[1]/div[2]/a[1]').click()
```

- While loop counter to loop through columns
- Use XPATH to collect data
- Use list comprehension and pd.Series to append data
- Create empty data for Latitude and Longitude columns to be used later
- Return DataFrame

```
# Web Scrape 7-11 Address and Opening Hours
while counter <= 4:
    if counter == 0:
        info = browser.find_elements(By.XPATH, '//*[@id="list-section"]/div[position()>=1]/div/div[1]/h3')
        data = pd.Series([x.text for x in info])
        df_scraped[columns[counter]] = data
    elif counter == 1:
        info = browser.find_elements(By.XPATH, '//*[@id="list-section"]/div[position()>=1]/div/div[1]/div[1]')
        data = pd.Series([x.text for x in info])
        df_scraped[columns[counter]] = data
    elif counter == 2:
        info = browser.find_elements(By.XPATH, '//*[@id="list-section"]/div[position()>=1]/div/div[1]/div[2]/div[1]')
        data = pd.Series([x.text for x in info])
        df_scraped[columns[counter]] = data
    elif counter == 3:
        info = browser.find_elements(By.XPATH, '//*[@id="list-section"]/div[position()>=1]/div/div[1]/div[2]/div[2]/div[1]')
        data = pd.Series([x.text for x in info])
        df_scraped[columns[counter]] = data
    elif counter == 4:
        info = browser.find_elements(By.XPATH, '//*[@id="list-section"]/div[position()>=1]/div/div[1]/div[2]/div[2]/div[2]')
        data = pd.Series([x.text for x in info])
        df_scraped[columns[counter]] = data

    counter+=1

df_scraped['Latitude'] = ''
df_scraped['Longitude'] = ''

return df_scraped
```

Web-scraping Circle K

- Initialize browser

- Function to scrape Circle K
- Initial Columns
- Open Website
- .Click() to show only HK Island stores

- While loop counter to loop through columns
- Use XPATH to collect data
- Use list comprehension and pd.Series to append data
- Create empty data for Latitude and Longitude columns to be used later
- Return DataFrame

```
def scrapeCircleK():

    '''
    This function is used to scrape the Circle K stores website to find the location,
    address, whether or not it's 24 hours, opening hours from mon-fri and sat
    if not 24 hours
    '''

    columns = ['Location', 'Address', 'Opening Hours', 'Latitude', 'Longitude']
    website_path = 'https://www.circlek.hk/en/store'
    browser.get(website_path)
    # Only take Hong Kong Island Circle Ks
    browser.find_element(By.XPATH, '//*[@id="r"]/option[1]').click()
    browser.find_element(By.XPATH, '//*[@id="submit"]').click()
```

```
# Web Scrape Circle K Addresses and Opening Hours
while counter <= 2:
    if counter == 0:
        info = browser.find_elements(By.XPATH, '//*[@id="ff_main"]/div/div/div/div[2]/div[2]/div[3]/table/tbody/tr[position()<=79]/td[1]')
        data = pd.Series([x.text for x in info])
        df_scraped[columns[counter]] = data
    elif counter == 1:
        info = browser.find_elements(By.XPATH, '//*[@id="ff_main"]/div/div/div/div[2]/div[2]/div[3]/table/tbody/tr[position()<=79]/td[2]')
        data = pd.Series([x.text for x in info])
        df_scraped[columns[counter]] = data
    elif counter == 2:
        info = browser.find_elements(By.XPATH, '//*[@id="ff_main"]/div/div/div/div[2]/div[2]/div[3]/table/tbody/tr[position()<=79]/td[4]')
        data = pd.Series([x.text for x in info])
        df_scraped[columns[counter]] = data

    counter+=1

df_scraped['Latitude'] = ''
df_scraped['Longitude'] = ''
return df_scraped
```

Use Google Maps API to find Coordinates of Stores

- Find and Store Coordinates Function
- Use for loop to loop through the whole DataFrame
- Use API key to request from Google Maps
- Update each row with the coordinates
- Returns the DataFrame

```
def coordinatesStore(df_scraped):

    '''
    This function is used to find the coordinates of 7-11 stores in HK Island.
    Paramters: df_scraped
    The dataframe that will use the address to find coordinates
    '''

    for i in range(len(df_scraped)):
        parameters= {"key":"AIzaSyC0DM3CqpVufyqks9nKhyuKqjuN9HOKqsA",
        "address":df_scraped.Address.iloc[i]}

        base_url = 'https://maps.googleapis.com/maps/api/geocode/json?'
        response = requests.get(base_url, params = parameters).json()
        response.keys()
        if response['status'] == 'OK':
            geometry = response['results'][0]['geometry']
            lat = geometry['location']['lat']
            lon = geometry['location']['lng']
            df_scraped.Latitude.iloc[i] = lat
            df_scraped.Longitude.iloc[i] = lon

    return df_scraped
```

CSV Output of Coordinates

7-11_scraped.csv

Location	Address	24 Hours	Mon-Fri	Sat	Latitude	Longitude
North Point	Portion of Ur	24 Hours			22.2907736	114.194412
Western	Shop No. 5, (	24 Hours			22.2868961	114.133912
Wan Chai	Shop C & D, (	24 Hours			22.2780103	114.170549
Sai Wan Ho	Shop No. GO	24 Hours			22.28505	114.223797
Wan Chai	Shop No. 1, (	24 Hours			22.279276	114.179815
Shau Kei Wa	Shop No. C2, G/F, King Fa		Monday to Friday: 0700-0000	Saturday: 07(	22.2786788	114.229902
Sheung Wan	Shop Nos. 1(	24 Hours			22.2870208	114.147681
Quarry Bay	Kiosk QUB 2 at Unpaid Co		Monday to Friday: 0700-2330	Saturday: 07(	22.2878881	114.209748
Central	Shop B, Lower Deck Level,		Monday to Friday: 0700-2300	Saturday: 07(	22.2870931	114.161215
North Point	Shop C & D, (	24 Hours			22.2918133	114.198448
Western	Shop A, G/F,	24 Hours			22.2855391	114.141961
Causeway Ba	Shop G, G/F,	24 Hours			22.2801919	114.182229
Chai Wan	Shop No. 8, Lower Ground		Monday to Friday: 0700-2300	Saturday: 07(	22.2605481	114.231096
Central	Concession HOK 59 at Hon		Monday to Friday: 0700-0000	Saturday: 07(	22.2837134	114.158321
Aberdeen	G/F, No. 178	24 Hours			22.2489355	114.155854
Chai Wan	Shop No. 201, Level 2, Hin		Monday to Friday: 0700-2300	Saturday: 07(	22.2627217	114.235745
Western	Portion of Fl	24 Hours			22.2872151	114.138722
Wan Chai	G/F, No. 27 (	24 Hours			22.2769227	114.168626
Central	Shop B, G/F	24 Hours			22.2831855	114.152594
Wan Chai	Shop B, G/F,	24 Hours			22.2776292	114.178443
Sheung Wan	Shop No. 289 on 2nd Floo		Monday to Friday: 0700-2300	Saturday: 07(	22.2879098	114.151791
Central	Lower Groun	24 Hours			22.2844752	114.153239
Wan Chai	Shop C, G/F,	24 Hours			22.2790348	114.179893
Causeway Ba	G/F, No. 17 I	24 Hours			22.278503	114.185978
Causeway Ba	Portion of Sh	24 Hours			22.2789775	114.192349
Sheung Wan	Shops F & G,	24 Hours			22.2855218	114.147547
Sheung Wan	Shop No. 2, Ground Floor,		Monday to Friday: 0700-0000	Saturday: 07(	22.2829992	114.149811

Circle_K_scraped.csv

Location	Address	Opening Hours	Latitude	Longitude
Wanchai	G/F & M/F,	24 Hours	22.2773896	114.170496
Wanchai	Shop 3, G/F,	24 Hours	22.277808	114.17308
Wanchai	Kiosk No.WA	07:00-23:00	22.276022	114.175147
Wanchai	G/F., 89 Wa	24 Hours	22.276516	114.175001
Wanchai	G/F., Warne	24 Hours	22.277742	114.171826
Wanchai	Shop A, G/F,	06:30-23:00	22.2780541	114.172908
Wanchai	Flat B G/F.,	24 Hours	22.277339	114.171104
Wanchai	Shop G4B G/	24 Hours	22.2791602	114.179443
Wanchai	Shop E G/F.	24 Hours	22.2774551	114.173522
Wanchai	G/F & Cockl	24 Hours	22.2787376	114.18141
Wanchai	Shop 1, Grou	24 Hours	22.2765046	114.173061
Aberdeen	Shop 7 & 8, T	24 Hours	22.2516355	114.137979
Aberdeen	G/F., Shop 7	24 Hours	22.2483068	114.15244
Aberdeen	Shop Nos. 3	24 Hours	22.2493714	114.148743
Aberdeen	Shop 116, W	06:00-22:30	22.2525023	114.136397
Aberdeen	Shop 7, Shek	06:00-00:00	22.248788	114.157033
Aberdeen	G/F., Main B	07:45-19:45	22.2510972	114.173216
Aberdeen	Ground Floo	24 Hours	22.2487125	114.15516
Aberdeen	Shop 30, Wa	06:30-00:00	22.253079	114.136107
Chai Wan	Shop 209-21	24 Hours	22.2630132	114.233059
Chai Wan	KIOSK CHW1	06:00-23:00	22.2678103	114.236078
Chai Wan	KIOSK No. CH	06:00-23:00	22.264625	114.237139
Chai Wan	Shop 3A and	24 Hours	22.26686	114.235195
Taikoo	Shop H1 & H	06:30-00:00	22.3218208	114.177969
Taikoo	KIOSK NO. TA	06:00-23:00	22.28465	114.21636

Plotting all Stores on HK Island Map

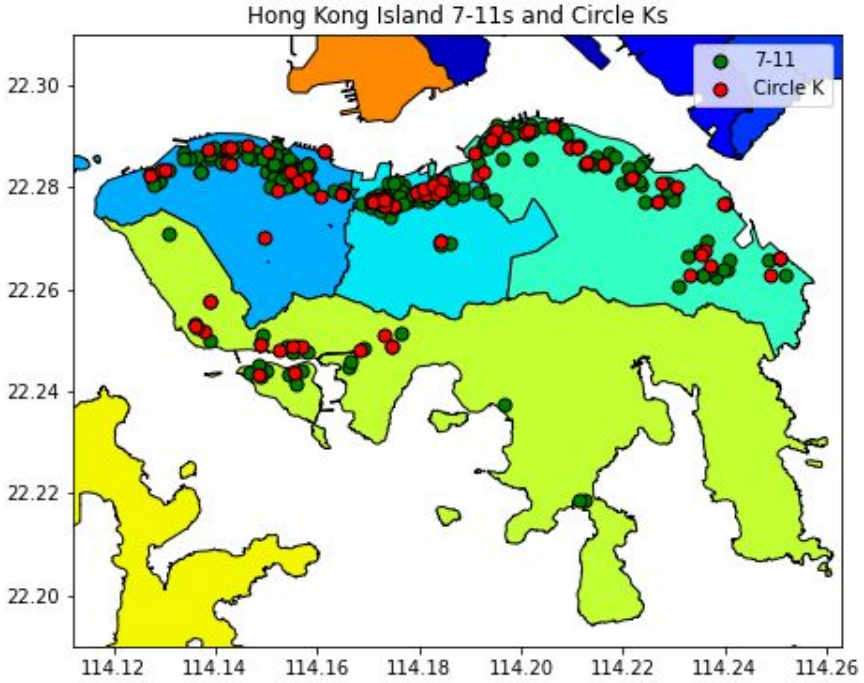
- Use GeoPandas to read HK Shapefile
- Fig, ax for plotting
- Set limits so that it only shows HK Island

```
def plotMapAll(seven_11, circle_k):
    '''
    This function then plots every 7-11 and Circle_K. It shows all the
    plotted points and Hong Kong Island map
    '''
    hk_map = gpd.read_file(r'/Users/XFlazer/Documents/HKU/FBE/Finance/FINA 2390/Project 3/Hong_Kong_18_Districts/HKDistrict18.shp')
    fig, ax = plt.subplots(figsize = (20, 6))
    xlim=(114.112, 114.263); ylim=(22.19,22.31)
    ax.set_xlim(xlim)
    ax.set_ylim(ylim)
    hk_map.plot(ax=ax, facecolor = 'White', edgecolor = 'Black', alpha = 1, linewidth = 1, cmap = "jet")
```

- CRS for coordinate reference system to plot points
- Point(xy) sets a point coordinate type that is needed to plot on shp map
- Color 7-11 Green, Circle K Red
- Show Map with legend

```
crs = 32610 # CRS tells python the coordinate reference system
seven_geometry = [Point(xy) for xy in zip(seven_11["Longitude"], seven_11["Latitude"])]
seven_geodata=gpd.GeoDataFrame(seven_11, crs=crs, geometry = seven_geometry)
seven_geodata.to_crs(4236) # Needed to plot on map
seven_geodata.plot(ax=ax, color = 'green', markersize = 50, edgecolor = 'black', label = '7-11')
k_geometry = [Point(xy) for xy in zip(circle_k["Longitude"], circle_k["Latitude"])]
k_geodata = gpd.GeoDataFrame(circle_k, crs=crs, geometry = k_geometry)
k_geodata.to_crs(4236)
k_geodata.plot(ax=ax, color = 'red', markersize = 50, edgecolor = 'black', label = 'Circle K')
ax.set_title("Hong Kong Island 7-11s and Circle Ks")
plt.legend()
plt.savefig(path + os.sep + 'HK Island Map of 7-11s and Circle Ks')
plt.show()
```

Hong Kong Island 7-11s and Circle Ks Map



Find the Distance between Coordinates and Store (7-11)

- Takes in the DataFrames
- Initialize columns to be filled in

```
def compareDistance(seven_11, circle_k):
    '''
    This function takes in both dataframes and compares the distance between
    each other. The closest one will then be selected and will return
    both dataframes
    '''

    seven_11['Distance_km'] = ''
    seven_11['Closest_Circle_K_Loc'] = ''
    seven_11['Closest_Circle_K_Add'] = ''
    seven_11['Circle_K_Latitude'] = ''
    seven_11['Circle_K_Longitude'] = ''
```

- Looping both 7-11 and Circle K DataFrames
- Fill in cells with the distance in km as well as the closest corresponding Circle K location, address, latitude and longitude

```
for i in range(len(seven_11)):
    distance_temp = 99999999
    for j in range(len(circle_k)):
        distance = geodesic((seven_11.Latitude[i], seven_11.Longitude[i]),
                            (circle_k.Latitude[j], circle_k.Longitude[j]))
        if distance < distance_temp:
            seven_11['Distance_km'].iloc[i] = float(str(distance)[:-3])
            seven_11['Closest_Circle_K_Loc'].iloc[i] = circle_k.Location[j]
            seven_11['Closest_Circle_K_Add'].iloc[i] = circle_k.Address[j]
            seven_11['Circle_K_Latitude'].iloc[i] = circle_k.Latitude[j]
            seven_11['Circle_K_Longitude'].iloc[i] = circle_k.Longitude[j]
            distance_temp = distance
```

Find the Distance between Coordinates and Store (Circle K)

- Takes in the DataFrames
- Initialize columns to be filled in

```
circle_k['Distance_km'] = ''
circle_k['Closest_7_11_Loc'] = ''
circle_k['Closest_7_11_Add'] = ''
circle_k['7_11_Latitude'] = ''
circle_k['7_11_Longitude'] = ''
```

- Looping both Circle K and 7-11 DataFrames
- Fill in cells with the distance in km as well as the closest corresponding 7-11 location, address, latitude and longitude

```
for j in range(len(circle_k)):
    distance_temp = 99999999
    for i in range(len(seven_11)):
        distance = geodesic((seven_11.Latitude[i], seven_11.Longitude[i]),
                            (circle_k.Latitude[j], circle_k.Longitude[j]))
        if distance < distance_temp:
            circle_k['Distance_km'].iloc[j] = float(str(distance)[:-3])
            circle_k['Closest_7_11_Loc'].iloc[j] = seven_11.Location[i]
            circle_k['Closest_7_11_Add'].iloc[j] = seven_11.Address[i]
            circle_k['7_11_Latitude'].iloc[j] = seven_11.Latitude[i]
            circle_k['7_11_Longitude'].iloc[j] = seven_11.Longitude[i]
            distance_temp = distance
```

- Returns both DataFrames

```
return seven_11, circle_k
```

Closest Stores and Distance CSV Output (7-11)

Location	Address	24 Hours	Mon-Fri	Sat	Latitude	Longitude	Closest_Circl	Circle_K_Lati	Circle_K_Lon	Distance_km	Closest_Circle_K_Loc
North Point	Portion of Ur	24 Hours			22.2907736	114.194412	Unit No. 5, G	22.2912167	114.195078	0.0843669	North Point
Western	Shop No. 5, (	24 Hours			22.2868961	114.133912	G/F., Nos. 3:	22.2875596	114.138609	0.48957374	Sai Wan
Wan Chai	Shop C & D, (	24 Hours			22.2780103	114.170549	G/F & M/F, :	22.2773896	114.170496	0.06895013	Wanchai
Sai Wan Ho	Shop No. GC	24 Hours			22.28505	114.223797	Shop B G/F.,	22.2821321	114.221624	0.39314583	Shau Kei Wan
Wan Chai	Shop No. 1, (	24 Hours			22.279276	114.179815	Shop G4B G/	22.2791602	114.179443	0.04038641	Wanchai
Shau Kei Wa	Shop No. C2, G/F, King Fa		Monday to Friday: 0700-0000	Saturday: 07(	22.2786788	114.229902	Shop B G/F.,	22.2803075	114.230592	0.19388796	Shau Kei Wan
Sheung Wan	Shop Nos. 1(	24 Hours			22.2870208	114.147681	Shops D & H,	22.2881338	114.146118	0.20275746	Sheung Wan
Quarry Bay	Kiosk QUB 2 at Unpaid Co		Monday to Friday: 0700-2330	Saturday: 07(	22.2878881	114.209748	KIOSK QUB3	22.2880038	114.209757	0.01285139	Quarry Bay
Central	Shop B, Lower Deck Level,		Monday to Friday: 0700-2300	Saturday: 07(	22.2870931	114.161215	Shop Nos. A,	22.2871502	114.161274	0.00871502	Central
North Point	Shop C & D, (	24 Hours			22.2918133	114.198448	Shop No.4, G	22.2906342	114.200757	0.27140257	North Point
Western	Shop A, G/F,	24 Hours			22.2855391	114.141961	Shop A G/F.,	22.284929	114.142068	0.0684479	Western District
Causeway Ba	Shop G, G/F,	24 Hours			22.2801919	114.182229	Shop B on Gı	22.2806683	114.182539	0.06165753	Causeway Bay
Chai Wan	Shop No. 8, Lower Ground		Monday to Friday: 0700-2300	Saturday: 07(	22.2605481	114.231096	Shop 209-21(	22.2630132	114.233059	0.3398036	Chai Wan
Central	Concession HOK 59 at Hon		Monday to Friday: 0700-0000	Saturday: 07(	22.2837134	114.158321	Kiosk No. CEI	22.2819989	114.157677	0.20114691	Central
Aberdeen	G/F, No. 178	24 Hours			22.2489355	114.155854	Ground Floor	22.2487125	114.15516	0.07570944	Aberdeen
Chai Wan	Shop No. 201, Level 2, Hin		Monday to Friday: 0700-2300	Saturday: 07(	22.2627217	114.235745	KIOSK No. CH	22.264625	114.237139	0.25509881	Chai Wan
Western	Portion of Fl	24 Hours			22.2872151	114.138722	G/F., Nos. 3:	22.2875596	114.138609	0.03988269	Sai Wan
Wan Chai	G/F, No. 27 (	24 Hours			22.2769227	114.168626	G/F & M/F, :	22.2773896	114.170496	0.19955719	Wanchai
Central	Shop B, G/F	24 Hours			22.2831855	114.152594	Shop No.1 G,	22.2831647	114.15463	0.2097932	Central
Wan Chai	Shop B, G/F,	24 Hours			22.2776292	114.178443	Shop G4B G/	22.2791602	114.179443	0.19842241	Wanchai
Sheung Wan	Shop No. 289 on 2nd Floo		Monday to Friday: 0700-2300	Saturday: 07(	22.2879098	114.151791	Shop 11, 12 a	22.287287	114.150392	0.15985389	Sheung Wan
Central	Lower Groun	24 Hours			22.2844752	114.153239	Shop No.1 G,	22.2831647	114.15463	0.2039809	Central
Wan Chai	Shop C, G/F,	24 Hours			22.2790348	114.179893	Shop G4B G/	22.2791602	114.179443	0.04840088	Wanchai
Causeway Ba	G/F, No. 17 I	24 Hours			22.278503	114.185978	G/F., 33 Jard	22.2795144	114.184956	0.15372151	Causeway Bay
Causeway Ba	Portion of Sh	24 Hours			22.2789775	114.192349	KIOSK TIH 2 a	22.2824215	114.191726	0.386735	Tin Hau
Sheung Wan	Shops F & G,	24 Hours			22.2855218	114.147547	Shops D & H,	22.2881338	114.146118	0.32453593	Sheung Wan
Sheung Wan	Shop No. 2, Ground Floor,		Monday to Friday: 0700-0000	Saturday: 07(	22.2829992	114.149811	Shop No. 28A	22.2794066	114.152107	0.46283699	Central

Closest Stores and Distances CSV Output (Circle K)

Location	Address	Opening Hours	Latitude	Longitude	Closest_7_11	7_11_Latitud	7_11_Longiti	Distance_km	Closest_7_11_Loc
Wanchai	G/F & M/F, 3	24 Hours	22.2773896	114.170496	Shop B, Grou	22.2772256	114.170549	0.01896702	Wan Chai
Wanchai	Shop 3, G/F.,	24 Hours	22.277808	114.17308	Shop A, G/F,	22.2783779	114.173341	0.0685685	Wan Chai
Wanchai	Kiosk No.WA	07:00-23:00	22.276022	114.175147	Shop A1, G/F	22.276563	114.175588	0.07517184	Wan Chai
Wanchai	G/F., 89 Wai	24 Hours	22.276516	114.175001	Shop A1, G/F	22.276563	114.175588	0.06066877	Wan Chai
Wanchai	G/F., Warne	24 Hours	22.277742	114.171826	Shop Nos. 1	22.2777219	114.171966	0.01455831	Wan Chai
Wanchai	Shop A, G/F.	06:30-23:00	22.2780541	114.172908	Shop A, G/F,	22.2783779	114.173341	0.05724509	Wan Chai
Wanchai	Flat B G/F., S	24 Hours	22.277339	114.171104	Shop B, Grou	22.2772256	114.170549	0.05854046	Wan Chai
Wanchai	Shop G4B G/	24 Hours	22.2791602	114.179443	Shop No. 1, (	22.279276	114.179815	0.04038641	Wan Chai
Wanchai	Shop E G/F. ,	24 Hours	22.2774551	114.173522	Ground Floor	22.2770565	114.173546	0.04420958	Wan Chai
Wanchai	G/F & Cockl	24 Hours	22.2787376	114.18141	Shop No. 2, (	22.2792596	114.18158	0.06038208	Causeway Bay
Wanchai	Shop 1, Grou	24 Hours	22.2765046	114.173061	Shop E & F, (	22.2763134	114.172883	0.0280278	Wan Chai
Aberdeen	Shop 7 & 8, 1	24 Hours	22.2516355	114.137979	Shop No. 1, (	22.2498464	114.139108	0.22977682	Aberdeen
Aberdeen	G/F., Shop 7,	24 Hours	22.2483068	114.15244	Shop No. 25,	22.2487869	114.153868	0.15651584	Aberdeen
Aberdeen	Shop Nos. 3	24 Hours	22.2493714	114.148743	Shop C & D, (	22.2494804	114.148882	0.01875816	Aberdeen
Aberdeen	Shop 116, W	06:00-22:30	22.2525023	114.136397	Shop No. 24A	22.2532466	114.136148	0.08633841	Aberdeen
Aberdeen	Shop 7, Shek	06:00-00:00	22.248788	114.157033	G/F, No. 178	22.2489355	114.155854	0.12268644	Aberdeen
Aberdeen	G/F., Main B	07:45-19:45	22.2510972	114.173216	Concession N	22.2486966	114.174443	0.29440041	Southern
Aberdeen	Ground Floor	24 Hours	22.2487125	114.15516	Portion 6 of S	22.2481534	114.154801	0.07210688	Aberdeen
Aberdeen	Shop 30, Wa	06:30-00:00	22.253079	114.136107	Shop No. 24A	22.2532466	114.136148	0.0190227	Aberdeen
Chai Wan	Shop 209-21(	24 Hours	22.2630132	114.233059	Shop No. 201	22.2627217	114.235745	0.27865181	Chai Wan
Chai Wan	KIOSK CHW1	06:00-23:00	22.2678103	114.236078	Shop 1C-1 in	22.2674969	114.235015	0.11491567	Chai Wan
Chai Wan	KIOSK No. CH	06:00-23:00	22.264625	114.237139	Shop No. 120	22.2639913	114.237074	0.07049211	Chai Wan
Chai Wan	Shop 3A and	24 Hours	22.26686	114.235195	Shop 1C-1 in	22.2674969	114.235015	0.07293883	Chai Wan
Taikoo	Shop H1 & H	06:30-00:00	22.3218208	114.177969	Shop No. G6,	22.2921837	114.19528	3.73525621	North Point
Taikoo	KIOSK NO. TA	06:00-23:00	22.28465	114.21636	Kiosk No. TA	22.28465	114.21636	0	Tai Koo Shing

Ask the User Which Shop to Select and Compare (7-11)

- Ask user which company they want to choose first
- Output the stores and ask user to select one
- If 7-11, find the closest correlated Circle K store (which is only 1 row)
- Output the distance of stores from each other
- Output the Opening Hours and if they are the same
- Show both stores on map through plotClosest function

```
def main(seven_11, circle_k):
    '''
    This function takes in the 7-11 and Circle K scraped data and coordinates.
    It then asks the user if they want to compare the distance between a 7-11
    to the closest Circle K or vice versa. Then, it displays it on the map.
    '''

    # Asks user to compare which stores
    company = 'true'

    print("\nThis program helps find the closest convenience store from each other.")

    while company != 'end' :

        print("To end the program, type 'end'")

        company = input("Which company do you want to compare distance to (7-11 or Circle K): ")

        if company == '7-11':
            print(seven_11[['Location', 'Address']])
            store = int(input("Select a store by number (0-{}): ".format(len(seven_11)-1)))
            print("\nThe 7-11 store is in", seven_11['Location'].iloc[store],
                  "and the address is", seven_11['Address'].iloc[store] + '.')

            corr_lat, corr_lon = seven_11['Circle_K_Latitude'].iloc[store], seven_11['Circle_K_Longitude'].iloc[store]
            corr_k = circle_k[(circle_k.Latitude == corr_lat) & (circle_k.Longitude == corr_lon)]

            print("The closest Circle K store is in", corr_k['Location'].iloc[0],
                  "and the address is", corr_k['Address'].iloc[0] + '.\n')
            print("The two stores are {} km apart.".format(seven_11['Distance_km'].iloc[store]))

            if seven_11['24 Hours'].iloc[store] != '':
                print("The 7-11 store is open 24/7!")
            else:
                print("The 7-11 store opens on", seven_11['Mon-Fri'].iloc[store],
                      "and", seven_11['Sat'] + '.')
            if corr_k['Opening Hours'].iloc[0] == '24 Hours':
                print("The Circle K store is open 24/7!")
                print("Both are open 24/7!")
            else:
                print("The Circle K store opens on", corr_k['Opening Hours'].iloc[0] + '.')

            plotClosest(seven_11, corr_k, store, '7-11', 'Circle K')
```

Ask the User Which Shop to Select and Compare (Circle K)

- If Circle K, find the closest correlated 7-11 store (which is only 1 row)
- Output the distance of stores from each other
- Output the Opening Hours and if they are the same
- Show both stores on map through plotClosest function

```
elif company == 'Circle K':
    print(circle_k[['Location', 'Address']])
    store = int(input("Select a store by number (0-{}): ".format(len(circle_k)-1)))
    print("The Circle K store is in", circle_k['Location'].iloc[store],
          "and the address is", circle_k['Address'].iloc[store] + '.')
    corr_lat, corr_lon = circle_k['7_11_Latitude'].iloc[store], circle_k['7_11_Longitude'].iloc[store]
    corr_7 = seven_11[(seven_11.Latitude == corr_lat) & (seven_11.Longitude == corr_lon)]

    print("The closest 7-11 store is in", corr_7['Location'].iloc[0],
          "and the address is", corr_7['Address'].iloc[0] + '.\n')
    print("The two stores are {} km apart.".format(circle_k['Distance_km'].iloc[store]))

    if circle_k['Opening Hours'].iloc[store] == '24 Hours':
        print("The Circle K store is open 24/7!")
    else:
        print("The Circle K store opens on", circle_k['Opening Hours'].iloc[0] + '.')
    if corr_7['24 Hours'].iloc[0] == '24 Hours':
        print("The 7-11 store is open 24/7!")
        print("Both are open 24/7!")
    else:
        print("The 7-11 store opens on", seven_11['Mon-Fri'].iloc[store],
              "and", seven_11['Sat'] + '.')

    plotClosest(circle_k, corr_7, store, 'Circle K', '7-11')
```

Example 7-11 Text Output 1

```
This program helps find the closest convenience store from each other.
To end the program, type 'end'

Which company do you want to compare distance to (7-11 or Circle K): 7-11
        Location                                            Address
0    North Point  Portion of Unit No. 2 on the Portion of the G/...
1        Western  Shop No. 5, G/F, Block B, Mei Sun Lau, Nos. 48...
2       Wan Chai  Shop C & D, G/F, Nos. 8-12 Fenwick Street, Nos...
3     Sai Wan Ho  Shop No. GC04, G/F, Lei King Wan, Site C, No. ...
4       Wan Chai  Shop No. 1, G/F, Chuang's Enterprises Building...
..           ...                                              ...
223    Admiralty         Kiosk No. ADM 16 at MTR Admiralty Station
224  North Point  Shop No. 130, 1/F, Island Place, No. 500 King'...
225   Sheung Wan  G/F, Teng Fuh Commercial Building, Nos. 331-33...
226   Sheung Wan  Ground Floor of Enterprise Building, 238 Queen...
227    Apleichau  Shop No. 205, Ground Floor, Commercial Complex...

[228 rows x 2 columns]

Select a store by number (0-227): 100

The 7-11 store is in Aberdeen and the address is Portion 6 of Shops A, B & G on Ground Floor of Albert House, 20,22,24 & 28 Chengtu Road & No.12 Sai On Street, Aberdeen, Hong Kong.
The closest Circle K store is in Aberdeen and the address is Ground Floor, No. 23 Tung Sing Road, Hong Kong.

The two stores are 0.072106882419383 km apart.
The 7-11 store is open 24/7!
The Circle K store is open 24/7!
Both are open 24/7!
```

Example 7-11 Text Output 2

```
To end the program, type 'end'

Which company do you want to compare distance to (7-11 or Circle K): 7-11
       Location                                            Address
0    North Point  Portion of Unit No. 2 on the Portion of the G/...
1        Western  Shop No. 5, G/F, Block B, Mei Sun Lau, Nos. 48...
2       Wan Chai  Shop C & D, G/F, Nos. 8-12 Fenwick Street, Nos...
3     Sai Wan Ho  Shop No. GC04, G/F, Lei King Wan, Site C, No. ...
4       Wan Chai  Shop No. 1, G/F, Chuang's Enterprises Building...
..           ...                                              ...
223    Admiralty          Kiosk No. ADM 16 at MTR Admiralty Station
224  North Point  Shop No. 130, 1/F, Island Place, No. 500 King'...
225   Sheung Wan  G/F, Teng Fuh Commercial Building, Nos. 331-33...
226   Sheung Wan  Ground Floor of Enterprise Building, 238 Queen...
227    Apleichau  Shop No. 205, Ground Floor, Commercial Complex...

[228 rows x 2 columns]

Select a store by number (0-227): 99

The 7-11 store is in Stanley and the address is Shop A, Ground Floor, No. 90A Stanley Main Street, Hong Kong.
The closest Circle K store is in Wong Chuk Hang and the address is Concession No. OCP 5 at MTR Ocean Park Station.

The two stores are 5.053392892758944 km apart.
The 7-11 store is open 24/7!
The Circle K store opens on Monday - Saturday (07:00-19:00) , Sunday & Public Holiday (08:00-19:00).
To end the program, type 'end'

Which company do you want to compare distance to (7-11 or Circle K): end
```

Example Circle K Text Output 1

```
This program helps find the closest convenience store from each other.
To end the program, type 'end'

Which company do you want to compare distance to (7-11 or Circle K): Circle K
          Location                                              Address
0          Wanchai           G/F & M/F, 38 Hennessy Rd, Wanchai, H.K.
1          Wanchai  Shop 3, G/F., On Hong Comm. Bldg., 145 Henness...
2          Wanchai                      Kiosk No.WAC4, Wanchai MTR II
3          Wanchai                  G/F., 89 Wan Chai Road, Hong Kong
4          Wanchai  G/F., Warner Building, 91 Hennessy Road, Hong ...
..             ...                                               ...
74  Wong Chuk Hang            No. WCH 8 at MTR Wong Chuk Hang Station
75    Sai Ying Pun  Shop A on G/F., & Cloak Room on LG/F., Kam Nin...
76       Queensway  Shop No. F01-02, Lab Concept, 1/F Queensway Pl...
77     Ap Lei Chau  Ground Floor, No. 85 Main Street Ap Lei Chau, ...
78        Wan Chai    MTR Station Kiosk WAC 5 at MTR Wan Chai Station

[79 rows x 2 columns]

Select a store by number (0-78): 2
The Circle K store is in Wanchai and the address is Kiosk No.WAC4, Wanchai MTR II.
The closest 7-11 store is in Wan Chai and the address is Shop A1, G/F, Tak Lee Commercial Building, 113 – 117 Wanchai Road, HK.

The two stores are 0.0751718441675777 km apart.
The Circle K store opens on 07:00-23:00.
The 7-11 store opens on Monday to Friday: 0700-2300 and Saturday: 0700-2300.
```

Example Circle K Text Output 2

```
To end the program, type 'end'

Which company do you want to compare distance to (7-11 or Circle K): Circle K
          Location                                              Address
0          Wanchai           G/F & M/F, 38 Hennessy Rd, Wanchai, H.K.
1          Wanchai  Shop 3, G/F., On Hong Comm. Bldg., 145 Henness...
2          Wanchai                      Kiosk No.WAC4, Wanchai MTR II
3          Wanchai                  G/F., 89 Wan Chai Road, Hong Kong
4          Wanchai  G/F., Warner Building, 91 Hennessy Road, Hong ...
..             ...                                                ...
74  Wong Chuk Hang            No. WCH 8 at MTR Wong Chuk Hang Station
75    Sai Ying Pun  Shop A on G/F., & Cloak Room on LG/F., Kam Nin...
76       Queensway  Shop No. F01-02, Lab Concept, 1/F Queensway Pl...
77     Ap Lei Chau  Ground Floor, No. 85 Main Street Ap Lei Chau, ...
78        Wan Chai    MTR Station Kiosk WAC 5 at MTR Wan Chai Station

[79 rows x 2 columns]

Select a store by number (0-78): 30
The Circle K store is in Central and the address is Shop No.1 G/F., & Open Yard Nos.10-16 Cochrane Street, Hong Kong.
The closest 7-11 store is in Central and the address is G/F & C/L, Nos. 9-11 Cochrane Street, Central, Hong Kong.

The two stores are 0.0371036937007752 km apart.
The Circle K store is open 24/7!
The 7-11 store is open 24/7!
Both are open 24/7!
To end the program, type 'end'
```

Showing Map and Points of Both Stores

- Takes in the DataFrames of the store, the correlating store, company_1 (which is the main company), and company_2 (correlating)
- Colors to match store brand colors
- Plot Hong Kong map as background. Use of relim() and autoscale_view() to reset views to show zoomed in view of plotted points

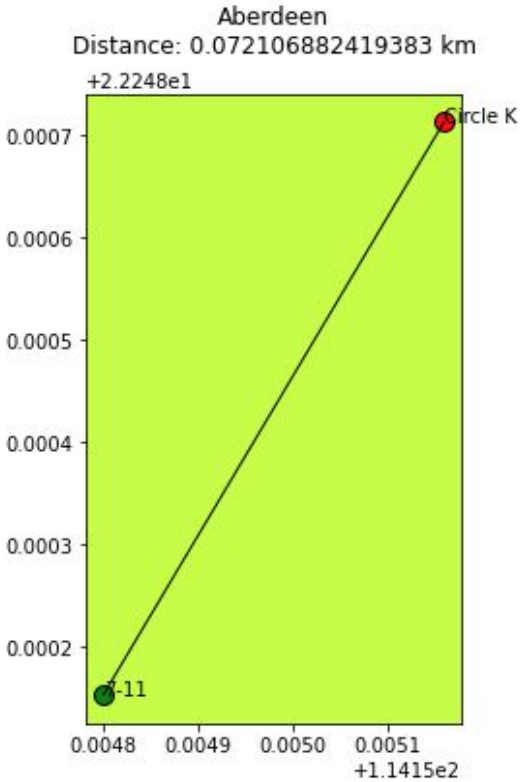
```
def plotClosest(store_df, corr_df, store, company_1, company_2):
    '''
    This functions takes in any store's main dataframe and the correlation of
    another store's to ensure they match. It also takes which store the user
    has chosen. The function then uses this to plot both points and connect
    them for visualization purposes.
    '''

    if company_1 == '7-11':
        marker_color_1 = 'green'
        marker_color_2 = 'red'
    else:
        marker_color_1 = 'red'
        marker_color_2 = 'green'

    hk_map = gpd.read_file(r'/Users/XFlazer/Documents/HKU/FBE/Finance/FINA 2390/Project 3/Hong_Kong_18_Districts/HKDistrict18.shp')
    fig, ax = plt.subplots(figsize = (20, 6))
    hk_map.plot(ax=ax, facecolor = 'White', edgecolor = 'Black', alpha = 1, linewidth = 1, cmap = "jet", legend = True)
    ax.relim()
    ax.autoscale_view()
```

Showing Map and Points of Both Stores (Cont.)

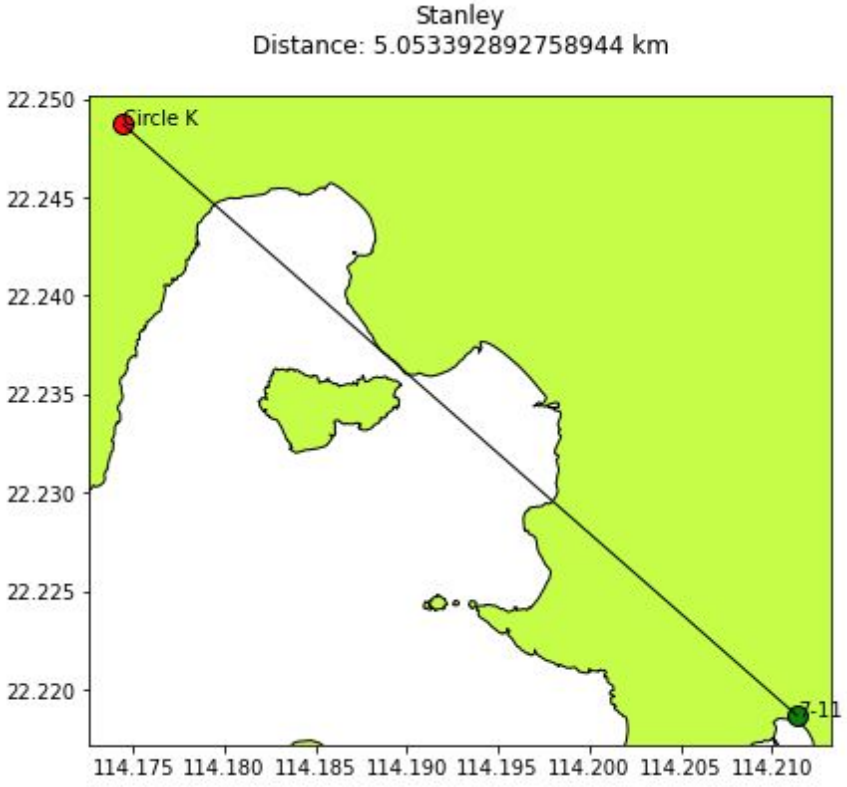
- Use Longitude and Latitude as x and y values to plot
- Colors to match store brand colors
- ax.annotate used to label store point
- Connect both points with a line
- Title used to show location and distance in km
- Show map to user

```
x_values = store_df['Longitude'].iloc[store], corr_df['Longitude'].iloc[0]
y_values = store_df['Latitude'].iloc[store], corr_df['Latitude'].iloc[0]
ax.plot(x_values[0], y_values[0], markersize = 20, marker = '.',
        markerfacecolor = marker_color_1, markeredgecolor = 'black')
ax.annotate(company_1, (x_values[0], y_values[0]))
ax.plot(x_values[1], y_values[1], markersize = 20, marker = '.',
        markerfacecolor = marker_color_2, markeredgecolor = 'black')
ax.annotate(company_2, (x_values[1], y_values[1]))
plt.plot(x_values, y_values, linewidth = 1, color = 'black')
ax.set_title(store_df['Location'].iloc[store])
ax.set_title("{}\nDistance: {} km\n".format(store_df['Location'].iloc[store],
                                            store_df['Distance_km'].iloc[store]))
plt.show()
```

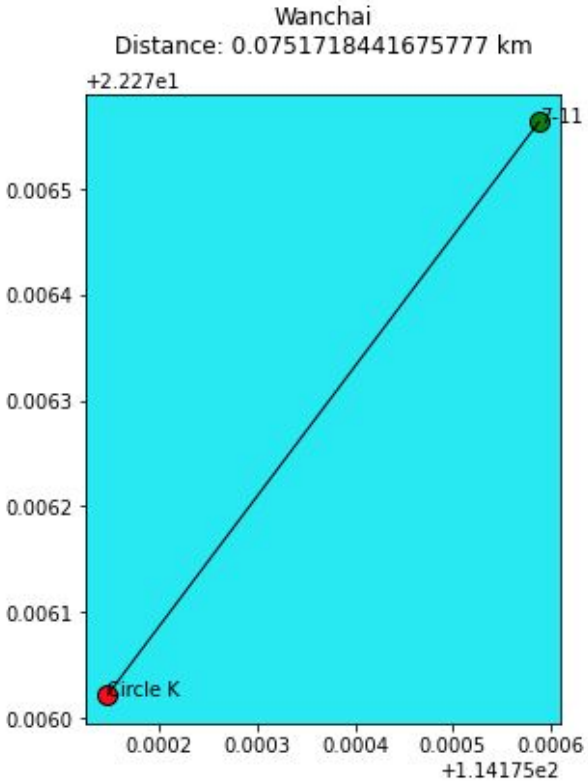
Example 7-11 Map Output 1



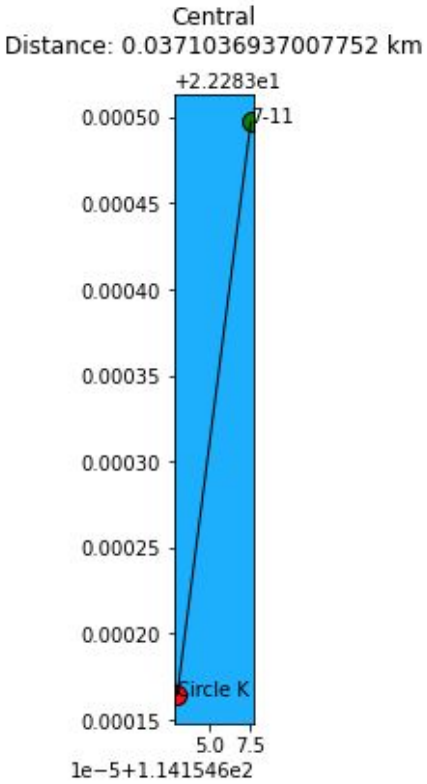
Example 7-11 Output 2



Example Circle K Output 1



Example Circle K Output 2



Improvements to Code

1. Make a Graphic User Interface (GUI) for the user to individually click on a point and measure the closest competing store
2. Allow for the user to click on a point and measure the distance from any other store, not necessarily the closest one
3. Make it easier for the user to choose a store (show all stores without needing to look at csv file since console doesn't print all, inputting filters to then choose from)
4. Have a map that outlays the terrain, city, and roads so that it's easier to look at the two closest points
    a. Allow for a zoom in animation from HK Island map to the 2 specific points to see where it's located overall
5. Label the major parts of the HK Island Shapefile
6. With more data, consider connecting revenues, costs between two closest stores
7. Create a regression model to predict if a store's opening hours will force the closest store to open at the same hours

References

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