Working with Google Maps

Objectives: Adding Spatial Data to Google Maps

The objective of these exercises is to explore Google Maps as a tool for visualizing spatial information. To accomplish this goal, we will perform the following tasks:

- Visit websites relevant to developing Google Maps web applications
- Explain the files & folders in the **gmap** folder that support Google Maps web apps
- Explain the use of KML files in Google Maps
    - Walk-through the sample code;
    - Point out how KML data is used to create information layers in Google Maps.
- Collect spatial data for the Hōkūleʻa & Hikianalia Mālama Honua World-wide Voyage website
    - Create a KML layer using **waypoint data** from the website.
    - Add images & video you found on the Web that documents the Hawaii-to-Tahiti leg of the Mālama Honua voyage to your KML.
- Collect spatial data on the UHMC campus using GPS & video/camera devices.
    - Create a KML layer using **track & waypoint data** from the GPS.
    - Add images & video you collected around campus to your KML.

Exercise #1: Data Collection: Hōkūleʻa website

Track data describes the location of an object at regular intervals over a period of time. The Polynesian Voyaging Society (PVS) has create a website that provides track data for the Hawaiian voyaging canoes Hōkūleʻa & Hikianalia as they visit different locations on their Mālama Honua World-wide Voyage.

The following steps will help you to collect the Track data from the PVS website:

1. From a web browser, type in the following website address: http://napali.org/pvs_wwv/
2. This site contains track data for the first leg of the voyage from Hawaii to Tahiti.
3. Scroll down the webpage until you find the section that begins with:

   Track data: (most recent on top)
   Each circular icon on the map marks a measurement point in this list.

4. Select all the rows of data starting at the following line:

   ```
   Date-Time(UTC)   Hawaiʻi-Standard-Time    Approximate-Local-Time
   Latitude  Longitude  Course Speed Vessel
   ```

5. …and ending just before the solid line:

6. <u>On the webpage</u>, right-click and select **Copy** from the pop-up menu.
7. <u>On your computer</u>, open the Windows Notepad program.

8. Paste the track data into Notepad and then save the file to your **Desktop**, using the name: **hokulea.txt**.

Exercise #2: Data Cleansing & Conversion

Data cleansing involves removing extraneous data, correcting erroneous data, standardizing data structure, and validating proper format. Data conversion refers to changing the format of the input data to a format compatible with your web application. For our purposes, *Keyhole Markup Language* (*KML)* is the format compatible with our Google Maps web app.

To complete this exercise, perform the following steps:

1. From your computer, start Microsoft Excel 2013, and select **Blank workbook**.
2. In Excel, select the **Data** tab, and then in the **Get External Data** group, select **From Text**
3. Find the text file, *hokulea.txt*, on your computer's Desktop, and import it.
4. In the **Text Import Wizard - Step 1 of 3**, check the box that says: *My Data has headers*. Press *Next >*.
5. In the **Text Import Wizard - Step 2 of 3**, use the horizontal scrollbar to preview the data to be imported. Verify that each column heading is properly aligned with the column of data it represents.
     - If a column heading is not properly aligned with its column of data, go back to step #4 and repeat these steps. Add or remove spaces between column headings so that the column headings are over the column of data.
6. Press *Finish*, and then *OK*.
7. Modify the first row. Change the column headings as follows:

    ```
    Change:  Date-Time(UTC)              To:  UTC
    Change:  Hawai'i-Standard-Time       To:  HST
    Change:  Approximate-Local-Time      To:  LocalTime
    ```

8. Delete the second row. *Right-click* on the second row and select **Delete** from the popup menu. The second row contains the following line:

    ```
    YYYY-MM-DDThh:mm:ssZ YYYY-MM-DDThh:mm:ss-10:00 YYYY-MM-
    DDThh:mm:ss∓HH:MM   degrees     degrees degrees knots
    ```

9. To remove duplicate data, select the **Data** tab, and then the **Remove Duplicates** option.
10. Press the **Unselect All** button. Check the *Latitude*, *Longitude*, and *Speed* boxes. Press **OK**.
11. Sort the data in ascending order by the **HST** column. Select the **Data** tab, and then the **Sort** option. From the **Sort by** column, choose **HST**. Press **OK**.
12. Save the Excel file to your Desktop by selecting the **File** tab and then **Save**. Select **Computer**, and then the **Desktop** folder. Use the filename: *hokulea.xlsx*

Exercise #4: Adding More Data

Now that we've collected, cleansed, & converted **Track** data for the first leg of the Mālama Honua voyage, we have a good idea of the location of both canoes as they sailed from Hawaii to Tahiti. However, we can improve the usefulness of our data by associating additional information with a few of the *track point*. A *track point* is one of the many *data points* that make up a *track*. A track point refers to a specific location at

a specific time. By clicking on the track point, the user activates a "pop-up balloon" that shares additional information about what was happening at that track point. The additional information can be in the form of **images**, **videos**, **HTML**, and/or **text** information. To find additional information about the Mālama Honua voyage, you can visit the PVS website at: www.hokulea.com

Follow these steps to associate additional information to your track data:

1. Find additional information on the Web about specific events or ceremonies that the Hokule'a & Hikianalia may have participated in. For example:
   - Departure from Honolulu
   - View of the two canoes from Waikiki
   - Arrival / departure from Lahaina
   - Arrival and/or departure from Hilo
   - Arrival and/or departure from the Tuamotus
   - Arrival in Pape'ete, Tahiti
   - Reports at sea.
2. Open the MS-Excel file, ***hokulea.xlsx***. It should be on your Desktop.
3. Add 8 more columns to your track data in the following order:
   Name, Description, ***Image***, ***ImageURL***, ***VideoURL, Text***
4. In the cell below ***Name***, enter the following formula:
   =H2 & " #" & (ROW(H2)-1)
5. Propagate this formula to all the other rows in the ***Name*** column.
6. In the cell below ***Description***, enter the following formula:
   **"HST: " & B2 & "
Latitude: " & D2 & " deg., Longitude: " & E2 & " deg.
 Course: " & F2 & " deg., Speed: " & G2 & " knots
" & K2 & "
Video: " & M2 & "
<p>" & N2 & "</p>"**
7. Propagate this formula to all the other rows in the ***Description*** column.
8. In the cell below ***Image***, enter the following formula:
   =""
9. Propagate this formula to all the other rows in the ***Image*** column.
10. Each row in the spreadsheet corresponds to a unique Track Point.
    a. To include an image with a Track Point, copy the image URL into the ***ImageURL*** column for that Track Point.
    b. To include a video with a Track Point, copy the video link into the ***VideoURL*** column for that Track Point.
11. Save the changes to your Excel file.
12. From your web browser, go to the MapsData website: http://www.mapsdata.co.uk/online-file-converter/
13. Follow the instructions on the website to convert your Excel file to a KML file. Remember that your Excel file is located on your computer's **Desktop** and that the KML file will be saved to your computer's **Download** folder.
14. Go to your ***gmap/kml*** folder on Google Drive and upload your KML file.
15. Delete the existing ***HokuleaWaypoints.kml*** file in your ***gmap/kml*** folder.
16. Rename your KML file to ***HokuleaWaypoints.kml.***
17. Refresh the Google Maps web app, and click on the icons with an image or video.
18. Verify that you can see the image in the popup balloon.

19. Verify that you can access the video from the popup balloon.

Exercise #5: Experimenting with CSS properties

1. Continue to enhance your Mālama Honua voyage data by finding additional information on the Web about specific events or reports from the crew members. For example:
    *   Interview with crew members
    *   Video reports from 'Oiwi TV
    *   etc.

Exercise #6: Data Collection with GPS and Video Camera

The GPS device collects two forms of spatial data; Tracks & Waypoints. Tracks are collected automatically and continuously once the GPS has acquired satellite signals. Waypoints are collected at specific locations by the user. A track records the route the user followed. A waypoint records a location determine by the user.

On the UHMC campus, use the GPS and camera to collect track, waypoint, image, & video data at 10 different locations around campus.

Work with the GPS device to learn how to:

*   Remove old tracks & waypoints
*   Acquire satellites
*   Clear current track
*   Take waypoints
*   Save current track

Work with the video camera to learn how to:

*   Remove old images from device
*   take an image at each waypoint
*   take a 10 sec. video at each waypoint

Exercise #7: Convert GPS data to KML format

The GPS data is stored on the device as GPX files. The GPX files need to be converted into KML files before the data can be used in your web app. Perform the following steps to convert your GPX files to KML files:

1. Connect GPS to computer using USB cable.
2. Wait for computer to recognize GPS device.
3. Open Windows Explorer and find GPS drive **GARMIN (E:)**
4. Go to **E:\Garmin** folder on GPS drive and find your ***Track*** & ***Waypoint*** GPX data.
5. Copy your GPX files to your computer's Desktop.
6. In a web browser, go to the GPS Visualizer website: http://www.gpsvisualizer.com/convert_input
7. Set the following options on the website:
    a. Output format: **Plain Text**
    b. Upload files here: Choose file -> Select your **GPX *Waypoint*** file
    c. Plain text delimiter: **comma**

8. Press the **Convert** button.
9. Download the CSV file from the website to your computer.
10. Open the CSV file in Excel.
11. Change *time* to *HST*.
12. Change *latitude* to *Latitude*.
13. Change *longitude* to *Longitude*.
14. Change *name* to *Name*.
15. Change *desc* to *Description*.
16. Add 4 more columns to your track data in the following order:
    Image, *ImageURL*, *VideoURL, Text*
17. In the cell below *Description*, enter the following formula:
    **="HST: " & B2 & "
Latitude: " & C2 & " deg., Longitude: " & D2 & "
    deg.

" & I2 & "
Video: " & K2 & "
<p>" & L2 & "</p>"**
18. Propagate this formula to all the other rows in the *Description* column.
19. In the cell below *Image*, enter the following formula:
    =""
20. Propagate this formula to all the other rows in the *Image* column.
21. Each row in the spreadsheet corresponds to a unique Track Point.
    a. To include an image with a Track Point, copy the image URL into the *ImageURL* column for
       that Track Point.
    b. To include a video with a Track Point, copy the video link into the *VideoURL* column for that
       Track Point.
22. Save the changes as an Excel file.
23. From your web browser, go to the MapsData website: http://www.mapsdata.co.uk/online-file-converter/
24. Follow the instructions on the website to convert your XLS file to a KML file. Remember that the
    KML file will be saved to your computer's **Download** folder.
25. Go to your *gmap/kml* folder on Google Drive and upload your KML file.
26. Delete the existing *HaleakalaWaypoints.kml* file in your *gmap/kml* folder.
27. Rename your KML file to *HaleakalaWaypoints.kml.*