

Working with GIS Data

A Geographic Information System (GIS) is used to visualize data geospatially, i.e. using maps. The Google Maps Application Programming Interface (API) provides a library of code that enables software developers to build GIS programs.

Term	Definition
GIS	Geographic Information System
GPS	Global Positioning System
Waypoint	A location that is of specific interest
Track	A collection of locations that record the actual path followed
Route	A pre-defined path of waypoints

Follow these exercises to collect, convert, cleanse and upload GIS data to your Cloud 9 environment in order to visualize the data geospatially.

Exercise #1: Collecting the data

Collecting the data is currently a manual process and involves the following equipment & tasks.

Table 1. Required Equipment.

Device	Vendor	Purpose
GPS receiver	Garmin eTrex 20 w/ 2 AA batteries	Collects Track and Waypoint data
Camera	Coleman video camera w/ 2 AA batteries	Collects image and video data
USB cable		Connects GPS or camera devices to a computer
Computer	Windows O.S.	Remove old image and video files from camera. Remove old GPX track and waypoint files from GPS receiver

Task #1: Remove old data from the GPS device

Follow these steps to remove old waypoint & track files from the GPS device:

1. Power-On the computer.
2. Power-On the GPS receiver.
3. Plug USB cable into GPS receiver.

4. Plug USB cable into computer.
5. Open a file manager window on the computer.
6. In the file manager, find the **GPS** drive.
7. On the **GPS** drive, locate the **Garmin/GPX** folder.
8. In the **GPX** folder, ONLY delete the GPX files, i.e. files that end in **.gpx**
9. When you've completed this task, continue on with the next task.

Task #2: Remove old data from the Camera.

Follow these steps to remove old image & movie files from the camera:

1. Power-On the computer.
2. Power-On the camera.
3. Plug USB cable into camera.
4. Plug USB cable into computer.
5. Open a file manager window on the computer.
6. In the file manager, find the camera drive.
7. On the camera drive, locate the **DCIM/100Media** folder.
8. In the **100Media** folder, ONLY delete the image & video files, i.e. files that end in **.JPG or .MOV**
9. When you've completed this task, continue on with the next task.

Task #3: Calibrate GPS receiver

The GPS receiver needs to be calibrated before using it to collect data. The following procedure is for the Garmin eTrex 20 device:

1. Find a location outdoors where you have clear visibility of the sky.
2. Power-On the GPS receiver.
3. From the Main menu, find the Satellite menu.
4. Click the Satellite menu to begin acquiring satellites.
5. Acquire a minimum of 5 satellites.
6. When you've acquired enough satellites, return to the Main menu.
7. When you've completed this task, continue on with the next task.

Task #4: Collect the data

Follow these steps to collect the data:

1. Find 10 interesting objects of interest (i.e. plants, buildings, murals, etc.) on campus

2. Use the GPS to take a waypoint for the object
3. Add a note to the waypoint that describes the object.
4. Take a minimum of 10 pictures of the object to create a **photosynth**
5. Walk towards the object as you take your pictures
6. Take a minimum of 10 pictures of the object to create a **panorama**
7. Turn 360 degrees as you take your pictures

Exercise #2: Convert GPX to CSV data

Sometimes, the format of the collected data needs to be converted to another format supported by the GIS program. In our case, we want to convert our location data from GPX to comma-separated value (CSV) format. CSV files can be further manipulated using Microsoft Excel.

Table 1. Required Equipment.

Software	Purpose / URL
GPS Visualizer	Converts GPX files into CSV files. http://www.gpsvisualizer.com/convert_input
Microsoft Excel	Manipulate CSV files.

Task #1: Copy Waypoint file from GPS device

Follow these steps to copy the Waypoint files from the GPS device:

1. Power-On the computer.
2. Power-On the GPS receiver.
3. Plug USB cable into GPS receiver.
4. Plug USB cable into computer.
5. Open a file manager window on the computer.
6. Find the **F:** drive and create a **day3data** folder.
7. Find the **GPS** drive and locate the **Garmin/GPX** folder.
8. In the **GPX** folder, ONLY copy the Waypoint GPX file, i.e. file that ends in **.gpx**, to the **F:\day3data** folder.
9. When you've completed this task, continue on with the next task.

Task #3: Convert GPX Waypoint file to CSV

Use the GPS Visualizer website to perform the file conversion. The URL is:

http://www.gpsvisualizer.com/convert_input

Follow these steps to remove old data files from the camera:

1. Set the following options at the GPS Visualizer website:
 - Output format: **plain text**
 - Choose file: select the GPX waypoint file from **F:\day3data**
 - Force your data to be this type: **waypoints**
 - Plain text delimiter: **comma**
 - Plain text output units: **U.S.**
2. Press the **Convert** button.
3. Click the link, "**Press to download ... data.csv**".
4. In the computer's **Download** folder, find the CSV file you just downloaded.
5. Right-click on the downloaded file and rename it to **day3waypoints.csv**.
6. Move the **day3waypoints.csv** file to the **F:\day3data** folder.
7. When you've completed this task, continue on with the next Exercise.

Exercise #3: Cleansing the dataset

Cleansing the data involves correcting bad field names, correcting erroneous or missing data, and including additional fields to the dataset. **Delete any image or video files that you do not wish to share with others.**

Task #1: Copy image files from Camera

Follow these steps to remove old data files from the camera:

1. Power-On the computer.
2. Power-On the camera.
3. Plug USB cable into camera.
4. Plug USB cable into computer.
5. Open a file manager window on the computer.
6. Find the camera drive and locate the **DCIM/100Media** folder.
7. In the **100Media** folder, ONLY copy the image files, i.e. files that end in **.JPG**, to the **F:\day3data** folder.
8. When you've completed this task, continue on with the next task.

Task #2: Cleanse the Image files

Follow these steps to remove image files you **do not** wish to share:

1. Open a file manager window on the computer.
2. In the file manager, find the **F:\ day3data** folder.

3. Double-click on each JPG file to view it.
4. **Delete** ONLY the JPG files you **do not wish to share** with others.
5. When you've completed this task, continue on with the next task.

Exercise #4: Upload data files to Google Drive

Upload your Waypoint & image files to Google Drive in order to make them accessible to your team member(s) via the Web. To use Google Drive, you need a valid Gmail account. A valid Gmail account has been created for each Cloud 9 account. To get the username & password to your Gmail KHOKL CS account, find your Cloud 9 username in the table below.

Table 1. Required Account Info.

If your Cloud 9 Username is:	Then your Gmail Username is:	And your Gmail Password is:
khokl1	khokl1.cs@gmail.com	Same as your Cloud 9 password
khokl2	khokl2.cs@gmail.com	Same as your Cloud 9 password
khokl3	khokl3.cs@gmail.com	Same as your Cloud 9 password
khokl4	khokl4.cs@gmail.com	Same as your Cloud 9 password
khokl5	khokl5.cs@gmail.com	Same as your Cloud 9 password
khokl6	khokl6.cs@gmail.com	Same as your Cloud 9 password
khokl7	khokl7.cs@gmail.com	Same as your Cloud 9 password
khokl_intern	khokl.intern@gmail.com	Same as your Cloud 9 password
khokl_mentor	khokl.mentor@gmail.com	Same as your Cloud 9 password

Task #1: Upload CSV & Image files

Follow these steps to upload image & video files to Google Drive:

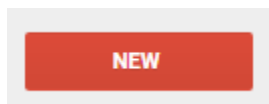
1. In Google Chrome, enter **gmail.com** as the URL address.
2. Login to your Gmail account.
3. Click on the **Google Apps** icon in the upper right corner of browser window.



4. Click on the **Google Drive** icon.



- Click on the **New** button and create a folder named **img**.



- Create another folder named **CSV**.
- Double-click on **img** folder to open it.
- Open a file manager window on your computer and find the **F:\day3data** folder.
- Select & drag the **JPG** files from the **F:\day3data** folder to the Google Drive **img** folder.
- Click on the **MyDrive** icon to move to the top Google Drive folder.
- Double-click on **CSV** folder to open it.
- In the file manager on your computer, find the **F:\day3data** folder.
- Select & drag the **day3waypoints.csv** file from the **F:\day3data** folder to the Google Drive **CSV** folder.

Exercise #5: Create Photosynths & Panoramas

In the following tasks, you will create photosynths and panoramas to included in your Google Maps webpage. To complete this exercise, you will use the website <http://photosynth.net> to produce photosynths & panoramas from your JPG image files.

To use the Photosynth website, you need a valid Microsoft account. To get the username & password to your Microsoft account, find your Cloud 9 username in the table below.

Table 1. Required Account Info.

If your Cloud 9 Username is:	Then your Microsoft Username is:	And your Microsoft Password is:
khokl1	khokl1.cs@gmail.com	Add team # to end of Cloud 9 password
khokl2	khokl2.cs@gmail.com	Add team # to end of Cloud 9 password
khokl3	khokl3.cs@gmail.com	Add team # to end of Cloud 9 password
khokl4	khokl4.cs@gmail.com	Add team # to end of Cloud 9 password
khokl5	khokl5.cs@gmail.com	Add team # to end of Cloud 9 password
khokl6	khokl6.cs@gmail.com	Add team # to end of Cloud 9 password
khokl7	khokl7.cs@gmail.com	Add team # to end of Cloud 9 password
khokl_intern	khokl.intern@gmail.com	Add team # to end of Cloud 9 password
khokl_mentor	khokl.mentor@gmail.com	Add team # to end of Cloud 9 password

Student A can perform Tasks #1 at the same time that Student B performs Task #2.

Task #1: Create Photosynths from Image files

Follow these steps to begin creating photosynths from your JPG image files:

1. In Google Chrome, enter **gmail.com** as the URL address.
2. Login to your Gmail account.
3. Go to your **My Drive** on Google Drive.
4. Right-click on the **img** folder and Download the folder to your computer.
5. A zipfile of the **img** folder will be downloaded to your **Downloads** folder.
6. Open a file manager window and find the zipfile in your **Downloads** folder.
7. Right-click on the zipfile and select **Extract All** from the menu.
8. The files will be extracted to a folder with the same name as the zipfile.
9. Find the **JPG** files in the extracted folder.
10. Select the 10 or more JPG files to use to create the Photosynth for a Waypoint.
11. Go to the website: <http://www.photosynth.net>
12. Login to your Photosynth account and press the Create button.
13. Drag & drop the **JPG** files from the **extracted** folder to the Photosynth webpage.
14. Press **next**.
15. Select the **Walk** synth type. Press **next**.
16. Add a title. Select unlisted. Press **next**.
17. Don't save the synth's location. Press **finish**.
18. View the synth in your library.
19. Repeat steps 10 – 17 to create a synth for each Waypoint.
20. When you've completed this task, continue on with the next task.

Task #2: Create Panoramas from Image files

Follow these steps to begin creating panoramas from your JPG image files:

1. In Google Chrome, enter **gmail.com** as the URL address.
2. Login to your Gmail account.
3. Go to your **My Drive** on Google Drive.
4. Right-click on the **img** folder and Download the folder to your computer.
5. A zipfile of the **img** folder will be downloaded to your **Downloads** folder.
6. Open a file manager window and find the zipfile in your **Downloads** folder.
7. Right-click on the zipfile and select **Extract All** from the menu.
8. The files will be extracted to a folder with the same name as the zipfile.
9. Find the **JPG** files in the extracted folder.
10. Select the 10 or more JPG files to use to create the Panorama for a Waypoint.
11. Go to the website: <http://www.photosynth.net>

12. Login to your Photosynth account and press the Create button.
13. Drag & drop the **JPG** files from the **extracted** folder to the Photosynth webpage.
14. Press **next**.
15. Select the **Panorama** synth type. Press **next**.
16. Add a title. Select unlisted. Press **next**.
17. Don't save the panorama's location. Press **finish**.
18. View the panorama in your library.
19. Repeat steps 10 – 17 to create a panorama for each Waypoint.
20. When you've completed this task, continue on with the next task.

Exercise #6: Tie it all together

Task #1: Restructure the Waypoints CSV file

In this task, you will modify the structure & content of the Waypoints CSV file in order to relate waypoints to panoramas, photosynths, and/or videos.

Use Microsoft Excel to make the following changes to the **day3waypoints.csv** file:

1. Open a file manager window and find the **F:\day3data** folder.
2. Double-click on the **day3waypoints.csv** file to open it in Microsoft Excel.
3. Change the column heading from **type** to **id**.
4. Replace the **W**'s in the **id** column with sequential numbers, starting at 1.
5. Insert a new column after the **id** column with the heading: **source**
6. Set the values in the **source** column to: KHOKL CS Students 2015
7. Change the column heading from **altitude (ft)** to **altitude**.
8. Insert a new column after the **altitude** column with the heading: **units**
9. Set the values in the **units** column to: ft
10. Change the column heading from **sym** to **icon**.
11. Change the column heading from **name** to **location**.
12. Change the column heading from **desc** to **description**.
13. Add a new column at the end with the heading: **synthURL**
14. Add a new column at the end with the heading: **panoURL**
15. Save your changes and close Excel.
16. When you've completed this task, continue on with the next task.

Task #2: Upload Waypoints CSV file to Cloud 9 and Test

In this task, you will upload the Waypoints CSV file to the **day3/data** folder in your Cloud 9 workspace. Then you will verify that your dataset, i.e. waypoints, panorama, & photosynths, are viewable in the Google Maps webpage.

Perform the following steps to complete this task:

1. Login to your Cloud 9 account and open the **day3** folder.
2. Select the **data** folder and then **File > Upload Local Files... > Select files**
3. Select the **day3waypoints.csv** file in the **F:\ day3data** folder a press **Open**.
4. Press **Close**.
5. Open the **demo.html** file in the **day3** folder and preview.
6. Hover over **Hawaii** button and select **UHMC Waypoints**.
7. Verify that 10 waypoints and summary info. are displayed on the UHMC map.
8. Click on a waypoint. Verify that waypoint info., panorama, and Photosynth are displayed.
9. Click on the panorama & Photosynth to view.

Task #3: Share your Waypoints CSV file with others

Share your great work with other students in the class.

1. Use the Gmail accounts provided to you to e-mail your **day3waypoints.csv** file to all the other teams in the class.
2. As you receive another team's **day3waypoints.csv** file, add their data to the end of your data. When you've finished adding data from all the teams, you should have a total of 50 waypoints in your **day3waypoints.csv** file.
3. Delete the old **day3waypoints.csv** file in the **day3/data** folder in Cloud 9.
4. Upload the new **day3waypoints.csv** file (with 50 waypoints) to the **day3/data** folder in Cloud 9.