TEXAS A&M UNIVERSITY

Lab Exercise

GEOG 232 Lab 4

Satellite imagery interpretation with Google Earth

This lab was developed by Dr. Andrew Klein and Mr. Songgong Gu

Deliverables: What should be submitted to eCampus

PDF Containing:

1. Answers to all questions, including screenshots

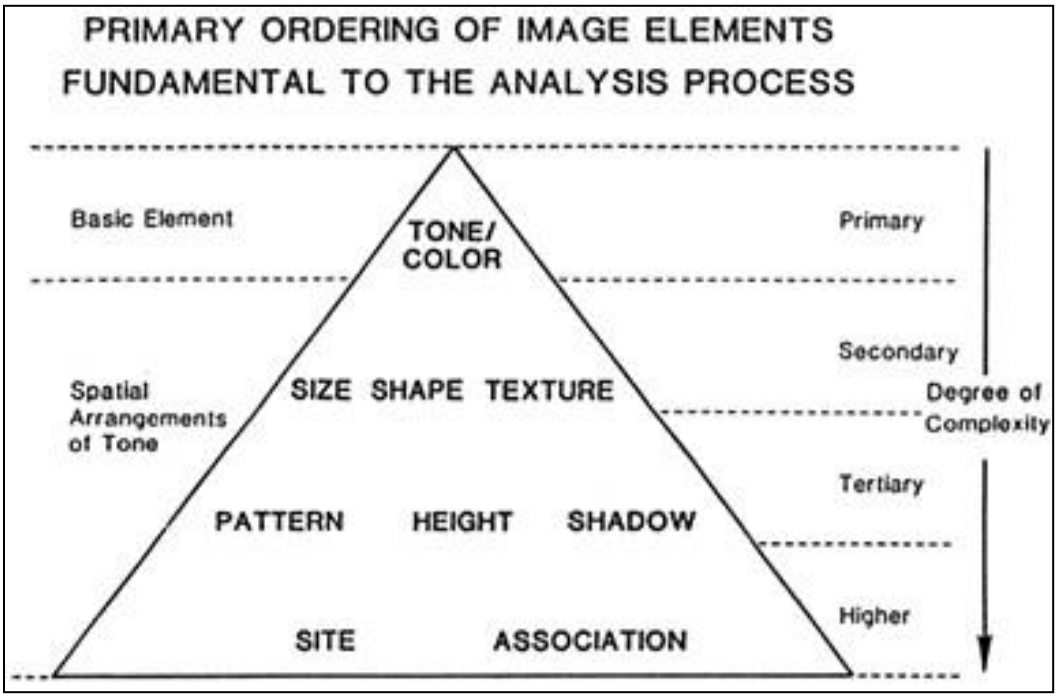
Introduction

In a geospatial context, image interpretation can be defined as the act of examining aerial photographs or satellite imagery for the purpose of identifying objects and judging their significance. This sort of image interpretation has been undertaken since the first aerial photograph was acquired from a balloon more than a century ago. Image interpretation is employed in many disparate fields and for many different applications ranging from military intelligence gathering, to mapping soils, to determining wildlife populations. While the tools, techniques and understanding employed in the remote sensing image interpretation realm have improved over the years, it fundamentally remains an acquired human visual skill.

Google Earth allows the general population to engage in image interpretation at multiple spatial scales. The purpose of this lab to improve your image interpretation skills by identifying features in the landscape through the use of the fundamental elements of photo interpretation (illustrated in Figure 1, below). This lab assumes students are versed in the basics of image interpretation that have been covered in the class lecture. Additional information on image interpretation can be found in the lecture notes section of the course website and should be referred to in describing the features under study in this lab. It is also assumed that students are familiar with the basic operation of Google Earth and can successfully navigate around the globe and save the current view to a file. At the back of the lab handout are more detailed instructions about how to adjust the vertical exaggeration and deal with placemarks, both of which will be useful in completing the lab.

Finally, the following section details the instructions required for successful completion of the lab. It is highly recommended that you read through the entire section before attempting to complete the lab.

Figure 1. Elements of Image Interpretation



http://rst.gsfc.nasa.gov/Sect10/elements_of_interp_pryamid.jpg

Lab Instructions

This lab will require the use of Google Earth Pro which should be installed in the Departmental Labs. You will note that in most cases these directions do not provide a step-by-step cookbook of how to accomplish something in Google Earth. You should learn how to navigate the Help screens and set the options correctly to accomplish what you need to do. The software interface is fairly intuitive.

This lab has four basic tasks. The first is simply to provide you with the opportunity to use some simple measurement tools in Google Earth (**Task 1**). The second is to locate and identify six landscape features from a list of topics provided (**Task 2**). You will also locate and identify one additional feature, geographic locale, or a phenomenon that is of specific interest to you (**Task 3**). Finally, you will locate and identify a process of landscape change through timelapse imagery available through Google Earth Engine (**Task 4**).

Task 1 – Make some simple measurements using Google Earth (12 points)

1. **Determine the Length (in meters) and orientation of the two main runways at Easterwood Airport (6 points)**
   a. List the coordinates of the ends of each of the three runways in Decimal Degrees and Universal Transverse Mercator Coordinates.
      a. If you do not know about Universal Transverse Mercator Projection you may wish to Google it so you provide your TA all the pertinent information.
   b. Measure the length of each of the three runways and report the length.
   c. Determine the heading of the three runways. You should consider what direction headings are typically measured from and make sure your answer makes sense.
   d. Do your answers make sense compared to the information on the runways provided by the airport (http://www.easterwoodairport.com/rwinfo.html)? Based on your observations, explain the naming conventions for the runways.
2. **Determine the area of Kyle Field (4 points)**
   a. Calculate the area of Kyle Field (in square meters and square yards) since 1955 and answer the following questions
      i. Does this represent the size of the new renovated field? What information does Google Earth provide to help you answer this question?
      ii. Is the size of the field really different in all of the images or are there some dates that the field is should be the same size, yet the calculated size appears somewhat different in Google Earth? In a few sentences, speculate on this question.
3. **Determine the distance from College Station, Texas, to McMurdo Station, Antarctica (2 points)**
   a. What is the distance between these two points?
   b. What evidence in the recent images of McMurdo Station can you provide that indicates what U.S. Governmental Agency runs the station?

Task 2 – Locate, identify and justify you selection of features in the physical, biological and human landscapes (18 points)

Remember, the world is a big place; I do not want to see people turning in the same features as I think you should be able to locate these on your own.

Listed below are a number of topics in three categories. From each category, please select the specified number of features to locate and identify. In total for this part of the lab, you will be expected to find, locate and describe six features. At most, **three** of these features can be located within the United States and **none** may be in Texas. The intent is for you to explore geographical areas and topics outside your own personal experience.

For each selected topic you select you should:

1. Identify the feature (one sentence);
2. List the latitude/longitude of the feature;
3. Create a Google Placemark at the feature's location;
4. Include a screenshot of the feature at the appropriate scale for image interpretation;
5. Interpret the image. You should correctly employ image interpretation concepts and terminology to describe the features of the landscape that enables you to correctly identify it. My expectation is that the answers will stress the higher order concepts illustrated in **Figure 1** (site, association and spatial pattern) rather than focusing on the lower order concepts (tone, shape, size). Your answer should be one substantial paragraphs of at least four sentences. Your answer can, and probably should, refer to the image you created in (4) and have included in your report.

A. Physical and Biological Features of the Landscape (6 points)

Select and describe **two** of the following:

- Glacial moraines formed by **either** alpine glaciers **or** continental ice sheets
- Karst (limestone) topography
- An ecotone (region of transition between two biological communities)
- Evidence of direct animal (non-human) modification of the landscape
- Evidence for the occurrence of a natural hazard

B. The Urban Environment (6 points)

Select and describe **two** of the following:

- Sprawling low density urban development that consumes large amounts of land to accommodate relatively few people or activities.
- Leap-frog development-urban development that occurs at some distance from the existing developed area leaving undeveloped gaps between the new and old development.
- Strip development-commercial land use that stretches out along a transportation corridor rather than clustering in a compact nodal form.
- A college campus **not** in the United States or Canada

C. Human Environment Topics (6 points)

Select and describe **two** of the following:

- Deforestation
- Human modification of the landscape to prevent soil erosion **or** evidence of recent soil erosion
- Desertification
- Evidence of direct human alteration of the coastal environment
- Evidence of the impact of human conflict

Task 3 – Locate and describe and interesting geographic location, object of phenomena (10 points)

Please locate, identify and describe an object that you have located in Google earth outside of the United States that interests you because of its appearance in Google Earth. I am looking for you to discuss some object that caused you to say…hmmm that is an interesting feature, I wonder what it could be – not because you have or wish to visit it on vacation, to go hunting/fishing there or because it was your ancestral home, etc.

For this section please follow the same directions for the write up as **Task 2**, with the exception that I would like an additional paragraph explaining why this feature is of interest to you.

Task 4 – Locate and describe and interesting process of landscape change using Google Earth Engine (10 points)

Please go to https://earthengine.google.com/timelapse/ and take a look at some of the timelapses available through the left sidebar. Then find a timelapse of your own (something NOT on the sidebar and, again, outside the United States) and follow the same directions for the write up as **Task 3**. Include the latitude and longitude of the area you viewed and specific years where change in most prominent.

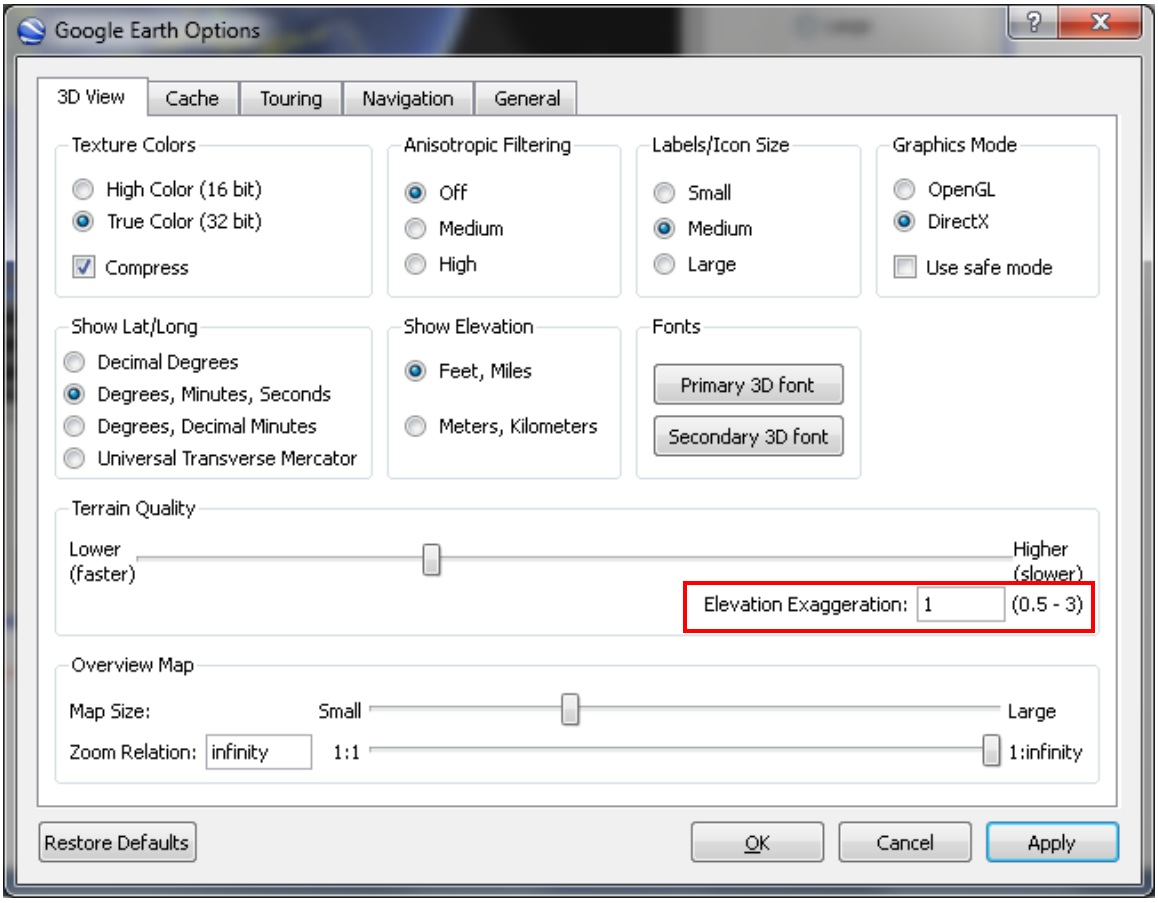
Using Google Earth

The directions on using **Google Earth** presented below were developed from Google Earth materials by Songgang Gu. They are by intent parsimonious and focus on two of the less common features of Google Earth that may be of use for this lab. It is my expectation that college students should be able to figure out how to navigate around Google Earth without much guidance. If you feel you are in need of more detailed instructions please consult the Google Earth User Guide, http://earth.google.com/intl/en/userguide/v4/.

Changing Elevation Exaggeration in Google Earth

To adjust the appearance of terrain elevation when you have terrain turned on in the 3D viewer, you can set the Elevation Exaggeration value from 0.1 to 3.0, including decimal values. The default setting for this value is 1.

1. Open Google Earth
2. Click Tools->Options



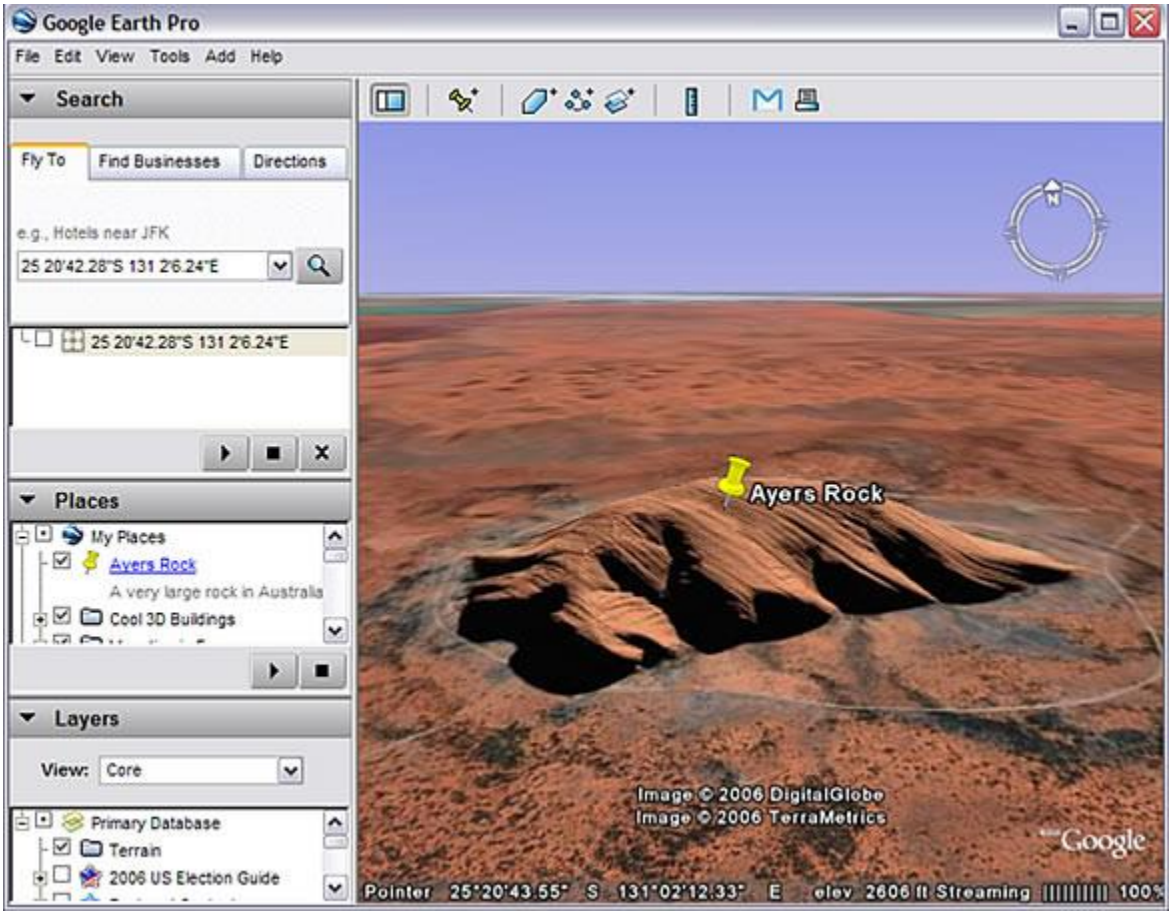
3. Change the number in the box beside Elevation Exaggeration.

Marking Locations

This section is extracted from the Google Earth User's Guide and describes the basics of marking locations within Google Earth using an example from Ayers Rock, Australia to demonstrate how to create, edit and position a placemark. More detailed information on marking locations using placemarks can be found at. http://earth.google.com/intl/en/userguide/v4/tutorials/marking_locations.html

Creating a Placemark for Ayers Rock

You can use placemarks to mark any location on the planet. Once you have created a placemark, it appears in the My Places folder in the Places panel. You can then quickly go to the marked location at any time by double clicking the placemark in the Places panel. Additionally, you can edit, move, share or delete any placemark.



To create a new placemark for Ayers Rock, Australia.

1. Go to Ayers Rock. For the purpose of this exercise, the quickest way to do this is to enter the following latitude and longitude coordinates in the Fly To field in the Search panel (see diagram above) and press enter:

25 20'42.28"S latitude and 131 2'6.24"E longitude

Google Earth should fly to Ayers Rock.

2. Click the Placemark button in the toolbar  . The New dialog box appears and a placemark icon appears in the exact center of the 3D viewer.

3. Try moving around the placemark by clicking and dragging it. You can use this method to move the placemark to any location in the 3D viewer.

4. In the New dialog box, enter the following information. Ignore the other fields for now:

    1. Name: "Ayers Rock"
    2. Description: "A very large rock in Australia."

5. Click OK. Google Earth displays your placemark in the 3D viewer and at the top of the My Places folder in the Places panel.

6. To view your placemark at any time, double click the placemark in the Places panel. To simply display the balloon description of the placemark, single click it in the 3D viewer or the Places panel.

A placemark appears in the 3D viewer only if it is checked. If you cannot see a placemark in the 3D viewer, be sure the box next to it in the Places panel is checked.

Editing Your Placemark

You can edit, move or delete any placemark that appears in the My Places folder. To edit and move the Ayers Rock placemark:

1. Right-click (CTRL click on the Mac) the Ayers Rock placemark in the 3D viewer or in the Places panel. Choose Properties. The Edit Placemark dialog box appears.

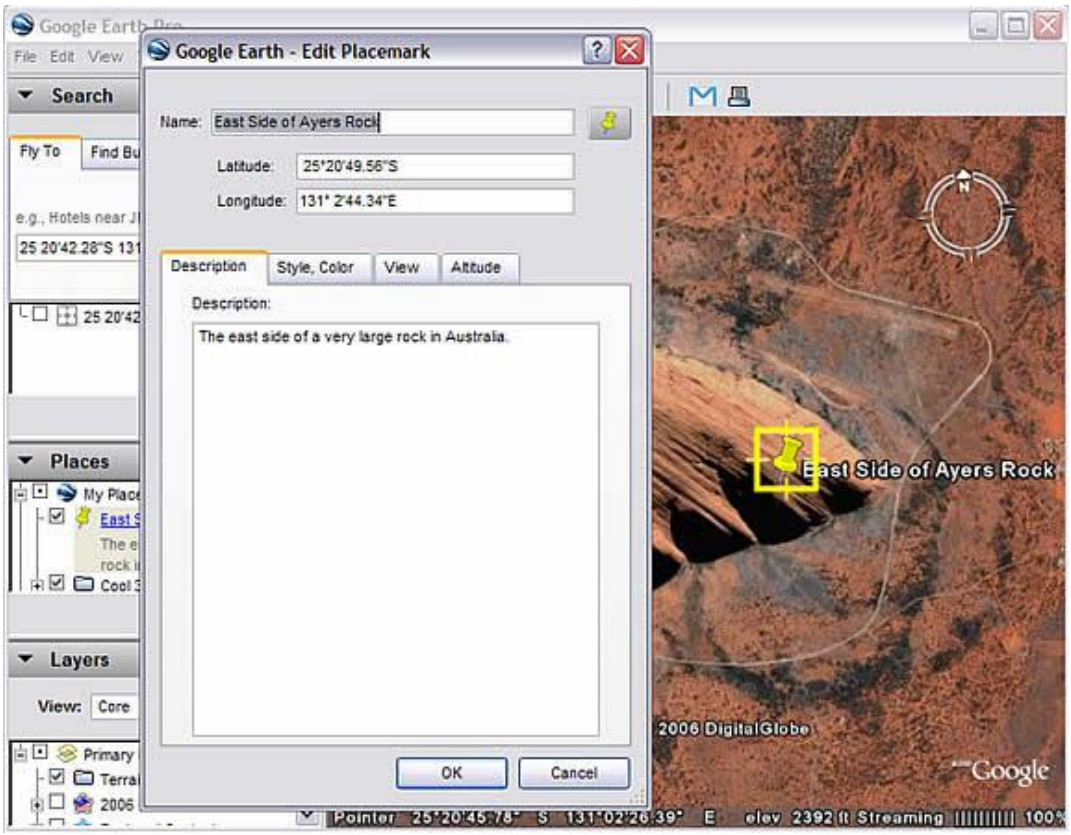
2. Click and drag the placemark icon to the east end of Ayers Rock (this means if the 3D viewer is positioned with north/up orientation, move the placemark to the right).

3. In the Edit Placemark dialog box, change the following information:

    - Name: "East Side of Ayers Rock"
    - Description: "The east side of a very large rock in Australia."

4. Click OK. Google Earth saves the new position and placement of the placemark.

5. To delete the placemark, right-click (CTRL click on the Mac) the placemark in the 3D viewer or in the Places panel and choose Delete.



You can tilt the terrain or navigate around a placemark to get just the perspective you like and then save that view so that this perspective is shown each time you visit the placemark. Simply navigate to the perspective you want and when you edit the placemark, in the Edit Placemark dialog box, click the Edit tab and click Snapshot view.

Saving placemarks in Google Earth

After you marked each location, you can save that location as a Google Earth file or a *.jpg file.

1. To save as a Google Earch file (.kmz), click File->Save->Save Place As. Give a name and choose a folder to save it. When you open this file in Google Earth next time, the image window will automatically focus to the location where you placed the mark. You can email this file to a person who can see your location with a placemark in Google Earth with convenience.
2. To save as a jpg picture, click File->Save->Save Image. You can import the save jpg image into your lab report to show your placemarks.