GEOG 482/582 | GIScience II | FALL 2015

ASSIGNMENT 2: MAPPING CAMPUS SAFETY & SECURITY

Objective: In this lab you will answer a series of questions about safety and security on the UO campus by applying spatial queries, spatial joins, and vector overlay analysis.

Learning Outcome: At the end of this lab you should be comfortable performing the following tasks:

- Collect GIS data using a handheld GPS unit.
- Use the QGIS interface to add, manipulate, and symbolize GIS data.
- Perform a basic spatial analysis.

Deliverables:

- Map of campus showing streetlights, callboxes and sidewalks

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INSTRUCTIONS

One of the major issues facing the University of Oregon is campus safety and security, and the new president wants a study done one campus safety infrastructure. Your job is to produce maps that will assist in the identification of campus locations to prioritize for additional infrastructure investments such as streetlamps and emergency call boxes, and compare your findings with location data on where campus crimes occur.

PART 1: COLLECTING FIELD DATA

To start this lab you need to collect some field data about the location of streetlamps on the UO campus. You are provided with a layer of the streetlamps on campus, but it is incomplete and you need to ground truth the location of street lamps in the west part of campus. In teams of two you will be using handheld Garmin GPS units to collect point data on the location of all campus streetlamps between 13th St, Knight Library, Kincade St. and University St.

- Once outside turn on your GPS unit. It will take a moment to calibrate to the satellites
- Before you record any waypoints, you need to make sure you are collecting data in the correct datum. In the main menu navigate to Set Up > Units. Set the datum to NAD83.

Q1: ***Why does it matter what datum your waypoints are recorded in?***

- Return to the main menu. You are now ready to mark some waypoints. Walk around, marking a point at every streetlamp. You should make a note of the number of the first last waypoints you take.

For this lab you will use QGIS to enter, analyze and present your data. QGIS is a free, open-source GIS software which provides similar functionality to ArcGIS. Because it is open-source, the code upon which QGIS is built is freely available to the public, which allows developers to improve the software and develop plugins to expand its capabilities.

- Connect your GPS unit to the computer and open QGIS.
- Before downloading the data from the GPS unit, make sure that the GPS Tools plugin is activated by going to Plugins > Manage and Install Plugins and seeing if the GPS Tools box is checked.
- In the Vector menu go to GPS > GPS Tools.
- In the Download From GPS tab download the waypoints from your Garmin GPS and save the layer as Lights_New.gpx.

In the shared folder in the course folder on the server, you will find the rest of the campus data provided.

- Add the following layers to your map:
    - Lights_Old
    - EmergencyCallBoxes
    - Streets
    - WalksLines
    - Buildings
    - ParkingAreas

Q2: *What coordinate system are the campus data layers in? What coordinate system is the GPX file you added in?*

Before you proceed, you need to save the GPS points as a shapefile and also change the coordinate system to match that of the campus data.

- Right click the Lights_New layer and select Save As.
- Save a shapefile called Lights_New and set the CRS (coordinate reference system) to that of the campus data.
- Once your shapefile has been added to the map, remove the GPS points from your map.

PART 2: MERGING, BUFFERS, AND DIFFERENCE

For this lab, your area of interest (AOI) is UO's main campus. Your maps should include the portions of campus that are north of 19th Ave., south of the Willamette River, east of Alder St. and west of Villard St.

To begin you analysis of campus safety, you want to see which areas are illuminated by streetlamps. First, you want to merge the waypoints you collected with the existing campus streetlight data (Lights_Old) to create one complete layer of streetlights.

- In the Vector menu go to Data Management Tools > Merge Shapefiles Into One
- Check Select layers in folder and browse to Your_Name/Data. Select both the Lights_New and the Lights_Old shapefiles at the same time and click Open
- Save the output shapefile in your Data folder as Lights_Merge

Note: QGIS will not close the dialogue box when the merge process is complete. Once your merged layer has been added to the map, close the dialogue box

You should now have a layer that contains both the streetlamps from the campus dataset and the points that you collected. Check the merged layer with both the old layers to make sure that the merge worked properly. If the layers don't seem to have merged, check that the Lights_New and Lights_Old layers are in the same coordinate system.

- Once you have verified that your merge worked properly, remove or turn off the Lights_New and Lights_Old layers

Now that you have a complete streetlight layer, you will create a buffer around each point to see what parts of campus are illuminated

- In the Vector menu go to Geoprocessing Tools > Buffer(s)
- Create 30ft buffers around the points in your Lights_Merge layer, making sure to dissolve the buffers.

Note: In QGIS, the buffer distance is entered in map units, which in this case are feet.

- Save your file as Lights_Buffer.
- Once your buffer layer has been added back to the map, it may help to visualize it by making it slightly transparent. Go to the Properties of the buffer layer and in Styles change the transparency to allow you to view the sidewalks and buildings around the buffers. It probably wouldn't hurt to change the color to something sensible like orange or yellow, either.

Now you should have a layer which approximates the areas illuminated by each streetlight. Next you will use this buffer layer to identify portions of sidewalk which are not covered by streetlights.

- To find the areas not illuminated by streetlights, you want to find the difference between the vector layer of the sidewalks and that of the streetlight buffers.
- In Vector > Geoprocessing Tools select Difference.
- The Difference tool takes the difference between the input vector layer and the difference vector layer, so:

  areas covered by input layer – areas covered by difference layer = output

- Use the Difference tool to generate a line layer that show the portions of sidewalk which fall outside of the streetlight buffers and save this layer as Walks_NoLight.shp.
- Add this layer to the map and check to make sure the difference process was performed correctly.

Next you will perform a similar analysis using the locations of campus emergency call boxes.

- Use the buffer and difference tools to create buffers around the emergency call boxes and identify areas of sidewalk which are not proximate to a call box.

Q3: ***What distance did you use to buffer the call boxes and why? What operations would you perform if you wanted to identify areas of sidewalk that were outside both call box and streetlight buffers?***

- Create a layer of the portions of sidewalk which are outside both the call box and streetlight buffer layers

Q4: ***What areas seem adequately covered by both streetlights and emergency call boxes? Where would you recommend the University install additional lights and call boxes?***

PART 3: ADDING CRIME REPORT DATA

As part of your analysis you want to see whether or not crimes are occurring in areas with few streetlamps or call boxes. As part of the Cleary Act, the University of Oregon is required by law to keep and report information about crime on and near campus. Cleary reports can be viewed on the UO Police Department's website: http://police.uoregon.edu/content/campus-daily-crime-log

These reports are in PDF format and so you will need to manually enter them into a table.

- Download the most recent Cleary Crime Log. This contains all the campus crime reports to date
- For this analysis, you are only interested in crimes which are classified as harassment or theft which occur on the UO main campus. So you can ignore anything located at Autzen, Spencer View Apartments, UO Riverfront or listed as Off Campus

- Enter the data from the Cleary report into a spreadsheet, making sure you have one column for the crime classification and one for the location
- We will be joining this data to our campus buildings layer, so you need to make sure that the building name you enter for the crime location is spelled and capitalized exactly as it is in the building attribute table. For example, the crime report will list the student union as "EMU" while in the buildings layer this is entered as "Erb Memorial Union"
- When you have finished entering all the incidents of theft and harassment from the crime report, save your spreadsheet as Campus_Crimes.csv

Q5: ***What are some issues you see in the available crime location data? What compromises or judgement calls do you have to make when entering data of this nature? Why do you think this is so for this particular data set?***

Now you will join your campus crime table to the building location associated with it. To do this you will need to generate centroids for the building polygons, save them using WGS84 as a coordinate system, use the field calculator to add field for the x and y coordinates of those building centroids, and then join this data to your campus crimes layer so that you can then plot the crime data using the centroid coordinates.

PART 4: VISUALIZATION AND RECOMMENDATIONS

- Create and upload four maps to your wordpress site including:
    - An overview map highlighting the campus safety concerns you identified during your analysis
    - A map of lit areas including your streetlights and buffers, highlighting the areas of sidewalk not illuminated
    - A map of emergency call boxes and buffers, highlighting areas of sidewalk not covered
    - A map of campus crime occurrences

Q6: ***What information would make your report more complete? Can you think of any other data that might be important to include that you did not or were unable to? Include a discussion of the shortcomings of using buffers alone to identify areas of concern.***

GRADING

You will be graded based on the following criteria:

• Overview Map showing key campus safety concerns	**6 POINTS**
• 3 maps showing lit areas, callboxes, and crime occurrence	**9 POINTS**
• Answers to questions and write up of findings	**10 POINTS**
• Presentation of your work in WordPress	**5 POINTS**
TOTAL	**30 POINTS**

DUE DATE:

Monday Lab: October 19th 10am

Tuesday Lab: October 20th 10am

*Late submissions will be penalized 5% per day.

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