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GEOG 491 Advanced GIS: Python  
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# ArcPy/Python Final Writeup

## **illumcloud analysis script - gatherlux**

My final project ties into an app I have been working on for the last two terms. Designed as part of the course Citizen Science and Geosensor Networks, and further developed into a prototype for Location Aware Systems, I hoped to write the script which allow me to analyse the data.

illumcloud is a citizen science app to crowdsource the mapping of illuminance data for use in well-lit and shaded path analyses and to aid in other analyses which could benefit from illuminance data such as solar panel efficiency and light pollution surveys. illumcloud is now prototyped and part of this lab uses the live recorded data.

The app uses the ambient light sensor along with gps geolocation to make a list of points with attached timestamps. After recording is stopped, the data points are collected and can be exported as a text file to be used in analysis.

### **Script Purpose and Method**

The initial script gatherLux.py took a folder of smartphone collected gps log data I had collected ahead of time stored in .csv format, and placed all of the records into a list data structure which held more lists which represented points. Then, simulated illuminance (lux) values as a new field by looping over points using a modulus operator and a short list of pseudo-normally distributed data. With the lux values added to the original csv files, I then used arcpy cursors to iterate through the list of lists to convert the data into shapefiles. Finally, I was able to perform an Inverse Distance Weighted interpolation from the Spatial Analyst extension to find the likely values of points between.

After getting my app to a place where I could export data, I spent some time recording values around campus, getting a large amount minimally covered and focusing on a few areas to obtain more meaningful data. From there, I created another script gatherLux\_LIVE.py which takes csv files from a different folder and prepares them for analysis, putting them into a shapefile. I also made a third script gatherLux\_DAY which specifically uses a folder of daytime values.

I had originally wanted to handle time within the script, but I had trouble working with date and time, as shapefiles can not handle the full length datetime object. Initially I had wanted to create a geodatabase, but settled on splitting date and time into separate fields and keeping it a shapefile due to time constraints with my other project.

While I was able to perform the IDW on the simulated data, the live data returned errors I was unable to work through, stating the filename or cell size was invalid. I suspect this is due to

the nature of how my data is collected, in that the distance between points varied greatly as it was purely plotted on a time interval.

### **Future Improvements**

The script(s) could be improved greatly by converting into a geodatabase, so that the datetime object can retain its awareness properties such as timezone. Additionally, changing how my program plots data by ensuring a minimum difference in records can help give some regularity to the distribution of the collected points, which may make applying the IDW more successful.

### **Script Testing Procedures and File Structures**

To test my scripts, simply open and run them using a python interpreter. You can change the “outshp/liveshp/dayshp” names to have custom file addresses. However, if left alone the names will come up as luxPoints\_SIM, luxPoints\_LIVE\_N, luxPoints\_LIVE\_D.

The file structure is as follows: **bold necessary for script**

**R:\\Geog491\_5\\Student\_Data\\tlessman\\Labs\\IllumiCloud\\**

\\bk - holds backed up items and other misc

**\\DayPaths** - source folder holding daytime live csv data

**{all csv files}**

**\\DayPoints** - target folder for placing daytime live shapefile data

**\\DayResults** - place to put analysis results from daytime data

**\\LivePaths** - source folder holding nighttime live csv data

**{all csv files}**

**\\LivePoints** - target folder for placing nighttime live shapefile data

**\\LiveResults** - place to put analysis results from nighttime data

**\\Paths** - source folder holding simulated live csv data

**{all csv files}**

**\\Points** - target folder for placing simulated live shapefile data

**\\Points.old** - more backup files of points

**\\Results** - place to put analysis results from simulated data

**\\Visualization** - holds images created for final presentation for Location Aware Systems

csv\_format.txt - note for structure of gps logger data

**gatherLux.py** - main script for simulated data

**gatherLux\_DAY.py** - script for daytime live data

**gatherLux\_LIVE.py** - script for nighttime live data

Illumicloud.mxd - ArcMap file to explore results

Illumicloud.sxd - ArcScene file to explore results