BSEN 5220 lab 4

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BIOSYSTEMS ENGINEERING

*The GeoXT system configuration files are explored while creating and uploading data dictionaries to collect information for point, line and area features. The data is then merged into aerial photographs and background images within PathFinder Office. This will allow students to explore the GeoXT system as well as visually represent their data on a photographic map.*

*The USGS topographic map is downloaded and over-layed with the GPS data to create a digital photograph including both aspects. The GPS data is exported into an Arc View shape file for future use.*

**INTRODUCTION**

PART A

This lab allows students to explore the powerful tool of data dictionary. This tool allows users to personalize spatial data in maps as a point, line and area features. In the data dictionary, a user can define the feature that they are mapping and assign attributes that provide more information about that specific feature. Our team’s objective this week was to learn to create and upload data dictionaries and GeoXT system configuration files. We also were to collect two position information for a point, line and an area feature. After the data was collected, we learned how to use background images in PathFinder office.

We were divided into the same groups as the previous week, and then mapped various features around campus using the data dictionary that we created. We were required to create 2 point features, 2 line features and 2 area features. Our point features were trashcans and storm drains, with two attributes either. The trashcan’s attribute was whether it was recyclable or not, and the storm drains was whether it had been painted or not. The two line features that we used were single blocks of crosswalks, with the attribute of chain handrails or not, and crosswalks, with the attribute of whether they were painted or not. Our area features included trees, with the attribute of being oak or not, and parking lots, with the attribute of being an A zone or not.

Once the data dictionary was created, each group used a GeoXT configuration file to store the configuration settings for the GPS receiver. The data dictionary and configuration file was then uploaded to the receivers and were taken outside of Corely to map the features. The groups then reconvened in the computer lab in Corely to download the data before leaving lab for the day.

PART B

Once the field data is collected and differentially corrected it is often beneficial to overlay the data on a topographic map or digital aerial photograph so that you are able to verify the data positions and see the data on a large scale. An environmental engineering firm would use this same technique if they were designing aspects such as a sedimentation retention basin for a concrete company. The engineer would be able to collect the position data with the GPS to determine the location of a wastewater outlet to overlay the position on a USGS topographic map.

Another point that will be covered is how to export GPS data out of PathFinder Office. PathFinder Office has limited capabilities regarding the creation of maps and to manipulate data. PathFinder Office exports GPS data into a format that will allow them to manipulate the data into the exact form that is required. Common export files include ASCII files, .DXF files and shape files that can be read from spreadsheets, CAD, and ArcGIS.

**PROCEDURE**

**PART A**

Creating a Data Dictionary

1. Open PathFinder Office and create a new project file to store on an external hard-drive. Find the Utilities on the menu bar and click on it. Select Data dictionary editor and open the window. Name it and then enter the new features.
2. Under the properties tab, you can name the feature, classify it as a point, line or polygon. Under the default settings tab, you can specify the logging intervals, minimum number of positions and accuracy. The following settings were used: for point features- 1 sec, 90 min. positions, for line features- 3 second, for area features- 3 seconds. All three features should have Code accuracy.
3. Every feature must have some means of entering the GPS unit operator. This may be accomplished via menu or text input. After you have created your data dictionary, click save and close.

GeoXT Configuration Manager

1. Find Utilities on the menu bar and select Other, then highlight Configuration Manager. A configuration manager window should appear. Under file on the menu, select New and enter a name on the Configuration Name text box.
2. Go to File and Save to an external hard-drive. Make sure that the configuration file is saved before you exit!

Data Collection

1. In the computer lab, attach the computer to the GeoXT using a serial clip and the computers COM port. Open PathFinder Office and turn on the GeoXT. Select the project file that contains your data dictionary and system configuration file.
2. Under the Utilities tab in the menu bar, select Data Transfer. Click on the “send” tab and click “add” to select files to send to the GeoXT. Select the data dictionary, which will bring up a new window that will allow you to select the data dictionary you created earlier. Once you have selected the file, click “open.”
3. Click the “add” button again and select Configuration. Select the configuration file that you created earlier and click “open.” The data dictionary and configuration files should be listed in the white box in the middle of the data transfer window. Press “Transfer All” and close the PathFinder Office after the upload is complete.
4. It is now time to collect data with the data dictionary. Press the “SYS” key on the GeoXT and highlight the data dictionary and press enter. Make sure the data dictionary you just uploaded is the active data dictionary, and check the configurations as well.

Collect Data

1. Once outside, press “Data” on GeoXt and select a new rover file. The next window will have a list of all the features you defined in your data dictionary. Simply select the feature you want to map and press enter.
2. Fill out the attributes you defined for the feature and press close to end data collection when you are done.
3. Once you have collected enough data, return to the Corely lab and download the data to the PC computer.

**PART B**

Downloading USGS Topographic Map and Aerial Photograph (DOQQ) for Alabama

1. Open internet explorer to <http://www.gsa.state.al.us>
2. Click on “Download Topographic Maps and Digital Data.” Click the download 1:24,000 zip file. The state of Alabama should be broken up into 20 cells and pick the cell with Auburn.
3. Now see a closer region of Alabama, that includes Opelika, Ashland, and Anniston. Click on the cell representing Opelika and download the file called “032085E4.ZIP.”
4. Download an aerial photograph from Canvas and unzip the file. Save these files to your external hard-drive.

Loading a Digital Aerial Photograph

1. Open the Corrected GPS files from last week. Change the coordinate system under Options on the menu bar so that the data is in UTM and 16 NORTH zone and

NAD 1983 Conus.

1. Load the background file into the file. At the bottom of the window there is a list called “coordinate system of selected files.” Once the coordinate system is correct, click the OK button in the upper right corner of the “Load Background Files” window. An aerial photograph should appear behind the GPS data.
2. Zoom in on the photograph and use the ruler tool to determine how well the GPS data and aerial photograph line up.

Loading the Digital Topographic Map

1. Turn the digital photograph off. Click on File and select Background. Now click on the box to the left of the file name. This should cause the black check mark to disappear. Now click Ok so the “Load Background File” window will go away. The coordinate system should be changed to UTM, 16 North and NAD 1927 Eastern US settings.
2. Now download the background file and load into the window. Add the topographic map file 032085E4.tif.
3. Click the file name for the topographic map and highlight the name. Select “coordinate system of selected files.” Once the coordinate system is correct, make sure the only item with the visible check mark is the topographic map. Load the background files and the topographic map should appear behind the GPS data collected last week.

Exporting files into ArcGIS

1. Click on Utilities on the menu bar and select “Export.” Select the files from last Wednesday’s lab and export them into the window. Once you have acquired the GPS data that will be exported, select the output folder by clicking on a second “Browse” button located in the middle of the Export Window.
2. Choose the export format under “Choose Export Setup” and highlight the sample ArcView Shapefile Setup. Click on properties and export. By clicking the tabs, you can specify which export files are designated.
3. Once the setup properties have been entered click “OK.” The export window will begin the process.

**RESULTS**

1. The printout of the data dictionary is attached in the appendix.
2. The plot of all data that was collected on Wednesday, including a legend is attached in the appendix. The legend distinguishes the difference between our point, line, and area features. The asterisks beside the features indicate a “yes” attribute, for that particular feature.
3. The summary of all features mapped is also attached in the appendix.
4. The aerial photograph file was too large to import into PathFinder Office, so we were unable to complete this process. We attempted to download these files offline, but PathFinder Office continued to crash every time.
5. The data collected last Wednesday overlaid on the topographic map is attached in the appendix.
6. Overall, this lab was a success. Our team was able to distinguish the differences between point, line, and area features. These are indicated by the legend on the bottom right corner of the Map #2. Due to our past labs, we were also able to set up the GeoXT quickly and efficiently and were able to collect data much easier than the first lab. We also realized we were quicker and more comfortable importing our data to the computer in the lab. We didn’t take as long to understand PathFinder Office and how to work it. We eere able to understand how we collected our data and how to decipher the differences of the points, lines and areas that we collected on PathFinder Office.

We did have a few failures. We were not able to tell the differences between the “yes” and “no” attributes on the plotted data points within PathFinder Office. We were able to distinguish them by going into the feature properties, but we could not figure out a way to make the “yes” features more distinct than the “no” features. We also had trouble getting the aerial photograph on PathFinder Office. The file we downloaded from canvas was too large, so every time that we opened the file it wouldn’t display on our computer. We also attempted to download them from the Internet, but our computers crashed every time due to PathFinder Office freezing and not responding. We also had to maneuver our topographic map around in order to grasp where our data was related to the rest of Auburn. The map automatically zoomed out, so it took us a little while to find our data and then zoom in to print.

**CONCLUSION**

Our data dictionary yielded us with two point features, two line features and two area features. Our point features were trashcans, with the attribute of being recyclable or not, and storm drains, with the attribute of whether they were painted or not. There were three data points collected of each of these, totaling two “yes” attributes (indicating they were recyclable) for trash and one “yes” attribute for storm drains being painted. We also retrieved two line features; a block of sidewalk, with the attribute of having a chain handrail or not, and a crosswalk, with the attribute of having painted lines or not. We resulted in having two chained blocks of sidewalks, and two crosswalks that were painted. Our last data collections were area features. We had a parking lot, with the attribute of being an A Zone or not, and trees, with the attribute of being oak or not. We collected two A Zone parking lots and one oak tree.

It was interesting plotting this information and exploring PathFinder Office to visualize our data. We were able to plot our data into a map (Map 1), which only showed us the difference in distance between features, and not any relevance to landmarks. By adding a topographic map to the data, we were able to transform our data points into landmarks. We were able to distinguish the area that the features were located, shown on the topographic map in the appendix. The exact location was a little different than topographic map indicated. We believe this was taken into account by the buildings being so close. When we took our readings, we did have at least three satellites but were surrounded by concrete and brick buildings, and that could have had a small impact to create error in our data.

Overall, This week’s lab was a success. We were able to efficiently collect various feature data using a data dictionary, and distinguish the differences of attributes within those features within PathFinder Office.