GPS Mapping Project of Mountain View Plaza

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Abstract
In compiling this presentation, I separated it into several different themes. Obviously I would start off with an intro and this just introduced the project and defining what my purpose was in giving this presentation. It then went into an overview of the project. In this section I gave the location and size of my project along with maps to give a better understanding of where it was, general description of Mountain View Plaza, and pictures of each of the stores to give a better understanding of what types of businesses are located within. After this I briefly mentioned the key figures that were influential in the construction of Mountain View Plaza, from the owners, contractors, and the engineers. I then flowed into the construction layout portion of my project, showing the plaza in a type of ground up construction phase format. Then I went onto describing multipath error, showing examples of it, and showing the comparisons between different readings along with comparing the accuracy of the GeoExplorerIII. I completed the presentation with telling why I chose the project, mistakes I had while working on it, and giving credit where credit was due.

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Introduction
I chose to do my GPS mapping project on Mountain View Plaza including within it the pertinent features that make up this development. My purpose in choosing this site is, to promote public awareness, to test the accuracy of the GeoExplorer III, and to compile my map data with my business associate, Mr. Nelson's data, to illustrate the buildings, features, and major services of Mountain View Plaza.

Methods and Materials
Location: Mountain View Plaza is positioned North of FVCC in the NW ¼ Sec.31, T29N, R21W. More specifically located at the corner of US Highway 93 and West Reserve, directly East of Ole’s Conoco Gas Station.

Size: The Mountain View Plaza encompasses a gross area of 59.075 acres. 49.764 acres contains the building lots and the remaining 9.311 acres is made up of two common area tracts, which contains a detention pond for the holding of storm water runoff.

Time Frame: The planning process, consisting of talking to contractors and engineers, and obtaining the information, which consisted of about 1 week. Data collection with the GPS unit was drawn out over a 2-week period.

Equipment used/accuracy level: While out in the field gathering data, I used the Geo-Explorer III with an accuracy rating of 2-5 meters, along with a pin finder to aid in the location of property corners. I was also gracious enough to be given a plat by the engineering firm TD&H, and a site map from the head contractor which included some helpful building dimensions in which I used as a comparison tool.

Computer Programs: While in the lab I made use of Pathfinder Office 2.90 for the purpose of creating my data-dictionary, uploading and downloading my data, differential correction in conjunction with the internet, and many other options that I will touch on later in the report. I was able to use a variety of computer programs to present some flavor to the project, and to make data correction on the screen a lot easier. AutoCad 2000lt was my choice for correcting multipath lines, to add lines where need be, as well as ultimately producing my final map. Being it is such a slick drawing program I preferred it for drawing purposes, and then moved into ArcView 3.3 for image support. Within ArcView, it gave me the ability to overlay my AutoCad drawing onto a Digital Orthophoto (DOQ) to give it a birds eye view, as well as transposing the cad drawing onto a USGS Quad Map to give a better representation of the lay of the land as well as adding contour lines to the drawing.

Base Station: ftp://www.co.missoula.mt.us/CBS%20Data/Index.htm is the USFS site that I used for the purpose of differentially correcting my gathered data. I found that it was always working when I needed it, and never had any problems with the site.

Equipment Information:
Trimble Geo-Explorer III: Handheld Global Positioning System (GPS) unit that I used to gather data of the Mountain View Plaza. Accuracy of 3-5 meters.
Gathering Data: Getting an actual (x,y coordinate, a.k.a. latitude and longitude) position of building corners, roads, sidewalks, parking lots, property corners, lights, signs, concrete islands, concrete planters, etc.

Multipath Error: Reflected signals from surfaces near the receiver, resulting in jagged, zig-zag lines on the drawing. These signals could be from cars, buildings, heating units, anything-metal etc. No Good

AutoCad: extensive computer drawing program with many capabilities.

ArcView: A computer program that has the ability to overlay GPS data with different types of images, be it a USGS topographic map, an orthophoto or even take a auto cad drawing like I did, and see it depicted in a different image like ArcView. You would not want to use this as a drawing tool though, especially if you have a lot of multipath and it is a large drawing.

Base Station: This is a location that has a continually running satellite receiver and is constantly computing corrections for each satellite signal that is being used. In what is called the post process phase of the data gathering, we use these base stations by locating them via Internet. These base stations include time files for each hour and you can select the time that you were gathering the data, download that file into your folder, and then retrieve that file(s) during this post processing stage. The reason for this is to remove common errors that occur while collecting data such as error in the satellite signal coming through the atmosphere, common blunders in the system and so forth. However, this will not eliminate your multipath error so you have to go onto your drawing and correct it manually.

Mission Planning: In conducting this project, I separated it into several different segments: extensive planning, data collection, data processing/correction, and the overall presentation. The planning stage consisted of gathering a variety of information so I would know what I needed to include in my data dictionary along with trying to arrange how I would go about mapping such a large area. This consisted of taking pictures of the site, driving around the plaza and just noting certain features that would be included, along with trying to organize a way to accomplish such a large task. One of the main points of my presentation would be comparing data that was collected on the ground as opposed to the data that I collected on top of the buildings. In order to be able to collect this information I had to initially get the clearance from the contractor or the business owners. To go along with the comparison of roof and ground data, I also wanted to compare the accuracy of the GeoExplorer IIII by locating property corners and comparing the found distance to the record distance. To be able to do this I had to talk with the engineers @ TD&H. and obtain a plat of the project which had the pertinent information that I needed. To clarify some information about the owners and business operations, I talked to the gentleman in charge of sales and leasing, Mr. Scott Strellnauer and he was able to supply me with the information that I needed. Once I felt that I had the information that was necessary, I then went back to the school and compiled what I had gathered and came up with what I thought to be a concise data dictionary. I will elaborate on this later in the report.

Prior to data collection I went into Pathfinder Office and selected the quick plan option. This allowed me to check for optimal times in which I should go out and collect the information. Quick plan is comprised of different graphs such as, # of satellites at specified times, a skyplot to see which satellites are up at specified times, HDOP, VDOP, PDOP, to see the different
precision ratings for horizontal and vertical accuracy, as well as other features to see when the best time for collecting data would be.
SKYPLOT

Elevation in Degrees of Satellites
## Data Dictionary

<table>
<thead>
<tr>
<th>Feature</th>
<th>Classification</th>
<th>Attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Corner</td>
<td>Point</td>
<td>Name Of</td>
</tr>
<tr>
<td>Building Perimeter</td>
<td>Area</td>
<td>Name Of</td>
</tr>
<tr>
<td>Building Pad</td>
<td>Area</td>
<td>Surface</td>
</tr>
<tr>
<td>Fence</td>
<td>Line</td>
<td>Type</td>
</tr>
<tr>
<td>Landscape Planter</td>
<td>Point</td>
<td>Type</td>
</tr>
<tr>
<td>Lights</td>
<td>Point</td>
<td>Type</td>
</tr>
<tr>
<td>Parking Spaces</td>
<td>Line</td>
<td>Type</td>
</tr>
<tr>
<td>Property Corn.</td>
<td>Point</td>
<td>Description</td>
</tr>
<tr>
<td>Roads</td>
<td>Line</td>
<td>Name</td>
</tr>
<tr>
<td>Sidewalk</td>
<td>Line</td>
<td>Width</td>
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<tr>
<td>Signs</td>
<td>Point</td>
<td>Type</td>
</tr>
<tr>
<td>Misc.</td>
<td>Point</td>
<td>Other</td>
</tr>
<tr>
<td>Misc.</td>
<td>Line</td>
<td>Other</td>
</tr>
<tr>
<td>Misc.</td>
<td>Area</td>
<td>Other</td>
</tr>
<tr>
<td>Island</td>
<td>Line</td>
<td>Type</td>
</tr>
</tbody>
</table>

**Data Dictionary:** Used inside the GPS unit as a method of storing and organizing data. For ex. if you wanted to locate a tree as well as denoting its species, in the data dictionary you would have what is called a “Feature.” This feature can be a point, line, or an area. For a tree, it would most commonly be located as a point feature with “tree” being the feature. Then you would have what is referred to as an attribute associated with it. This just breaks the classification down a bit further. So our attribute will be “type,” and then you would classify the different types of species. So therefore you can classify your trees, and get a better understanding of just what all is out there, as well as having a systematic way of classification.

### Results and Discussion
Problems: While out working on my project, one of the problems that I encountered was not being able to obtain satellite signal when being up close to the buildings. Since the buildings were so tall it prohibited the signal from getting to the receiver. In order to cure this problem, I used the offset command to be able to get out from the building so I could receive signal. Another one of the problems that I encountered was with the area line type. I made my parking lot feature an area, which wasn't bad, but I wish that I had an edge of asphalt line feature included in the data dictionary. The reason I say this is because if you don't complete the area command then it will draw a stray line connecting back where you started from, and sometimes I just needed to pickup a little section of payment, so like I said, it would have been nice to have that command. Something else that I had trouble with was getting access on top of the buildings that I wanted to use for my comparison. So to alleviate this problem I just used the buildings that I was able to get clearance for and compared what I could which turned out to be just suffice. The only other thing that I can that hindered my process was not being able to bring my Autocad drawing into ArcView on the computers in the lab. So I received the assistance of Dr. Bob, and he was able to go onto his personal computer and pull it up just fine (of course) then install ArcView on the GIS computer where I was finally able to bring it in with the Cad Reader extension on. Other than these few glitches in the system, I felt that for the most part everything else went pretty smoothly.
UNCORRECTED MAP
Additional Tables: The only other pictures that I have in which I have not turned in are the ones showing the construction phase of the project. Other than these pictures everything else has been included.

Conclusion and Recommendation: I plan on giving the general contractor of Mountain View Plaza a copy of the map in which I have compiled and I am sure that he could use it as a rough estimate of how things look and use it just for a general purpose. At this time I would like to go ahead and say thanks to all that helped in this project for providing me with insight and information to make this project in what I feel was a success. Thank You.
As for any recommendations, I believe my main one would be that this class should count for more than a weak 2 credits. It is astounding that for the amount of work you put into a class like this you only come out with 2 credits, especially since the GIS class counts for 4. Other than that, I would just say from the beginning of the semester get the ball a rolling and start thinking of what someone would like to do, and as I have heard a few times, KEEP IT SIMPLE. Such a large project takes up a lot of time and definitely eats into other classes. Other than these few opinions, I would say make it fun and do something that you would have interest in doing, along with doing the best job that you can because it definitely reflects once you are up giving the presentation. Thanks