Monticello Road Photography Project: A Spatial Analysis

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Abstract

This project examines the spatial distribution of images from the Monticello Road photography project and their relationship to the surrounding landscape. A representative sample of images are geolocated and analyzed based on proximity to landmarks, the street and one another. Analysis shows the photos cluster around neighborhood businesses and the street itself. A second analysis studies the impact of buildings on the visibility of a nearby mountain from the neighborhood and finds significant obscuring due to the built environment.

Introduction

Monticello Road is a community arts project that celebrates the people and places along a one-mile strip through one of America's most interesting neighborhoods in Charlottesville, Virginia. These pictures provide a comprehensive and intimate view of the everyday life of a healthy community.

Photography only provides one version of the truth, filtered by where, when and how a photographer chooses to capture images. So I often receive process questions about the project, especially as pertains to what parts of the neighborhood I photograph and I how I define the boundaries of the study area.

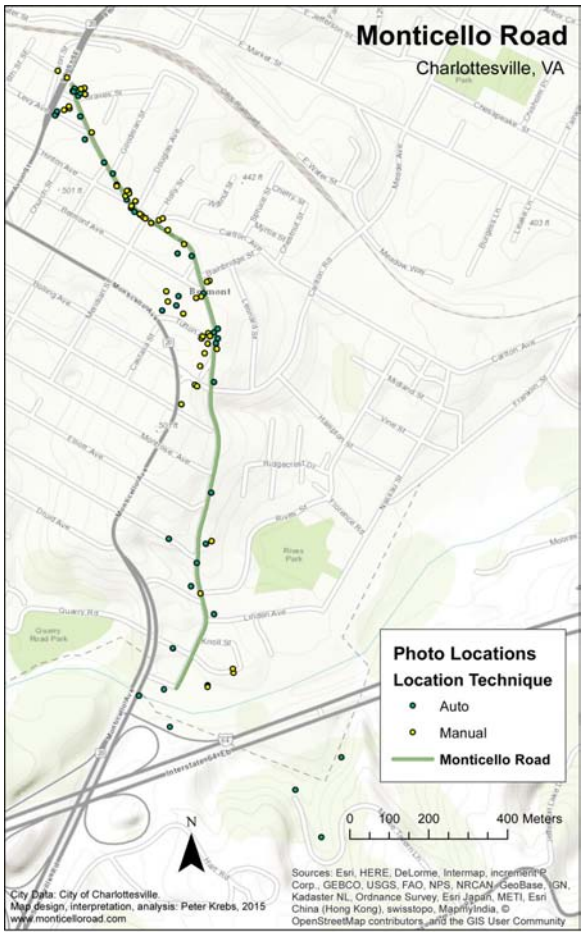
I typically answer that I consciously limit the project to the street and directly-adjacent properties and I believe that the images will be distributed throughout the length of the street—though not evenly, perhaps clustered around my home or a few places where I spend sedentary time. These responses are logical but not empirical.

Any project of this kind naturally sheds a bright light on the visual changes to a neighborhood over time. One of the pictures documents an especially picturesque landscape that has since been

significantly altered. This made me question the aggregated impact of building on the visual landscape. On a given site, it is intense and I postulate that it is also wide spread.

It was stated in class that GIS provides a check on intuition. This would be an opportunity to test my theories.

The Images



Through the life of the project, I have captured thousands of images, which would have been overwhelming. One of the features of photography is that it not particularly relevant if an image is *made*; what matters is which images are *seen*. I have a subset of selects (numbering in the low hundreds) that are used in the book and the frequent sideshows I present. That provides a further curation because it reflects both a photographer's view of what is *visually interesting* and an editor's view of what *says something* about the place. I refined my selection one more time by eliminating multiple images all taken at the same time (different people at the same party, for example). Through this process, I reduced the sample to 94 images, a highly manageable number, but enough for a meaningful analysis of a linear mile-long space.

I started with a map derived from Charlottesville's web-based GIS library. I was able to geolocate about half the images using PhotoMechanic's on-board geolocation utility. After turning the images and their metadata inside out, I have no idea why only half the images showed up on the map. Ultimately, I manually geolocated the remaining images by making a new shapefile and appended them (adding a source field so I could track their provenance).

Location Analysis

Distance from Krebs Household

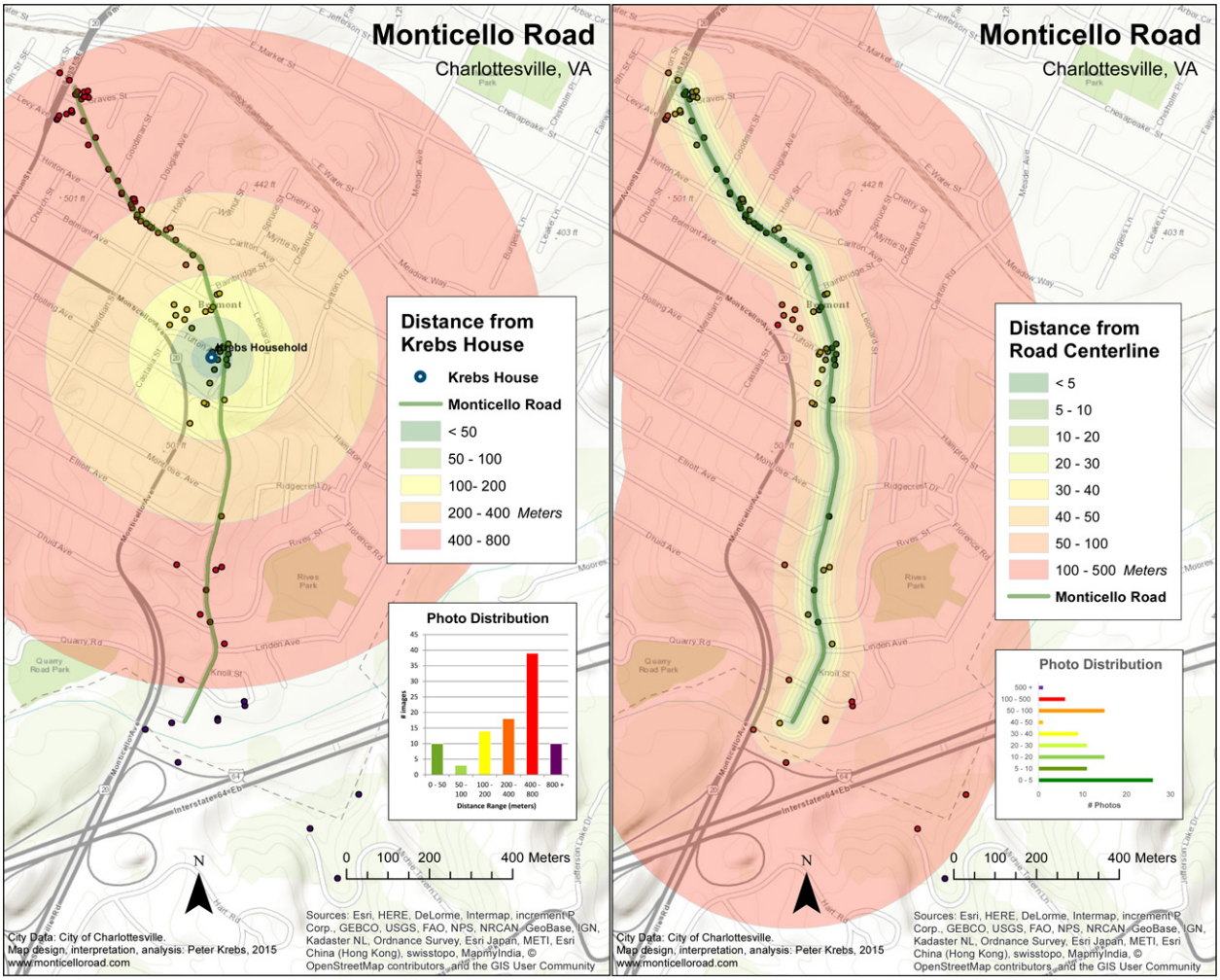
My first question was whether the fact that I live in the neighborhood influences where I choose to photograph—do they tend to cluster around my home?

I used an address locator[1] to position my home on the map. Next I made a series of concentric buffers around that point. There appears to be a small but not particularly significant bias around my house (assuming a fifty meter circle). Most of the images are at least a quarter mile away—and remember the road only extends about half a mile in either direction so that indicates some (but insignificant) clustering near the house.

Distance from Street

Next, I wanted to know how much, from a spatial perspective, the road organizes the project. Were the photos primarily taken on the street (within 5 meters of the centerline)? Sidewalk (5-10 meters)? People's yards/terraces (10-20)? Within at least a block (100 meters)?

[1] ESRI "Street_Addresses_US" via UVA Geostat drive.

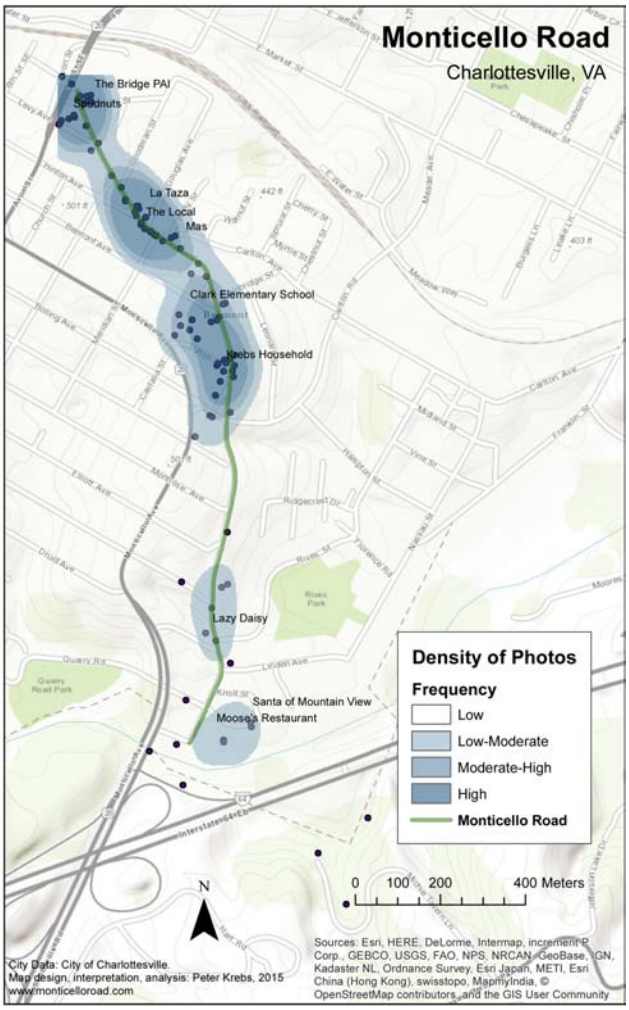


I created a new shape file by selecting the portions of Charlottesville's street centerline file with the words "Monticello" and "Road" and added concentric buffers. As is plainly visible in both the map and the chart, a strong plurality of images were captured on the street itself and a vast majority within a single block.

Density

I could see on the Ring Buffer map that there were visual clumps of images and I wanted to know what gravitational force was pulling them together. I postulated that they might be businesses or gathering places where I spend time.

I mapped several of these enterprises with the address locator. Next I ran a kernel density tool and could see that indeed the nodes do cluster around businesses that I frequent.



Going into the project I was concerned that I would pay less attention to areas south of my home because they're not on my way into town. That seemed like it might look bad because that part of the neighborhood is also less affluent. The second learning from the density analysis is that I am not particularly biased that way (I also frequent businesses to the south) but do seem more comfortable spending time in restaurants and cafes, where I can sit (as opposed to open patches of sidewalk).

Visibility Analysis

There is one area just south of my home that was a gathering place, but neither home, business, nor enterprise of any kind: a vacant lot at Carlton Road between Monticello Avenue and Monticello Road, popularly know as "the Park" due to its sublime views of Montalto. Four photos are there, which skews southward the ellipse around my house. Due to recent construction of several house on the site, that view has been obliterated and the gathering place eliminated. The development was by-right so no one could oppose the project and the property owner is free

to do what they will but it does beg the question of what public loss comes with private development. Taking this case as a model, I set out to see how the built environment impacts the visibility of Montalto—the site so beautifully framed by Virginia dogwoods in the image left image below.

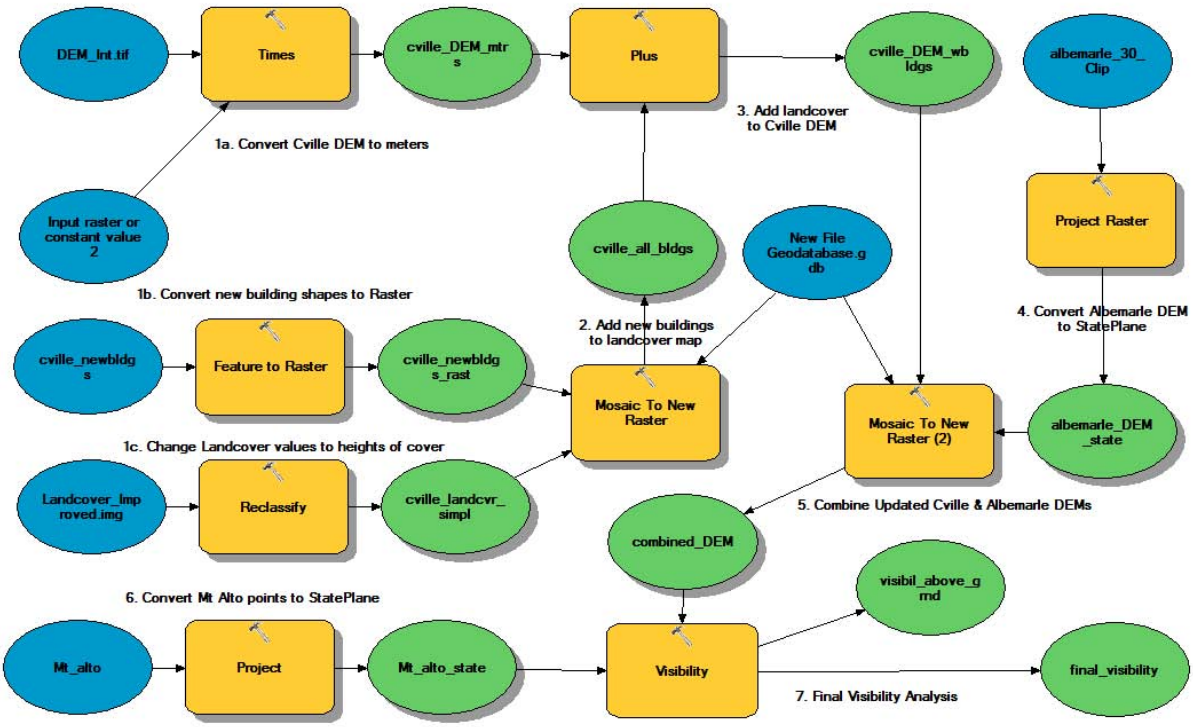
Left: “The Park,” 2012, with Montalto visible center. Right: Same spot, now “The Belmont Steps,” 2015.

Methods

I expanded the extent of my map to include Montalto, which is outside Charlottesville’s limits. I converted everything all XY data to meters and all rasters to my map’s Virginia State Plane system. I tried working with the Albemarle DEM file because it’s extent includes both the neighborhood and Montalto, but there were a few problems. First, it’s huge so I clipped it to a more manageable circle around Charlottesville.

I painted a set of points around the summit of Montalto as an observer feature and ran a quick Visibility Analysis to see whether I knew how to use the tool. It worked well—all of the neighborhood land with appropriate prospect has a view of Montalto if one ignores buildings and vegetation.

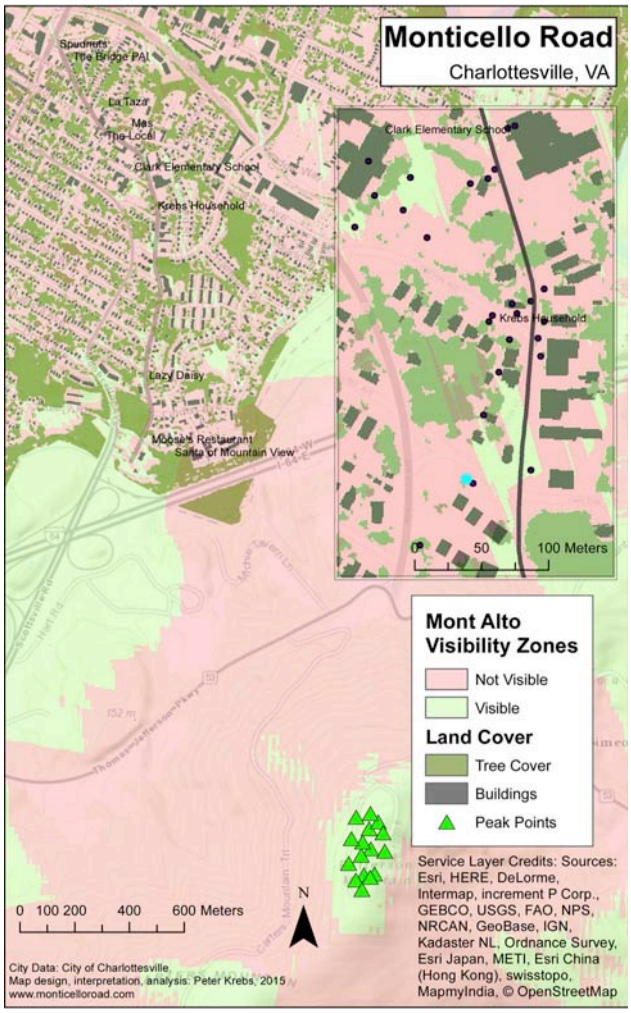
The buildings added a lot of complexity because the Albemarle DEM is not fine-grained enough (30 meters) to account for them. So I used the Charlottesville DEM (3 meters) for the neighborhood portion and married it to Albemarle with a Vector Mosaic. But it was not quite ready for that: the buildings still needed to be added.



The Visibility Modeling Tool

To get buildings and vegetation, I reclassified the Charlottesville Land Cover map, setting values of 25 feet for buildings, 15 for tree cover, and 1 foot for simple vegetation (presumably grass and landscaping).

The new houses were so new that they were not included in this map, so I created a shape file with the new buildings, converted it to a raster, reclassified it appropriately, and mosaicked it to the Charlottesville map. (Note that for most of these operations, I had to use "Mosaic" instead of "Plus" because in the latter, if *either* operand has empty cells, the result will have empty areas too.)



Land cover is excluded from zones outside the study area. Inset shows "the Park." The blue dot is where the photos were taken.

Next I was used vector math (plus) to add building and plant height to the Charlottesville DEM, which I married to the Albemarle DEM via mosaic, yielding a combined DEM, with Montalto, and Charlottesville with buildings and vegetation at the Charlottesville resolution.

Then I ran the Visibility Tool. Because my Z values are in feet, I included a Z-factor conversion of .3048 and added a surface offset of 2 meters (accounting for human observer height).

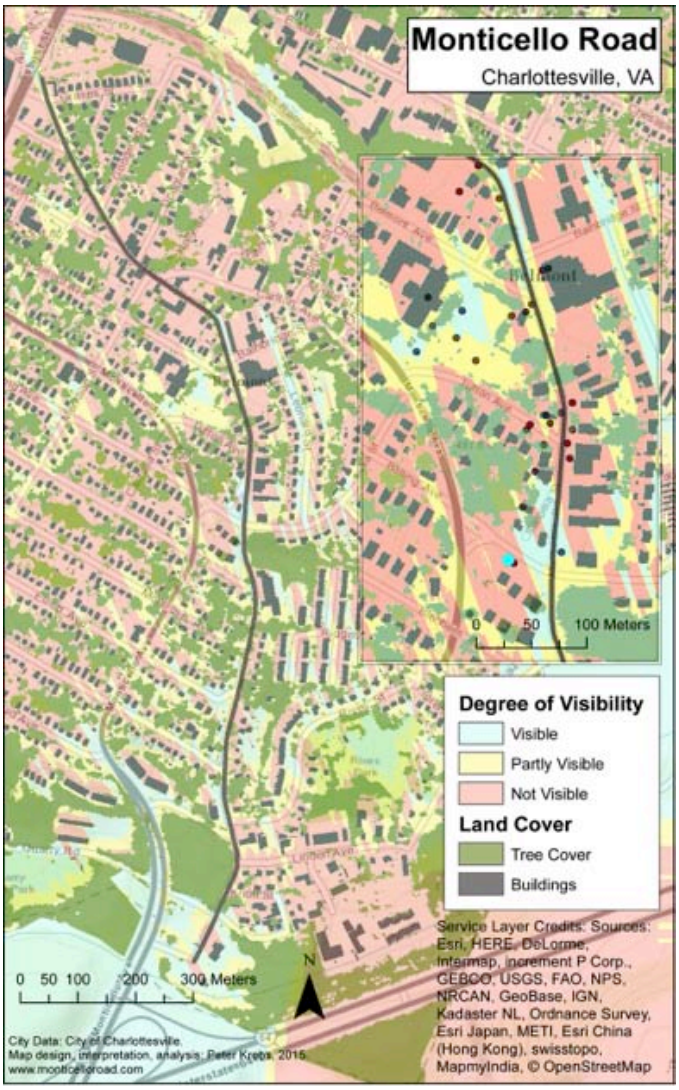
Findings

The results look the way I would expect them to—the buildings and trees block the view from most of the neighborhood, with the exception of a few glimpses between and in some open areas

with correct prospect. Note that if one considers the buildings themselves as landscape, the view is good from there, meaning there are many mountain views from windows and rooftops, if not from the ground.

It's dispiriting to see how much the constructions block the mountain-view but this analysis seems a little bit harsh compared to my everyday experience. There are many places in the neighborhood where you can catch a glimpse of the mountain—more than indicated on the map.

So I decided to go back and take another look, with more sophistication. After all, many obstacles—such as trees without their leaves are translucent. So I looked at the "output-above-ground" raster, which shows how high an observer would have to rise to see the feature and grouped everything visible within an additional 2 vertical meters as a fudge factor and called those areas "partly visible." If you can see by standing on a bench of moving or visually editing a nuisance (which people do constantly) then that should count for something.



These revised results seem a lot more realistic, more true to my lived experience of the site. More areas have partial visibility, which seems right. I know the road itself has many partial views—the mountain winking in and out of sight is part of what makes the road charming. I also like the very visible shadows the buildings cast across the view shed.

Extension: Location Analysis of Monticello Road Backers

My original proposal included proximity analysis of my backer/participant list; I would like to know whether the project participants live on the street, nearby or in the neighborhood. I am more apt to be asked about the people than the photos so I would like to know the spatial distribution of their residences, relative to Monticello Road.

Because my address data is very limited (I only have about a fifth of their home addresses) it would have required outreach to obtain a sufficient sample size and I did not have time within the constraints of this project. I now know how to perform the necessary analysis however and will be able to perform this analysis in my own time. Here's what I will do:

A. Surface Distance from Monticello Road

1. Complete collection of address information via email/survey campaign (I have 100% coverage of email addresses)
2. Format Excel sheet for easy geocoding.
3. Create a new shape file and geocode using the address locator. (Be sure to use State Plane system)

4. Determine the distance of each point either with the buffer approach I used for the photos or (better) use a Join [shapefile to Monticello Road CenterLine], which will include a distance field in its resulting data set.

B. Belmont Neighborhood Residents?

1. Add the Charlottesville Neighborhood Shape File to the map.
2. For simplicity, I will remove all the neighborhoods except for Belmont
3. Run a simple intersect analysis to see which points fall within the Belmont shape file.

I will have to think carefully about how I present this information to protect the addresses of my backers from being reverse-geolocated. At a minimum, I will ask permission to position their residence on the map without identity information. Worst case scenario, I will present the data in a graph but not a map.

Lessons Learned

Schedule. Although I am still confounded as to why the GPS data in my images did not translate to the map (it looks good and no one I called was able to find any problems either) I should have abandoned that pursuit much sooner. I lost about a week just trying to resolve that one issue and I should have cut the process short and done it manually much sooner. If I had made a project schedule in advance that problem would have been avoided. The Monticello Road project itself has a very detailed schedule and I don't know why I didn't do that right away. Lesson learned.

Know your data. Experiment with the data extensively prior to making a proposal. I knew I could embed GPS data into the metadata, but ArcMap obviously didn't read it as well as I

thought. If I had known the data would be so difficult, I might also have proposed less ambitious analysis.

Triage. When I saw what a problem the data created, and had created a schedule, I saw that the backer sub-project would not be possible, so I made it an extension in the interest in saving the rest of the project. I will be able to so it now that I have the tools and because the interest in that particular question is so high, I have an incentive to follow through.

Modeling Tool. I used the modeling tool throughout and it was incredibly useful for keeping track of my work—especially since I was experimenting on the fly and would have to recreate my successes.

Intuition. Although GPS provides a check on intuition, the Visibility project showed me that the opposite is also true. Mapmaking is as much art as science and although the ArcMap is a powerful tool (and I now appreciate why it costs so much) we must retain our critical faculties throughout and make decisions accordingly—even if it modifies our plans.

Bottom Line. Although I was often very frustrated, I came to enjoy working with GPS as I really began to understand how it works. Now I really like it and I will definitely use it extensively in the future. I'm confident that I'll be able to do well.

Acknowledgements

I would like to thank Professor Guoping Huang and Zihao Zhang for their indispensible assistance with this project.

Data Sources

My own photos, captured 2011-present

Charlottesville Maps from their GIS Page

USGS DEM and Land Use files from the "Classes" folder

Basemap: ESRI "World Topo Map"

Address Locator: ESRI "Street_Addresses_US" via UVA Geostat drive