12-4-2014

Analyzing Drone Footage to Assess Necessary Streetlight Placement: Where in New Washington Heights and Poe Mill are Streetlights Most Necessary?

Savannah Jennings  
Furman University

Billy Tutt  
Furman University

Recommended Citation
http://scholarexchange.furman.edu/ees-presentations/8

This Presentation (Class or campus) is made available online by Earth and Environmental Sciences, part of the Furman University Scholar Exchange (FUSE). It has been accepted for inclusion in Earth and Environmental Sciences Presentations by an authorized FUSE administrator. For terms of use, please refer to the FUSE Institutional Repository Guidelines. For more information, please contact scholarexchange@furman.edu.
Analyzing Drone Footage to Assess Necessary Streetlight Placement
Where in New Washington Heights and Poe Mill are Streetlights Most Necessary?
Savanah Jennings & Billy Tutt
EES201 – Introduction to Geographic Information Systems – Fall 2014, Furman University, Greenville, SC

I. Introduction

New Washington heights and Poe Mill are low-income neighborhoods with high crime rates and the people living there felt more street lights would make the areas more safe at night. In our project, we aimed to answer the question: where are streetlights most appropriate in these neighborhoods? Can drone footage taken from the recent drone flapper help to improve our ability to accurately model streetlight effectiveness in these neighborhoods? We will present our findings to the residents of Poe Mill and New Washington Heights in order to aid their efforts in making their streets safer. This question is relevant to GIS because we can use spatial analysis techniques to improve the safety of these neighborhoods.

II. Literature Review

A concerning article from the Public Safety website argues that there is sometimes tendency to “over-light” a block, street, or neighborhood which can be just as bad as too little lighting is crime ridden areas. The website describes the most successful street lighting techniques, such as the most appropriate height of luminaires, the most effective bulb type and wattage, how far apart street lights posts are etc. The website also successfully describes general questions well and may be helpful to the why lighting is important and what are the most common ways of light usage.

An article by Welsh and Farrington argue that there are two main theories of why improved street lighting causes crime reduction. They first believe that improved lighting leads to improved surveillance of potential offenders by improving visibility and by increasing the active number of people on the streets. Secondly they suggest that improved lighting communications that there is a community investment within an area, leading to community pride, cohesiveness, and informal social control (p.5). Morrow and Hunter’s report on the Chicago Alley Lighting Project actually yielded interesting and different results than that of others would have reported. Their team purposed were to assess the impact of improved lighting on two high crime areas in Chicago. They concluded that the three crime categories actually increased over the six-month testing interval. Overall offenses rose 12 percent, property offenses as 20 percent, and non-index crimes as 20 percent. This article shows the importance of the type of lighting initiative that must be taken within each unique neighborhood and community. Sometimes we must continually check within our own street light Project. To avoid these issues, we suggest shorter, closer together lights because these better address the needs of the neighborhood residents.

III. Methodology

These neighborhoods had been studied already and we updated the information given to us. Previous data was collected through use of a drone, which flew over Poe Mill in a predeterminant light pattern. We collected our data by visiting the neighborhoods and identifying where the streetlights were, which direction the lights were facing, if they were functional, and what type and wattage they were. The three types of streetlights we found were Metal Halide (MH), Mercury vapor (MV), and Sodium vapor (Na). If it was a new light fixture, we added its coordinates to the map. Any broken lights were not included in our maps.

We used the data collected by the drone to determine the intensity of light surrounding each streetlight. In order to do this we expected still images from the footage and analyzed the light density, using ImageJ. Figure 3 is a graph which show light decay which came from this analysis. To get the equation of how light decays as further from the light, we used Minitab. This approach is shown in Figure 3. We combined this data with the data we collected by applying the light spread to the new lights we observed. We then used the Zonal Statistics Tool in ArcGIS to show the distribution of light around each streetlight, taking into account its type and wattage.

IV. Results and Discussion

Our results are shown in Figure 1 and 2. These maps represent typical light closed in New Washington Heights, and the light detected by the drone. As you can see above we do the light pattern using blue and green and the green shows the light spread around the streetlights. Another thing we noticed is that in the drone footage, the direction that the lamp is facing makes no difference, but on the ground it does affect light spread.

V. Future Research

Future research would include a more accurate representation of the light distribution around each streetlight. For example, crime rates were grouped into our analysis, such as the direction the lamp is facing, the angle of the light, tree cover, elevation slope, and humidity. We have found that there is a clear difference because our created "Perception Map" and the actual drone footage. From the drones, the streetlights appear as points due to the aperture of the GoPro camera. From the ground the lights spread much farther. From what we can actually see, further research can provide a more accurate representation of perceived light.

VII. References/ Data Sources