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

A concerning article from the Fulfill. Spaces website argues that there is sometimes tendency to ‘new-light’ a dark, dirt, or neighborhood which we can see as bad as we take lighting is crime ridden areas. The website attributes the most successful street lighting techniques, such as the most appropriate height of luminaries, the most effective bulb type and wattage, favorable aspect shouldpoints etc. We also successfully answer general questions about, but may be helpful to the why lighting is important and what are the most common ways of light usage.

As an article by Walsh and Farrington argue that there are two main theories of why improved street lighting causes crime reduction. They find that improved lighting leads to improved surveillance of potential offenders by increasing visibility and by increasing the active number of people on the streets. Second, they suggest that improved lighting communications that is a community investment within an area, leading to community pride, attractiveness, and increased social control (p.20).

Morison and Hunter’s report on the Chicago Alley Lighting Project actually yielded interesting and different results than that which we would have expected. Their aim/purpose was to assess the impact of increased lighting on two high crime areas in Chicago. They concluded that the three crime categories actually increased over the six-month testing interval. Violent offenses up 11 percent, property offenses as 22 percent. This article shows the importance of the type of lighting variables that must be taken within each unique neighborhood and community. Something we hope to continually check within our own Street Light Project. To avoid these issues, we suggest shorter, closer together lightings because this better addresses the needs of the neighborhood residents.

These neighborhoods had been analyzed already and we updated the information given to us. Previous data was collected through use of a drone, this time over Poe Mill in a predetermined light pattern. We collected our data by visiting the neighborhoods and identifying where the streetlights were, and 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 (Sv). If it was new lighting, 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 Image J (Figure 1) is a graph which shows light density which came from this analysis. To get the equation of how light densities is further from the light, we used NORM. This equation is shown in Figure 2. We combined this data with the data we collected by applying the light spread to the raw images we observed. We then used the Euclidean Distance tool in ArcGIS to show the distribution of light around each streetlight, taking into account its type and wattage.

Future research would include a more accurate representation of the light distribution around each light. For example, similar variables were applied to our analysis, as in the direction the light is facing, the type of light, tree cover, elevation, slope, and humidity. But how you found that there is a clear difference between our created “Perception Map” and the actual drone footage. From the drones, the streetlights appear as pointy due to the area from the GoPro cameras. From the ground the lights spread much farther than what you can actually see. Perhaps future research can provide a more accurate representation of perceived light.

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2. Results and Discussion

Our research is shown in Figures 1-3 and 2. These maps represent perceived light from in New Washington Heights, and the light detected by the drone. As you can see (or see the drone) the drone light is much more accurate. 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.

We have concluded that there are several areas is both Mill and New Washington Heights that lack adequate lighting. In Figure 1, we mapped the streetlight and squared a border around them. Using this map, we can determine if the light spreads around them. From this map, the areas that require more lighting are more clear. In fact, in figure 2, we have also concluded that a camera with better aperture and better lighting settings may produce a more accurate representation of the light spread. This could be an important problem with the use of cameras, as the human eye perceives light differently from computers.

Figure 1: New Washington Heights light spread as estimated based on human perception.

Figure 2: New Washington Heights light spread as estimated by the drone footage.

Figure 3: Graph of light decay as distance from streetlight increases.