AUBURN UNIVERSITY

SAMUEL GINN COLLEGE OF ENGINEERING

GPS Final Report: One Light, Two Light, We like Blue Lights

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BSEN 5220

December 7, 2018

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Abstract:

Blue Light Emergency Phones (BLEP) are stationary emergency devices installed in areas frequented by pedestrians. These emergency response systems cost $7,000-$20,000 dollars for installation depending on location, and require up to $200 of maintenance each year. When the *help* button is pressed by an endangered person or bystander, the location of the call box is sent to emergency dispatchers who can send emergency response to that call station. Auburn University, an academic institution located in Auburn, Alabama, serves over 30,000 undergraduate and graduate students, faculty, administration and staff. Statistically, 22 out of 1000 students were involved in crime on campus in 2017, a figure that continues to increase each calendar year. Currently, Auburn University has 135 BLEP systems located on the main campus and areas surrounding campus including: pathways near academic buildings, residential halls, parking lots and garages, panhellenic housing, and the Ralph Brown Draughon Library. The objective of this project was to determine if the quantity, proximity, and functionality of the BLEP systems meet the needs of the stakeholders that they are intended to assist. In order to meet this aim, the positions of the phones, distance between the phones, and the time of travel between BLEPs were mapped and juxtaposed against on-campus reported crime locations. Each BLEP located within the parameters of East Samford Avenue, South Donahue Drive, South College Street, East Magnolia Avenue was mapped as a point feature. The path between blue lights was mapped as a line feature, and the time necessary to travel between BLEPs at a brisk pace was recorded within the line features. This data was logged into the Geo7x Pro receiver and uploaded onto ArcGIS for mapping, compilation, and analysis. By using crime statistics and the reported locations of crimes committed, a map of criminal activity was created and fitted to the BLEP mapping in order to assess the correlation between crime and proximity to BLEP systems. As a result of this study, it was found that more BLEP stations need to be implemented across Auburn's campus especially in areas including but not limited to: the eastern side of the College of Engineering, the Upper Quad, the College of Math and Sciences (COSAM) buildings, the Fine Arts buildings, and Ag Hill extending down Mell Street; it was also suggested that the physical appearance of current/future BLEPs need to be changed to make the stations more easily visible during all times of the day.

Introduction:

Auburn University (AU) is a public land, sea, and space grant institution located in Auburn, Alabama. Established in 1856, Auburn has become one of the largest developing educational institutions in the Southeast United States, home to 15 schools and colleges, more than 140 academic concentrations, and boasting almost 30,000 students. Although AU attracts some of the best students domestically and internationally and is considered the flagship school of the state of Alabama, it is still affected by on-campus and off-campus safety concerns. In 2017, 589 reported safety-related incidents occurred on the AU Main Campus. Of those incidents, 6.3% of those were violence against women. Arrests for major crimes, including murder, rape, aggravated assault, robbery, or arson accounted for 12.2% of all crimes committed on campus. University stakeholders are constantly analyzing established safety measures in order to optimize or implement new systems to keep the campus community safe. AU has a multitude of devices, personnel, guidelines and safety measures designed to address a variety of potential emergencies. One of the devices on campus available to Auburn stakeholders are Emergency Call Boxes, also known as Blue Light Emergency Phones (BLEPs). Each BLEP costs anywhere from $7,000-$20,000 for installation and materials, with an annual maintenance cost of up to $200 per device.

As of Fall 2018, there are 135 BLEPs located around the AU campus. These call boxes are generally located along pedestrian walkways near academic buildings, residence halls, the Ralph Brown Draughon (RBD) Library, and frequented sidewalks on major streets leading onto campus. When pressed, the BLEPs emit loud noises, flash, and immediately call 911 dispatchers, indicating the location of the call box. Security cameras on nearby buildings are also programmed to readjust to keep the activated BLEP in its frame. Students are encouraged to press the red buttons on the BLEPs to activate the emergency response when they are involved in or witnessing any emergent situation. Those being pursued by a would-be attacker are encouraged to follow a Blue Light path, pressing each emergency call box button to update emergency responders of their changing positions. For students, staff and faculty traversing around campus by foot during the day and night, the likelihood of a BLEP being the first emergency response device available to them is fairly high.

This project will assess if the effectiveness of the distance between installed phones, phone functionality, and the quantity of devices on campus is sufficient, or if any of these variables can be improved to optimize the safety of AU students and personnel. By researching high crime and low crime areas, and correlating these locations with the location of the BLEPs, it can be determined if there is a correlation between the frequency of incidents and the location of BLEP stations. By ensuring that devices are located in frequented and isolated areas, in plain view, within close proximity, of each other, and fully functional, one of the first defenses against on-campus threats can be brought to its full potential.

Methods:

Study Site

The area of study for this project lies within the boundaries of West Magnolia Avenue, South College Street, West Samford Avenue, and South Donahue Drive. This area is widely regarded as the central part of campus. The Auburn University central campus is an appropriate area of focus for the study due to its proximity to facilities that are open late or 24/7. These facilities include, but are not limited to, academic buildings with student/faculty swipe access, the RBD library, Upper/Lower Quad, South Donahue Residence Hall and the Student Center. These areas are saturated with students both during and after business hours. Traveling between facilities, residence halls, parking lots, and other areas late at night can create situations in which students become more vulnerable to crimes of opportunity. Within the boundary of central campus, there have been various reported incidents of sexual assault, stalking, robbery, and harassment. It is important to continuously assess the effectiveness of safety devices and protocols to prevent and lessen the frequency of harmful incidents on campus. The boundary of the main campus was chosen as a model for the assessment of the usefulness of the Blue Light Phones due to the highly frequented nature of that area of campus. By conducting a study correlating report crime incidents to Blue Light locations, the effectiveness of the stations can be affirmed or disproved. Mapping out the point locations of the blue light stations, mapping the paths to stations with the closest proximity, and recording the amount of time necessary to travel between blue lights within the site and subsequently comparing this information to the locations of reported crimes exposes areas where stations can be installed to heighten security within the main campus. If a positive correlation is made between the absence of blue light stations and criminal activity, the university can use the model of this site assessment and expand it to the rest of the Auburn University campus to study and optimize safety measures for its stakeholders.

Data Collection

In order to begin the study, a Data Dictionary was created to store and organize our research within the GPS receiver and the Pathfinder program. Our team selected point and line features to enter into the data dictionary and selected attributes (operator and walk time) that would be easily depicted on our final map. The operator attribute would help to make sure each member participated in the study while the time attribute was used to measure the distance between each BLEP based on the walking pace of the operator. As each attribute was set, the maximum number of coordinates were defaulted to 90 positions for each point feature. This number of coordinates would ensure a more accurate reading of each BLEP location with the presence of at least 4 satellites. Once downloaded into the Geo7x Pro receiver, the data collection was performed. An interactive map of campus showing each blue light position was

utilized during data collection to ensure that each blue light within the selected boundary was mapped and the mapped paths were all between blue lights closest in distance to each other.

To simulate a real emergency situation, we started from the South College boundary across from Corley Building. From there, our first data set was collected and our line feature began. The total duration of the data survey took approximately 3 hours as each line feature was made and checked to make sure no paths were re-traced or missed. All team members had a map of the BLEPs on their mobile device and one team member was designated to control the stopwatch for the input of seconds after each light was reached. In total, 30 blue light stations and 31 walking paths were mapped within the chosen boundary; within the Library Parking Deck and the Stadium Parking Deck there were 10 and 8 blue light stations in each, respectively, that were dispersed throughout the parking levels, but only one light was mapped at each of these structures.

Data Analysis

The data collected was used further for data analysis on the ArcMap program. The data collected through the data dictionary on the Geo7x Pro receiver was uploaded to the GIS Pathfinder Office program. The data was transferred from the receiver using the Data Transfer function. The transferred data was displayed in the map view of the GIS Pathfinder program. The Blue Light Phones were point features symbolized by X's. The paths between the blue light were symbolized by lines on the map. The data was differentially corrected by code processing only using the closest operational base station and exported from GIS Pathfinder to ArcMap. To represent the BLEPs in ArcMap, the marked X's were changed to the color blue and enlarged. The exported map was then overlaid onto a basemap of the Auburn University campus; this basemap features street and building names as well as concrete walkways throughout the campus. Once the collected data was overlaid on the basemap, it became easier to visualize the proximity of each Blue Light Phone to buildings and each other. Each path walked between the individual Blue Light Phones was visibly taken by walking the safest route while also attempting to make the walk as direct as possible. The attribute data for each feature included how long it took, in seconds, to walk to each Blue Light Phone from the nearest one. In addition, the attribute data contained the name of the operator who collected the data. From the attribute table created by the ArcMap, the average walking path time was calculated to be approximately 123.28 seconds. The Auburn University Main Campus Crime Log was accessed, from which the locations (within the selected boundary area) of reported instances of sexual assault, harassment, and stalking were incorporated into the finalized map. Data points of the reported crime locations were added into the map and represented by enlarged red circles. This finalized map containing all mapped blue light stations, blue light paths, and crime locations can be seen in the Appendix. The interpretation of the data collected for the locations of the blue lights compared to the crime data showed sections of the selected campus area that would benefit from the implementation of new blue light stations to better serve the student population.

Results and Discussion:

Table 1 - Attribute data for mapped blue light pathways.

Path ID	Operator	Length (m)	Time to Walk (s)
0	Sydney	166.487	140
1	Elizabeth	142.075	120
2	Bailey	108.616	85
3	Cami	198.462	139
4	Rosia	187.635	170
5	Sydney	244.906	178
6	Bailey	426.864	306
7	Elizabeth	82.995	67
8	Cami	85.008	57
9	Cami	106.210	58
10	Rosia	104.309	81
11	Cami	67.245	47
12	Cami	198.161	142
13	Cami	110.796	79
14	Cami	206.834	144
15	Cami	93.285	63
16	Cami	220.802	148
17	Cami	413.853	281
18	Cami	155.349	98
19	Cami	138.927	109
20	Cami	138.750	101
21	Cami	134.285	95

22	Cami	61.513	49
23	Cami	73.043	56
24	Cami	63.998	47
25	Cami	139.103	110
26	Rosia	387.000	284
27	Rosia	143.451	114
28	Rosia	143.304	112
29	Rosia	389.174	240
30	Rosia	156.006	118
31	Rosia	129.075	107

Upon initially reviewing the mapped data of the blue light locations and pathways, it was observed that there are several areas of campus that could stand to be improved. The lengths of the pathways between the lights varied across campus; at the center of the study area is approached the map shows that the blue light stations were closer in proximity. At the outer bounds of the study area, the length of pathways between lights dramatically increased, the longest of which extends from the front of Davis Hall all the way to the Engineering Loop. However, toward the center of the selected boundary, there were still several sectors in which the presence of BLEPs was few and far between; these sectors include the eastern side of the College of Engineering, the Upper Quad, the College of Math and Sciences (COSAM) buildings, the Fine Arts buildings, and Ag Hill extending down Mell Street.

During the study, several inconsistencies were discovered in the Auburn Campus interactive map of the blue lights. The blue light station at the south side of Mary Martin Hall was absent. Additionally, the blue light station #22 (Dudley Hall/Building Science) was not available for use. Both of these out of service stations were still listed as operational according to the interactive map.

When comparing the position of the BLEPs to the locations of reported crimes, it was found that in general, an emergency station was fairly close in proximity. However, there were many reported crime locations at which the path of a victim to a blue light station would be obstructed in some way whether it be by a building, on-campus construction, etc. Auburn University Campus Safety advises that if presented with a case in which you are being pursued by a would-be attacker, you should attempt to run away while continuously pressing the blue light emergency call buttons. This would allow law enforcement to see the route of a person in distress and help them get to the emergent situation. The efficiency of this plan of action is greatly diminished if the person attempting to escape the attacker cannot see the lights along the

path they are following; it became evident during much of the data collection that more often than not, BLEPs could not be seen from one to the next while following the mapped paths. Much of the data collection was done at the end of the day when the sun had set, at which point it became increasingly more difficult to locate the blue light stations and identify the most direct paths between them without the help of the map.

To improve the issues assessed during data collection and interpretation, several measures need to be taken. The existing blue light stations first and foremost need to be made more easily identifiable from a distance both during the day and at night. This task can be accomplished through actions such as painting the stations a brighter, more noticeable color and increasing the size or radial illumination of the light positioned at the top of the stations. More stations need to be implemented across campus, specifically in the aforementioned sectors in which a noticeable scarcity of BLEPs was observed.

Conclusions:

The Blue Light Emergency Phone feature data collected within the Auburn University campus boundaries of West Magnolia Avenue, South College Street, West Samford Avenue, and South Donahue Drive was analyzed in order to assess the efficiency and functionality of the lights within a frequently populated area of campus, and to determine any areas of improvement that would optimize the safety and security of Auburn's campus, students, and personnel. Within the boundaries of this central campus area, there have been various reports of crime incidents over the past year involving sexual assault, harassment, stalking, and robbery. In total, the data of 30 blue light stations and 31 blue light walking paths was recorded and collected within the specified area. This blue light data was collected by the group through the use of the Auburn mobile map of current BLEP services available across campus. However, some inconsistencies were found within the Auburn BLEP map during the data collection; the BLEP near Dudley Hall was found to be out of service and the BLEP shown to be behind Mary Martin Hall was no longer installed. Other issues noticed throughout the study were the distances between lights, visibility of the BLEP stations, and the shortage of BLEPS around the outskirts of campus. Many of the lights are very dark in color and dimly-lit, making them less visible at night and therefore more difficult to to access in the case of an emergency. The distance and length of pathways between light stations drastically increased as the outer boundaries of campus were approached during the study. Steps should be taken by Auburn University Campus Safety to address the issues found throughout this study, such as installing more BLEP's around the outskirts of campus, updating the Auburn mobile map and making it more easily accessible to the public, and improving the visibility of the stations.

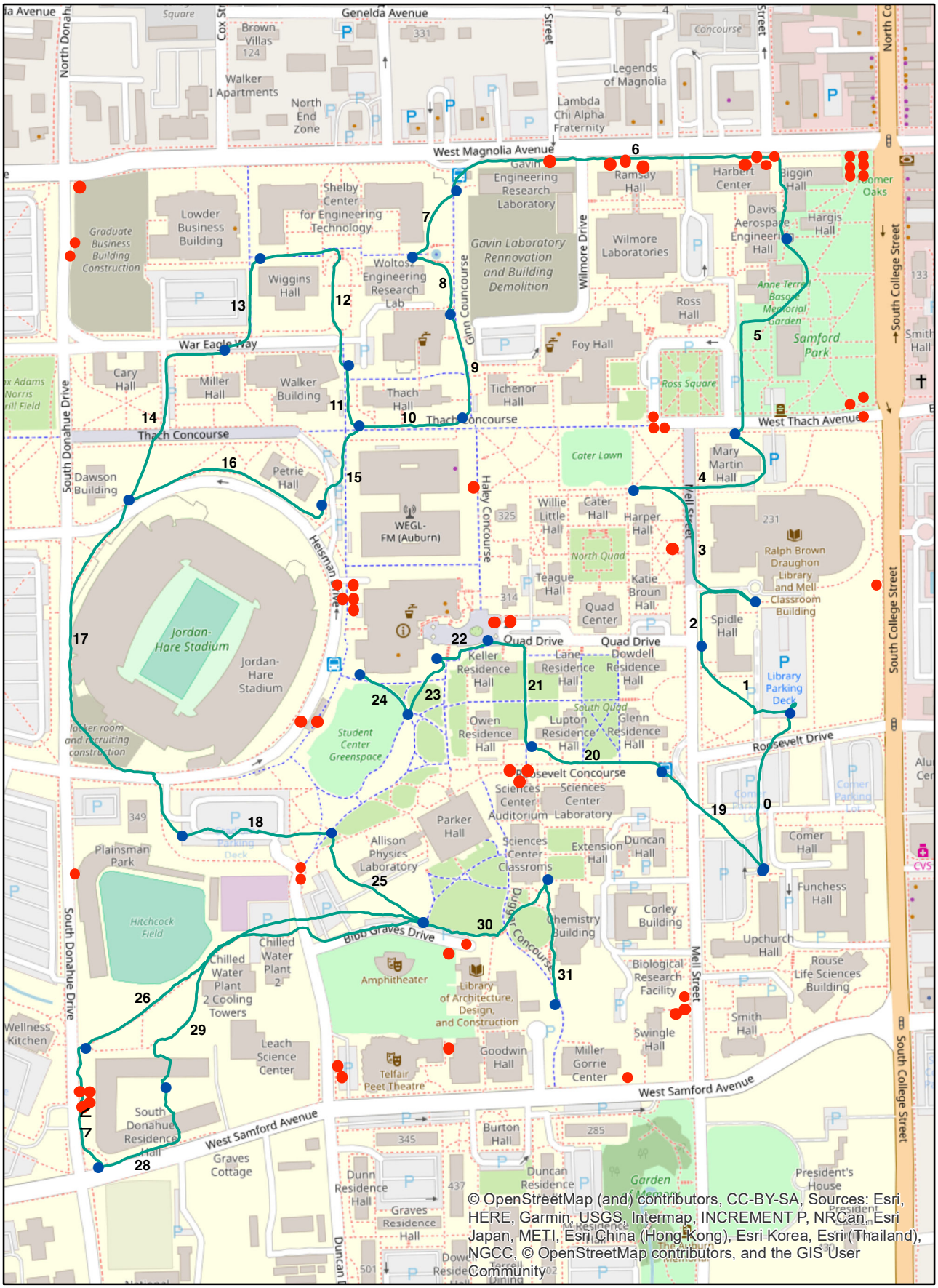
References:

Adam Crews (personal communication via e-mail, November 16, 2018)

"Auburn University Crime." *College Factual*, 27 Sept. 2018, www.collegefactual.com/colleges/auburn-university/student-life/crime/.

Susan McCallister (personal communication via e-mail, November, 11, 2018)

Appendix



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