Web Map of Geo-visualization of Transit in Cerritos, CA

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Introduction

The overall purpose of this project is to explain ridership and accessibility of public transit to the City of Cerritos's public transit system (Cerritos on Wheels). A series of transit analysis that demonstrate the importance of modelling passenger logistics and behaviours to achieve COW's prime mission objective of serving its population as a transportation provider will be presented.

Figure 1. Project study area in Cerritos, CA, United States.

Data and Data Sources

City of Cerritos shapefiles, including parks, city boundaries, and transit-related information such as bus routes and bus stops, were provided by the City of Cerritos. Roads shapefile was provided by the Los Angeles County GIS website. The rest of the data was collected first-hand and purely original.

Table 1. List of data and data sources used in the project.

Dataset	Source
Cerritos Transit Shapefiles	City of Cerritos
Ridership Personal Survey	Personally collected
Los Angeles County Road Shapefile	Los Angeles County

Methodology

The goal of this methodology objective was to gain a perspective on transit accessibility throughout the length of the city of Cerritos, specifically for recreational parks. This project required a rigorous process of data collection through on-board paper bus surveys filled out by bus riders while they were on the bus, which was responsible for much of the data source. No City of Cerritos employees were involved in the process, nor is the city affiliated with the process. Qualitative data was imported to Microsoft Excel while the geographic responses from the survey were then checked for feasibility and accuracy via Google Earth as part of a manual geocoding process. A Python script to convert the batch file of KML layers into ArcGIS-friendly LYR files was written and executed. After data formatting and cleaning, the geographic data was ready for analysis, which it was used for three separate geo-visualization methods: Overall Heat Map of Passenger Activity, Senior Citizen Accessibility to Recreational Areas, and a 3D Space Time Travel Cube.
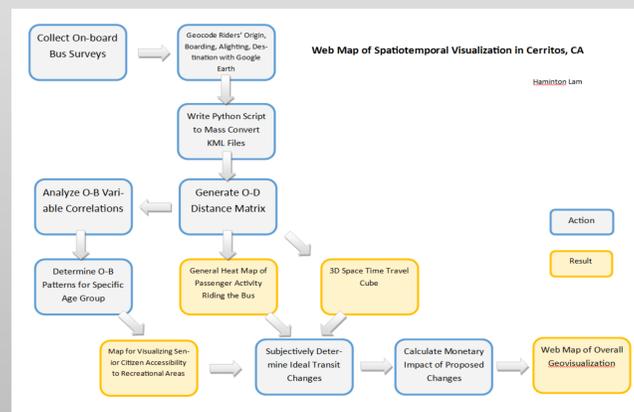

Figure 2. Methods flowchart of project.

Timeline

Results

In Figure 3, after the six separate fixed bus routes are combined, the most heavily traveled area is the Civic Center, which is the brightest yellow spot (not the dimmer two larger circles). In fact, the density of the two yellow dimmer circles is supported by foot traffic from Artesia High School, while the darkest orange on the northwestern corner is accompanied by Cerritos College, which is one of the popular final bus stops. It is the second most visited bus stop, acquiring visitors from Cerritos College and Gahr High School. As seen in the map, there is parallelism between the blue and tan bus stop locations. This is because they are the same location, except in the opposite direction, since the difference between the 1A, 1B, 1C bus stops and 2A, 2B, 2C is simply the north-south and east-west direction.

In Figure 4, From the 183.65 miles of primary and secondary road segments in the entirety of Cerritos, 91.9% of the streets were covered by fifteen minute walk times from the centroids of all parks in the City, 78.8% was covered by a ten minute walk, and 35.2% was occupied by a five minute walk. Because of this wide spread, most of the city was deemed accessible to recreational areas and exercise-inducing opportunities, since transit covered primary roads. No significant change in bus stop placement or bus route deviation was found in analysis.
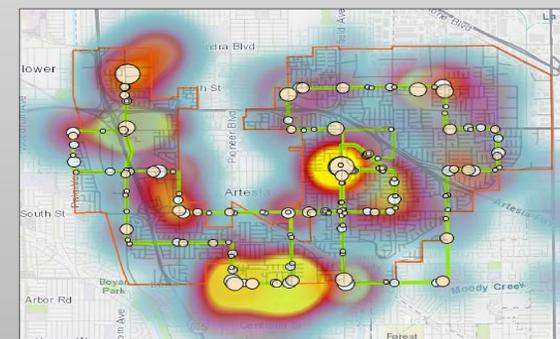

Figure 3. Overall Heat Map of Passenger Activity. Blue spots represent sparse travel while yellow and red represent high density travel. All bus routes are shown in green, with bus stops (various circle sizes) snapped to the route. The different sizes reflect the popularity of the bus stop.
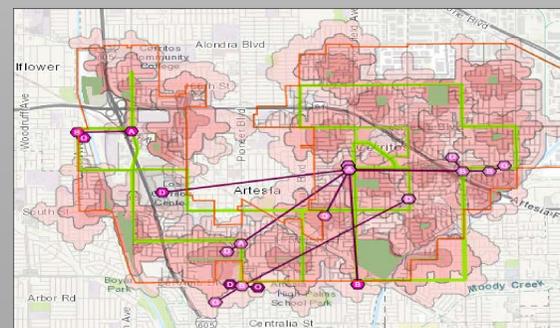

Figure 4. Geo-visualization of Senior Citizen Accessibility to Recreational Areas. Pink blobs or 'buffers' represent five additional street walking times in minutes from the center of parks. Hexagonal points in purple represent Origin, Boarding, Alighting, or Destination, where the darkness of purple represents higher wait time. Each unique path is linked by a line. Some paths overlap.

Discussion

Figures 3 and 4 delivered satisfactory results despite some gaps in data, like the lack of data collection from Tuesday and Thursday. These flaws, however, did not affect much of the geo-visualization maps since most passengers reported to have travelled similarly throughout Monday through Thursday. Still, this lack of data representation made the findings not conclusive enough to determine a particularly optimal route.

Although the process for the Space Time Travel Cube (not shown) technically ran successfully, the results were not representable. Had a more consistent data collection process been implemented, the Space Time Travel Cube could have delivered better results, since the cube recommends a consecutive day-to-day, hour-to-hour basis of data possession.
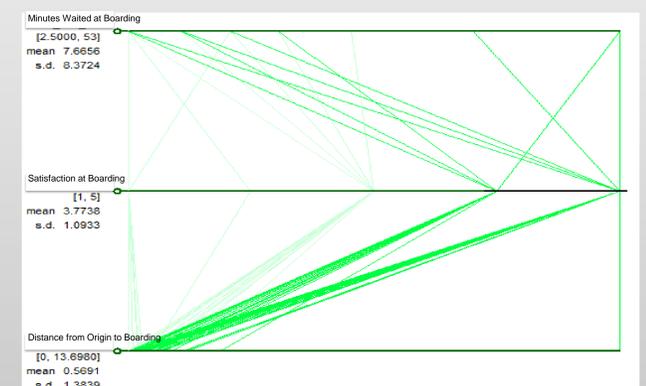

Figure 5. Parallel Coordinate Plot of boarding data pertaining to time, satisfaction, and distance passengers reported to have traveled.

Conclusion

From the direct survey findings, Cerritos on Wheels was found to have quite a profound impact for transporting passengers to and from important destinations. The senior citizens of this survey overall expressed tremendous satisfaction levels, with a mean of 4.75 out of 5. In all, 37.2% of bus trip purposes accounted for home destinations, 24.8% for school, and 18.2% for work. Although these percentages did not highlight the magnitude or how strong the incoming and outgoing rider traffic was on the bus, they certainly dictate that over three quarters of trip reasons are for important matters. The Overall Heat Map of Passenger Activity confirms that these destinations are not only urgent, but quite short. The map reveals only about three decently sized hot spots outside the boundary of the City.

Parks themselves overall provided ideal coverage throughout the City. which lends credibility toward the widespread connectivity and accessibility of the City's transit system.