GIS as Tools to Analyze the Orange Line BRT Stations in Relation with Surrounding Neighborhood and Bus Feeder System

Geographic Information System (GIS) is a powerful tool that provides access from a map to its geographical information, so planners and designers have the common understanding and probable implication for decision-making (Fleming, 2005). This paper will explore the GIS analysis of BRT Orange Line system in LA to provide understanding on the relationship between the BRT line with several chosen variables: proximity to open space, relationship to median income, and bus feeder availability to provide the information on what needs to be enhanced in order to increase the bus ridership.

I. Issue

Bus Rapid Transit (BRT) is a high performance transit mode using special vehicles on roadways or dedicated lanes with equal or exceed performance of rail system with fraction of the cost in terms of construction, infrastructure and maintenance (Metro, 2012). Metro Orange Line is one of BRT systems in Los Angeles area that runs mostly on two-lane dedicated bus way follows the inactive Southern Union Pacific Railroad alignment, 14.5 miles along Chandler Boulevard Corridor (Flynn, 2011). There are 14 active stations currently, with amenities similar to light rails: ticketing machine, sheltered station, seating, bike lane, bike locker, parking, and greenways along the bus lane.

The Orange Line BRT system has close connection with the existing bus systems in Los Angeles. The bus systems act as the feeders into the bus rapid transit area thus giving transportation connection to ensure accessibility of many places in LA. Additionally, other variables also correlate with BRT Orange Line systems. Arc GIS is a suitable tool to show the connection between the orange line system in relation with those variables including proximity to open spaces, connection to the feeder bus system effectiveness and relation to the median income. These three issues will be address separately but will provide a comprehensive analysis on the
relation between the Orange Line BRT in with greater Los Angeles plan and transportation system.

The paper will analyze thoroughly the variables related to the whole Orange Line system and one particular area, the Pierce College Station. This station is located in a residential area and according to the Metro plan, the area is not envisioned to experience any change in use or intensity. Also, the Pierce College Station has the lowest walkability score (Metro, 2012). Due to these reasons, it is important to analyze if the station has enough bus feeder systems to serve the residential neighborhood, so the residences of the area can utilize the public transport system conveniently and don’t need to rely heavily on private vehicles.

II. Data Collection

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III. Data Processing

Preparing the Data

There are three data that needs to be prepared before inputting them into the ArcMap.

- The median income data comes out in csv files and needs to be converted into the excel format.
- The installed bikeways using kmz data from google earth. Kmz format is a zip file of kml data and needs to be converted using Arc GIS explorer, which is free software from esri. The ArcGIS explorer allows me to change the format into a layer package, readable by ArcMap 10.
The Orange Line BRT stations data needs to be inputted into excel file. For precaution, it is better to just use the name of the road without “street, boulevard or avenue” to make the geocoding process better and faster.

After preparing the data that I need, I can process them in ArcMap.

Data Combination

1. Preparing the general base map

   The road system used for the base map is the simplified version of the US wide road system. Therefore, it needs to be clipped using the Los Angeles Tract map. The census website has the particular road system for Los Angeles City, but it is too detail and will obstruct the main focus of the desired map. Thus, the simplified US road system is used in this project.

2. Geocoding the Orange Line BRT station

   The main element of all the maps is the location of Orange Line BRT stations. The most accurate way to have the right nodes geocoded is by using address locator using the most updated list of the stations address provided by the Metro itself. The Geocoding steps are as follow:
   - Create address locator
   - Geocode addresses
   - Address re-matching: 34% of the address needs to be re-matched due to error in street number or street name

3. Showing the public spaces using the land use layer

   The land use layer from the LA City planning is showing different kind of land uses. To extract only the public space, I need to change the symbology of the map. Using the “LANDUSE” value, I only inserted the open spaces category and I make other categories hollow. Therefore, the map only shows the open spaces in Los Angeles.

4. Showing the Bus Line System

   The needed bus line systems used in the map is the Orange Line BRT bus line system.
Therefore, I have to create new layer from selection after selecting the specific line.

5. Showing the Installed Bikeways System

The needed installed bikeways system used in the map is the one adjacent to Orange Line BRT bus line system. Therefore, I have to create new layer from selection after selecting the specific line.

6. Showing graduated symbols of bus feeder daily ridership

Creating point maps using individual point markers to represent the graduated quantities of ridership in every feeder bus station.

7. Creating the choropleth map using graduated colors of median income per household

Representing the attribute values, the map is colored from according to the graduated increase in quantity of household median income. The classification consists of five values with darker colors for higher household median income.

*Finishing the Map*

In the end, the Pierce College Station map is brought to Adobe Illustrator to get the final enhancement. The gray scale map of the Pierce College station is combined with the clipped colored map along the 0.5 radiuses. The result is a contrast map using different types of colors to distinguish the inside and outside area of study.

**IV. Result**

Processing the available data using ArcMap, there are three results as follow:
BRT Bus Feeders Ridership in Proximity to Open Space

Daily Ridership (Based on October 2010)
- 0 - 500
- 501 - 1000
- 1001 - 1700
- 1701 - 2700
- 2701 - 4779

Landuse
- Open Space

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Orange Line Pierce College Station Accessibility from Feeder Bus System

- Public Facilities
- Residential
- Open Space
- Commercial
- Bike Path
  - 0.25 miles buffer
  - 0.50 miles buffer
- Pierce College Station
- Feeder Bus Station
V. Conclusion

• BRT Bus Feeders Ridership in Proximity with Open Space

The Sepulveda Station is the Orange Line station with the closest proximity with the open spaces. Looking from the GIS map result, it can be concluded that the feeders system through the Sepulveda station does not have the highest ridership. Unexpectedly, open space does not affect the ridership and policy implementation relating the two is not necessary.

• BRT Bus Feeders Ridership in Proximity with Median Income

The map shows that there is a correlation, although not exact, between median income and ridership. The highest the median income is, the lower bus ridership into the area. From this analysis, it can be concluded that people with lower income utilize the bus more frequently. Therefore, the project aiming to increase ridership should be concentrate within those areas of residence. The highest ridership goes to Van Nuys station in Orange Line system. Rationally, it is logical because the Van Nuys station connects BRT Orange Line with BRT Red Line with high ridership. Also, the BRT Red Line runs and serves a lower income community.

• Orange Line Pierce College Station Accessibility from Feeder Bus System

There are several conclusions that can be drawn from the map. First is that there is low access of feeder bus system in Pierce College station because the stops are unevenly distributed. There are high numbers of stops along Winnetka Avenue running from south to north part of the area, but less on the other places. The second one is the bike lane adjacent to Orange Line BRT is disconnected with the surrounding neighborhood because it only serves east to west and doesn’t go into the other part of the neighborhood.

From the three conclusions, it can be determined that the BRT Orange Line ridership is not correlated with proximity open space and highly correlated with median income. Thus, any policy should be more focus on the income level. Also, the focus area of the Pierce College station is disconnected in term of connection to feeder bus system and bike lane system.
VI. Limitation

The limitation of the project is the data availability especially for the daily ridership estimation of the bus feeder system. As the data was collected solely on October 2010 and then divided into daily mean. A recently updated set of data in a longer time series would provide more accurate estimation, thus creating a more reliable map.

If I could do the project with no resource limitation, I would use the most updated data to create the optimum accuracy. Also, I would add the data of accident rate in every intersection in the Pierce College neighborhood to create a more comprehensive result by adding safety issue for my third map. Unfortunately this can’t be done because I wasn’t able to access any data of intersection level.

References:

