Calculating Network Accessibility

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From: Phoebe Rudolph
Subject: Assignment 4
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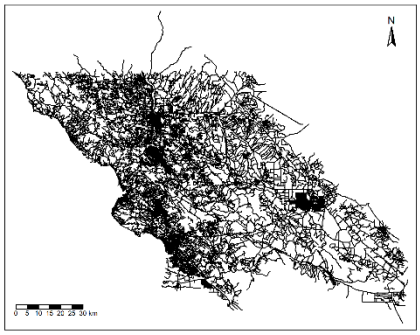
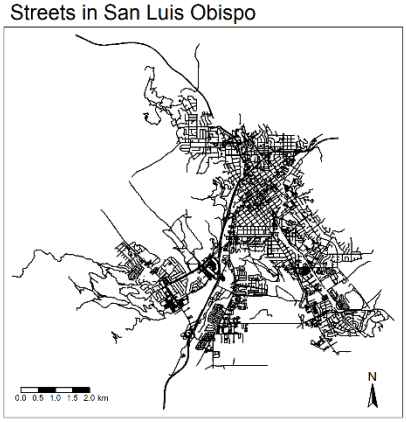
Purpose: To calculate and visualize accessibility using the R5 routing engine developed by Conveyal. In this lab, we analyzed accessibility to schools and transit stops in San Luis Obispo, California. We downloaded San Luis Obispo transit data from SLO Transit's GTFS feed.

Conclusions: To calculate transit accessibility in San Luis Obispo, first we needed to gather our data. We downloaded street data in California, as shown in the map labeled "California Streets". Then, we clipped this data to focus on the San Luis Obispo streets, as in the map "Streets in San Luis Obispo". Next, we loaded the school locations from OpenStreetMap. We can see these seven schools in the map "San Luis Obispo Schools". From this map, we can see that three of the schools in San Luis Obispo are almost right on top of each other, while the other four are more spread out among the city. After that we created a grid over the city and mapped the schools and streets on the grid. This grid is shown in "San Luis Obispo on Grid". Then, we made a map representing the minimum travel time to any school. This map is called "Variation in Travel Time to a School". From this map, we can see that people in the outskirts of San Luis Obispo have much longer travel times to any school. It appears that in most cases, you need to live within a 0.5 mile radius of a school in order to be able to get there in 20 minutes or less.

California Streets

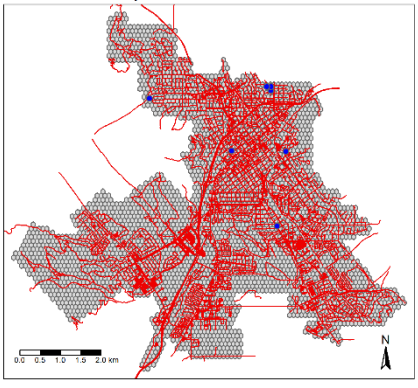


Streets in San Luis Obispo

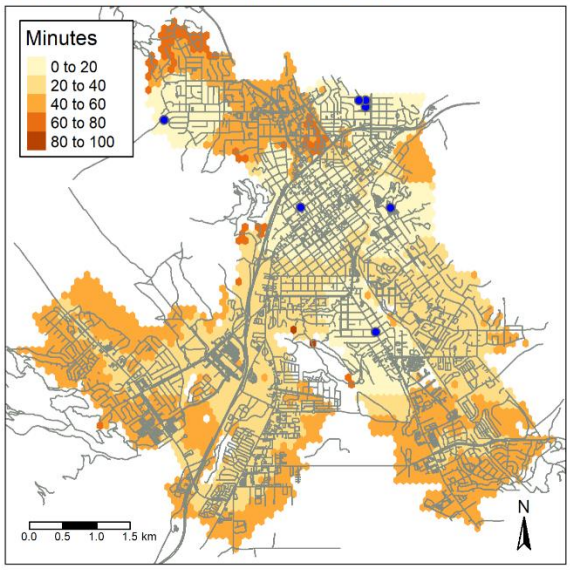


San Luis Obispo Schools

San Luis Obispo on Grid

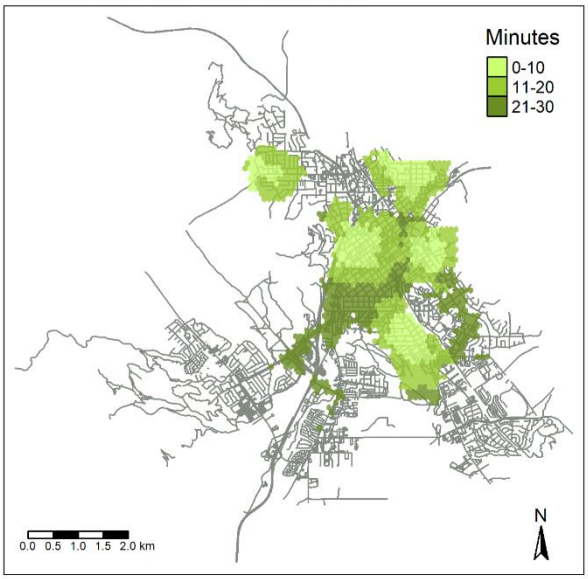


Variation in Travel Time to a School



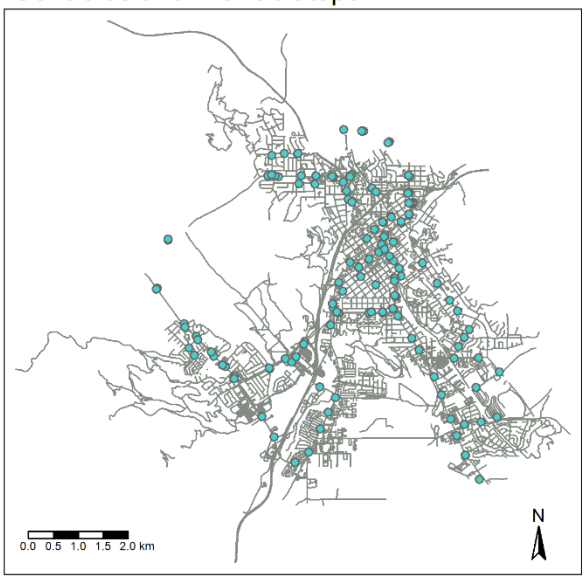
Next we created isochrones by subsetting the grid based on bins of travel times. I separated the time in minutes by increments of 10, so we have 1-10 minutes, 11-20 minutes, and 21-30 minutes as our steps. We can see these isochrones on the map “Isochrones for Travel Times”. We then calculated the areas of these polygons. The area of the 0-10 minute isochrone was 2582357 square meters. The area of the 11-20 minute isochrone was 4531347 square meters. The area of the 21-30 minute isochrone was 3099325 square meters. From these isochrones we can see that there are certain, seemingly random, areas of the city where travel times are much lower than others.

Isochrones for Travel Times



The next step was to calculate accessibility. First, we loaded transit stop locations and created grid cells. We then counted the number of transit stops within each grid cell and created centroids of the grid cells. We mapped this in “Centroids and Transit Stops”. After this we were finally ready to calculate accessibility using the accessibility() function.

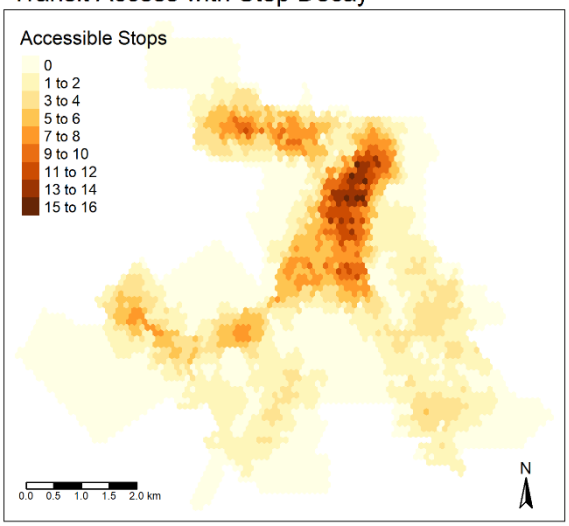
Centroids and Transit Stops



Using step decay function, we mapped accessibility in the map “Transit Access with Step Decay”. Using continuous decay function, we mapped accessibility in the map “Transit Access with Continuous Decay”. Using the step decay function, the data seems more accurate as there are more levels of the accessibility of transit. From these both of these accessibility maps, we can see that the there is a central area of San Luis Obispo that has

the greatest access to transit. From there, the further you go away from the city center, the less available transit becomes.

Transit Access with Step Decay



Transit Access with Continuous Decay