

Transit Data Visualization — Storyboard

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A common problem we have noticed with maps, schedules, and other visualizations of Seattle's mass transit system is that there isn't a good overview of what routes exist, and where they go. For example, the official King County Metro timetables have detailed maps of each route, but they can only be viewed individually. On Google Maps, the opposite is true; you can see all routes by switching to the transit view, but it is a mess of lines with no way to differentiate between routes.

Our goal for this assignment is to visualize all of the public transportation in the Seattle metro area on a map, and then allow users to interactively filter the routes, as broadly or as narrowly as they wish. We think that by providing this more flexible form of interaction, it will make it easier for people to plan trips, explore new places that are connected by transit, find out where local routes lead to, and explore possible transfers.

Data Exploration

For this assignment, we used King County Metro's public transit dataset, which we downloaded from <http://metro.kingcounty.gov/GTFS/>. The dataset includes information about transit in the Seattle area in Google's *General Transit Feed Specification* (GTFS) format. For space efficiency, the dataset is broken up into several files, which can be joined on specific columns to form the dataset in its entirety. Therefore, with a specific goal, analysis is more efficient because one does not need to join all the data files at once. The files are listed below (list is taken directly from the GTFS reference site¹):

- *agency*: the agency or agencies that provide the data
- *calendar*: specifies when a service starts and ends as well as the days of the week it runs
- *calendar_dates*: exceptions to the calendar
- *fare_attributes*: fare information
- *fare_rules*: rules for applying fare information to routes
- *routes*: a group of trips that are displayed to riders as a single service
- *shapes*: rules for drawing lines on a map to represent routes
- *stops*: locations where vehicles pick up or drop off passengers
- *stop_times*: times that a vehicle arrives at and departs from individual stops
- *trips*: trips for each route. A trip is a sequence of two or more stops.

In order to get an idea of the shape of each route, we joined *trips* and *routes* on *route_id* and *trips* and *shapes* on *shape_id*. The figures below were created with Tableau using the latitude and longitude information present in the dataset, and coloring by route. Figure 1 shows the entire dataset, and Figure 2 is a closeup of Seattle and Bellevue. Figure 1 is vaguely interesting but the routes are too close together to be useful to the viewer; Figure 2 shows that the data is not obviously missing any routes.

¹ <https://developers.google.com/transit/gtfs/reference>

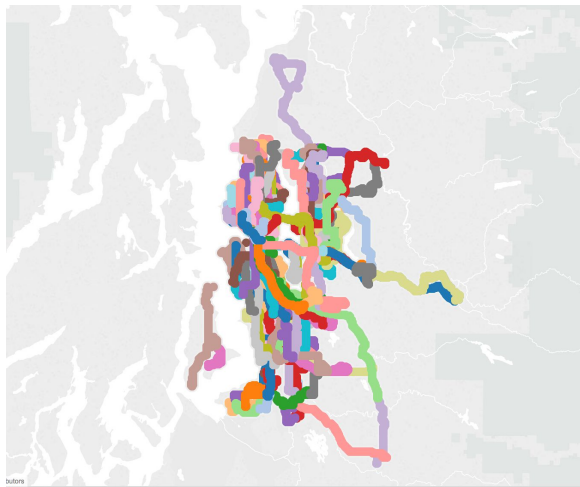


Figure 1: All data

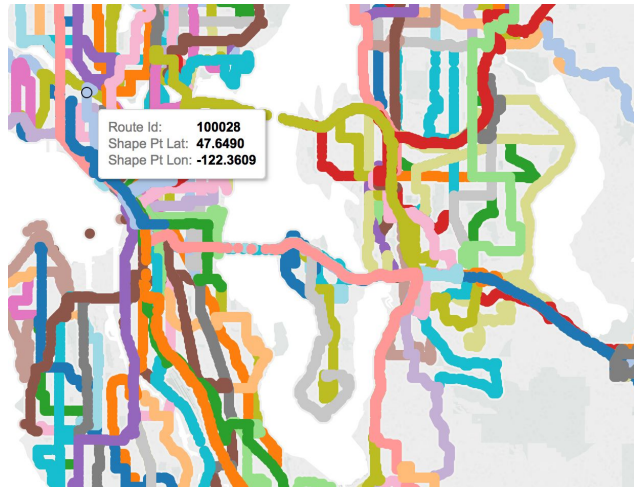


Figure 2: Close-up

Figure 3, a close-up of the Capitol Hill and South Lake Union area, shows all expected bus routes, as well as the changes that took place after the light rail started going to UW. It also shows that the data is *not* continuous lines (as expected, logically), but single points of information that are associated with a route ID. Figure 4 shows that the map contains information about all modes of transit, including ferries!

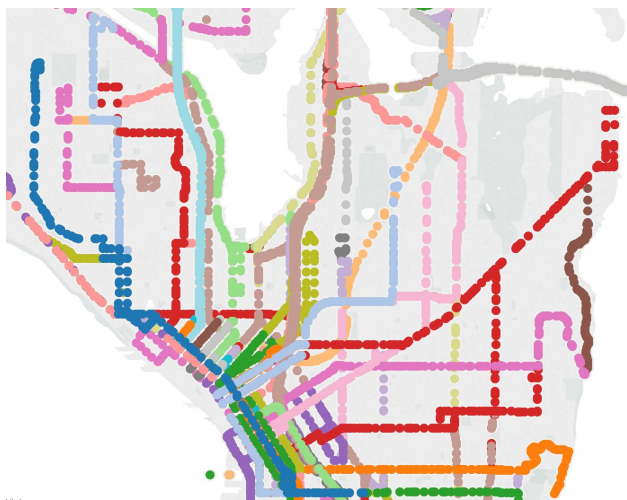


Figure 3: Close-up of Capitol Hill

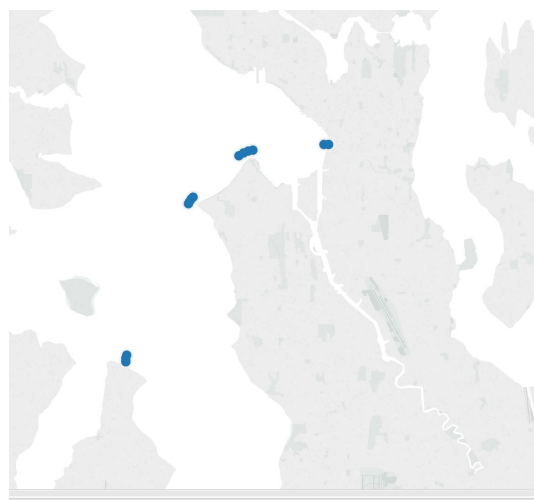
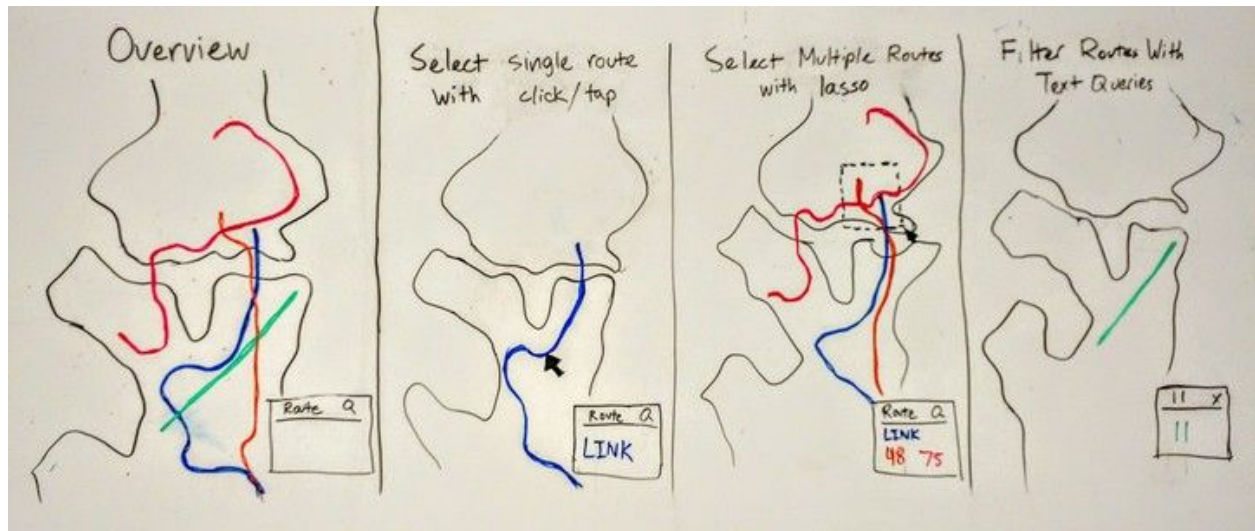


Figure 4: Boat information exists

Planned Interaction Techniques



Figures 5a, b, c, d: Planned visualizations/interactions

Figure 5 shows the features we plan to include. The visualization created by Tableau invites the viewer to click on routes and explore the data in many ways that would be useful to viewers without the overhead of using Tableau. We will use Javascript and D3 to create an interactive visualization that makes this transit data accessible to users in a way that encourages users to learn about transit in Seattle.

The basic visualization, "Overview" (Figure 5a), will be very similar to the map with colored routes created by Tableau, except that the underlying data will be continuous lines representing routes instead of a collection of points. The user will be able to click on a single route (Figure 5b) to remove all other routes and see where the selected route goes, as well as filter by text on the route name (Figure 5d) to find a route by name. The user will also be able to select a region of the map and highlight all the routes that pass through that region (Figure 5c).

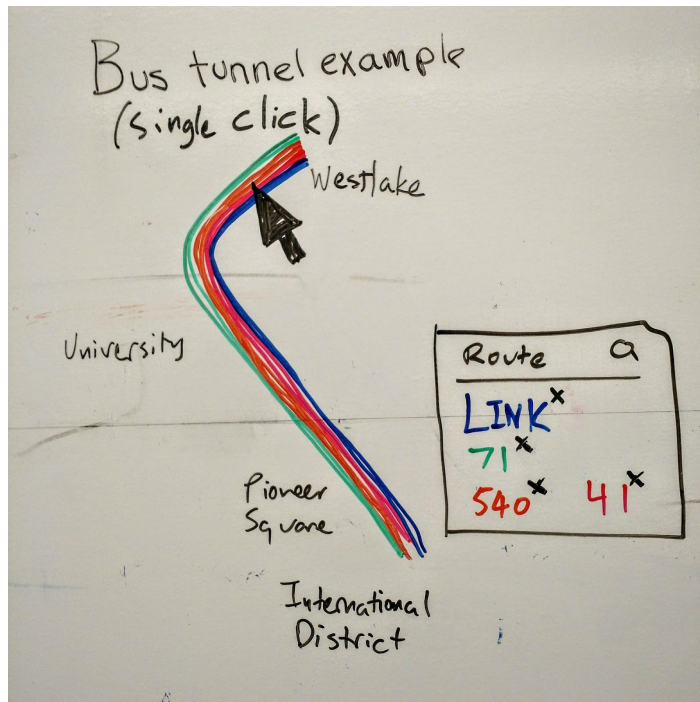


Figure 6: Visualization of a congested area

Figure 6 shows an example of how our interaction will handle a congested area--in this case, the bus/light rail tunnel downtown. Because it will be difficult for a user to click on only one route when multiple routes travel the same streets, the first click on a stop will highlight all routes that stop there. Then, the user will be able to quickly select the route(s) she or he actually wants to see.

Usage Scenarios

One possible way to use this visualization is to see find out which bus routes service your neighborhood. Let's say you just moved to the city, and from using Google Maps, you know which route to take to get to work and back, but you don't have a good idea where all of the buses around your home go. Without our visualization you would have to remember all of the route numbers, and then search them individually on the Metro website. With our visualization you could simply drag a box around your neighborhood, and all of the routes that pass through the box would be highlighted. This lets you see all of the possible destinations that you could reach on one bus.

Another possible usage scenario is as a transit rider who knows one portion of a route very well but wants to see where else the route goes. For example, a commuter who typically rides the same bus to and from work every day may not know what happens if he stays on the bus past his normal stop: does it go to a convenient grocery store? Does it head downtown? Or, does it get on the highway and travel a long ways without stopping? In order to answer these questions, the user simply needs to highlight a route, either by typing in the name or clicking on part of the route.

One more way someone might use this tool is to rapidly look at all of the routes that leave a congested area, like Downtown Seattle. Currently, if you wanted to see where all of the northbound buses

from the bus tunnel go, you would have to look up each route individually on the Metro timetables, and click through multiple buttons to open up the map. In addition, you lose context every time because the abstract map on the timetable shifts positions and markings for streets. Using this visualization, you could either use the text query to rapidly see the course of a list of known routes, without leaving the map, or simply click on the bus tunnel, and see all routes passing through that segment at once.