

Project Title: Uber Moves

Link to the project repository: <https://github.com/han-ngo/Uber-Moves>

Team		
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Background and Motivation.

Most people see every day traffic on their daily routine but often has any clue on the overall traffic. This project provides a visual exploration one can use to find out where and when people hire cabs mostly. This project helps uber driver to see and visualize pickups and place himself in a better place and time for maximum pickups during his work hours.

Project Objectives.

This project is about showing when and where uber pickups were made in New York city for a given month (Eg: April 2014). The primary questions that this project answers –

1. Which places have more pickups?
2. What are the peak timings in a day where most pickups were.
3. Is Uber busy on weekdays or weekends?
4. How busy is uber on the wee hours of a weekday or weekend.
5. For each pickup, tool tip provides the exact location and pickup time on mouse hover.
6. This helps a uber driver place himself in a better position to get maximum pickups.
7. This helps city traffic controllers visualize the movement of FHV(for-hire vehicles) in the city.

Data.

The data will be collected from data.world website.

The data has all the uber pickup information in New York City for a given month (Eg: April 2014). The total number of pickups for just one month is close to 600,000!

The data is in the following format:

- Date/Time : The date and time of the Uber pickup
- Lat : The latitude of the Uber pickup
- Lon : The longitude of the Uber pickup
- Base : The TLC (Taxi & Limousine Commission) base company code affiliated with the Uber pickup

Link to the database:

<https://data.world/data-society/uber-pickups-in-nyc>

Data Processing.

The dataset includes about 600,000 items. It is very large for a serverless website. We will clean up the dataset and save those data in grids to support streaming-based data loading. Each small grid is a single json file. We will only load the data that will appear in our current viewport.

We will build another derived dataset, sampling each hour's total pickup count in a uniformly distributed grid system into one single file. When the viewport of the map is in a large scale, we will use it to display a heat-map.

To retrieve category data of specific geographic position, we will try to do some data preprocessing based on **Here Location Services'** api. It provides an api can return category information with inputting latitude and longitude.

<https://developer.here.com/documentation/places/topics/quick-start-find-text-string.html>

Visualization Design.

Design 1:

The uber pickups will be visualized as follows –

- All the pickup points will be placed on the New York City map as shown below -

UBER MOVES

DAYS: FRI - SUN TIME: 9am - 10am

AM PM
0 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11

MON TUE WED THU FRI SAT SUN

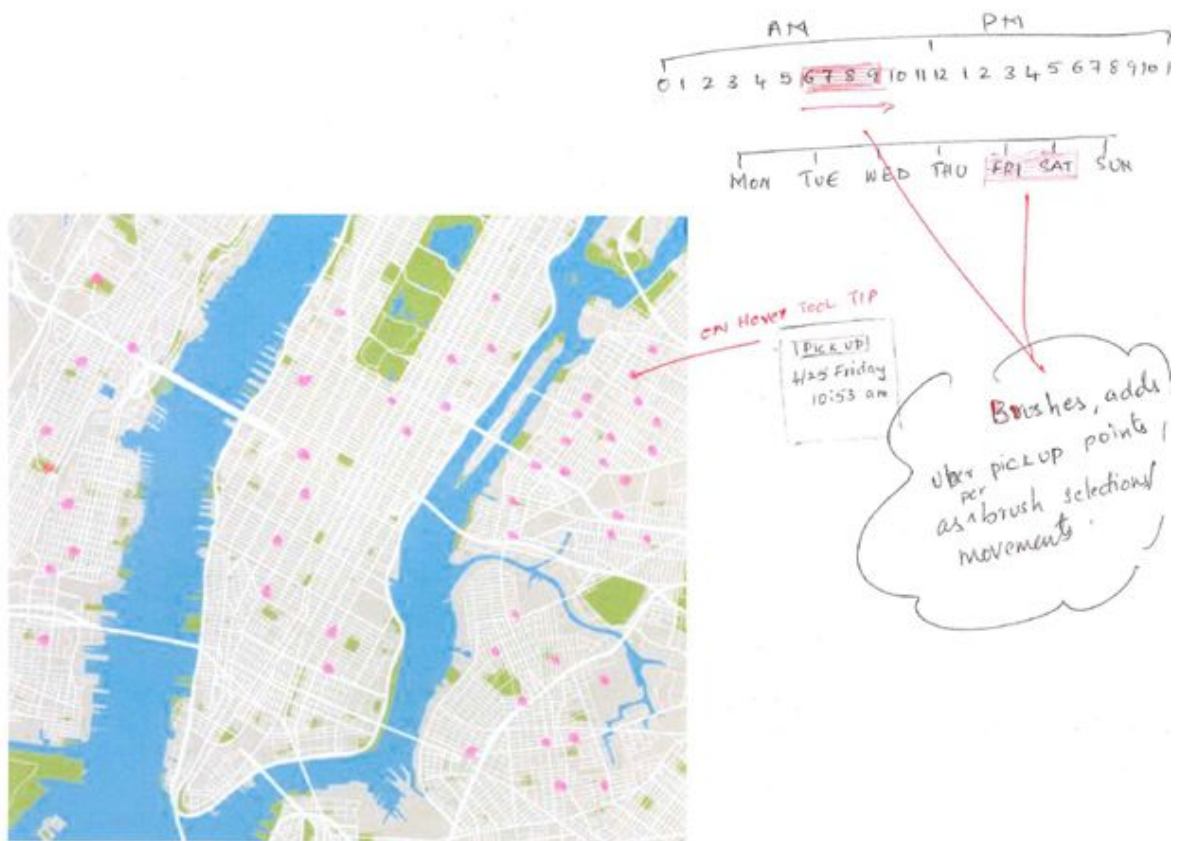


← Shows data for uber pickups for selected day(s)/time

- You can use brushing on either Time or Days of the week. The uber pickup points will show up or disappear on the map based on brushing area. A click anywhere on the Time or Day of the Week axis will undo brushing.
- The header on top of the map shows the selected Days and Time from brushing. By default it will be Days: *All Days* Time: *All time*.
- Any area of interest can be zoomed in by selecting a region. The zoomed map will be shown on the right side of the actual map. A click on the actual map will make the zoomed map disappear.



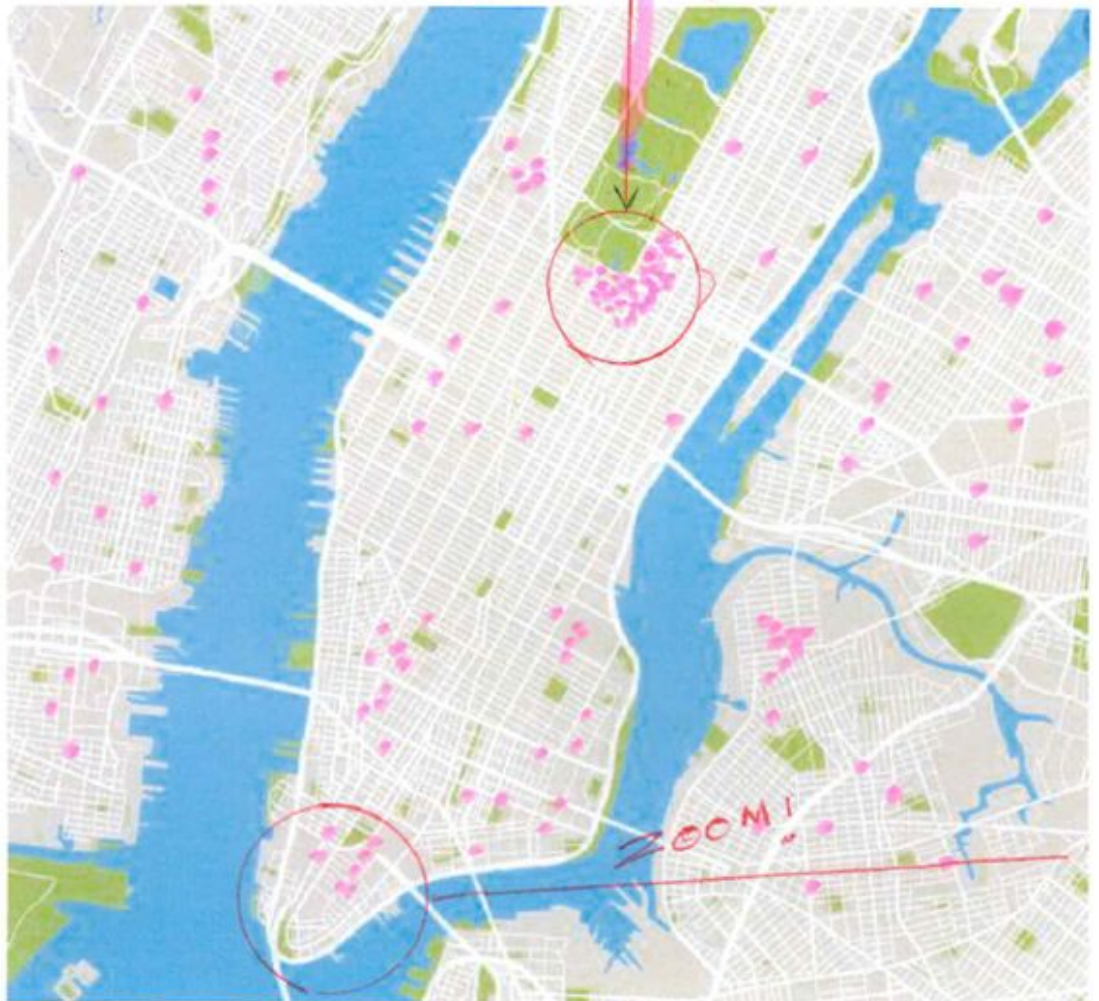
- A tooltip will show the details of an uber pickup point on mouse hover. Tooltip will show all the details of all points if there are multiple pickups from the same location.



- Pickup points will be colored lighter or darker. The color intensity increases if a spot has many uber pickups.

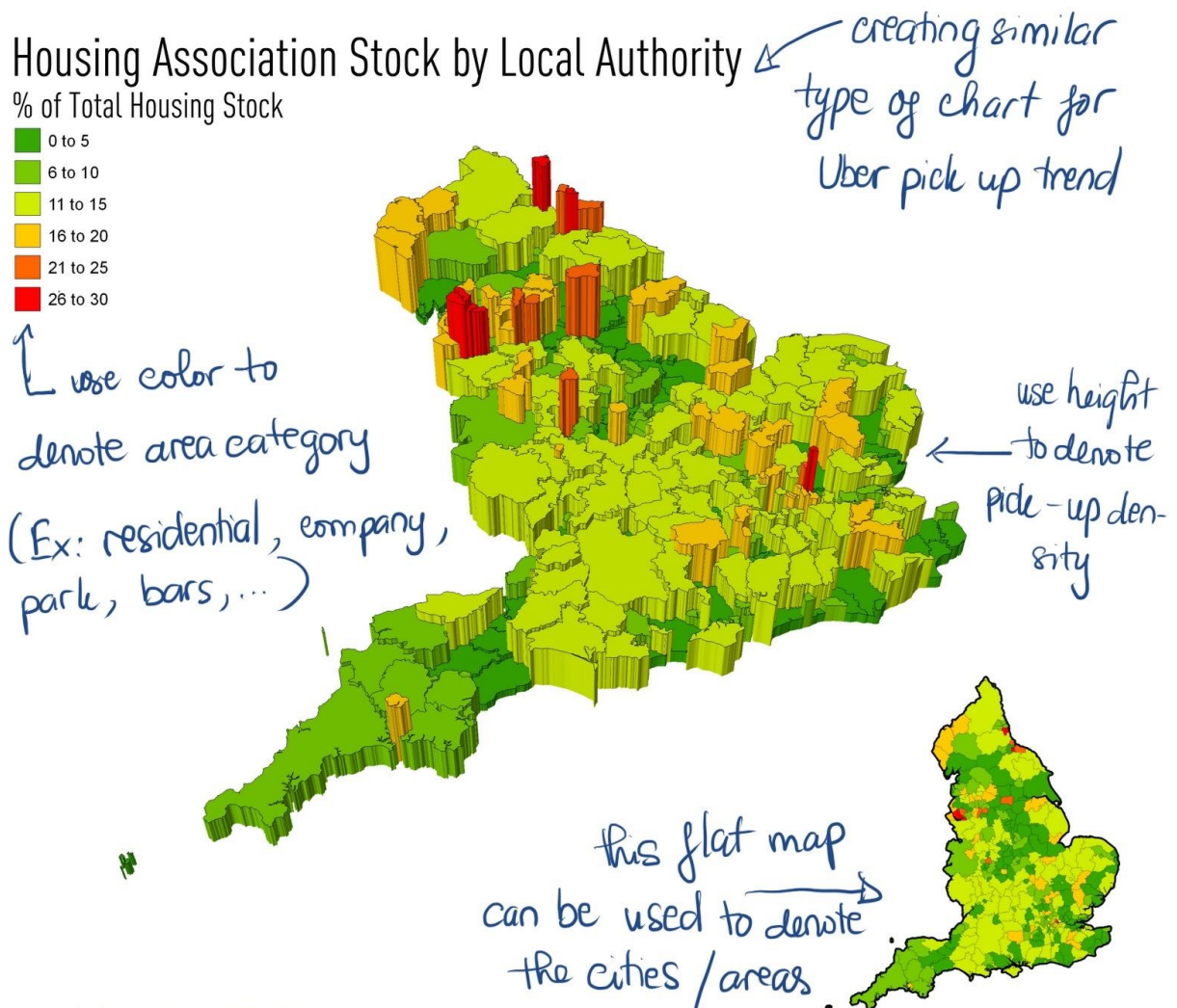
- Story telling - highlighting something interesting in the visualization!

Weekends busy
at park
500 pickups
at this spot!



Design 2:

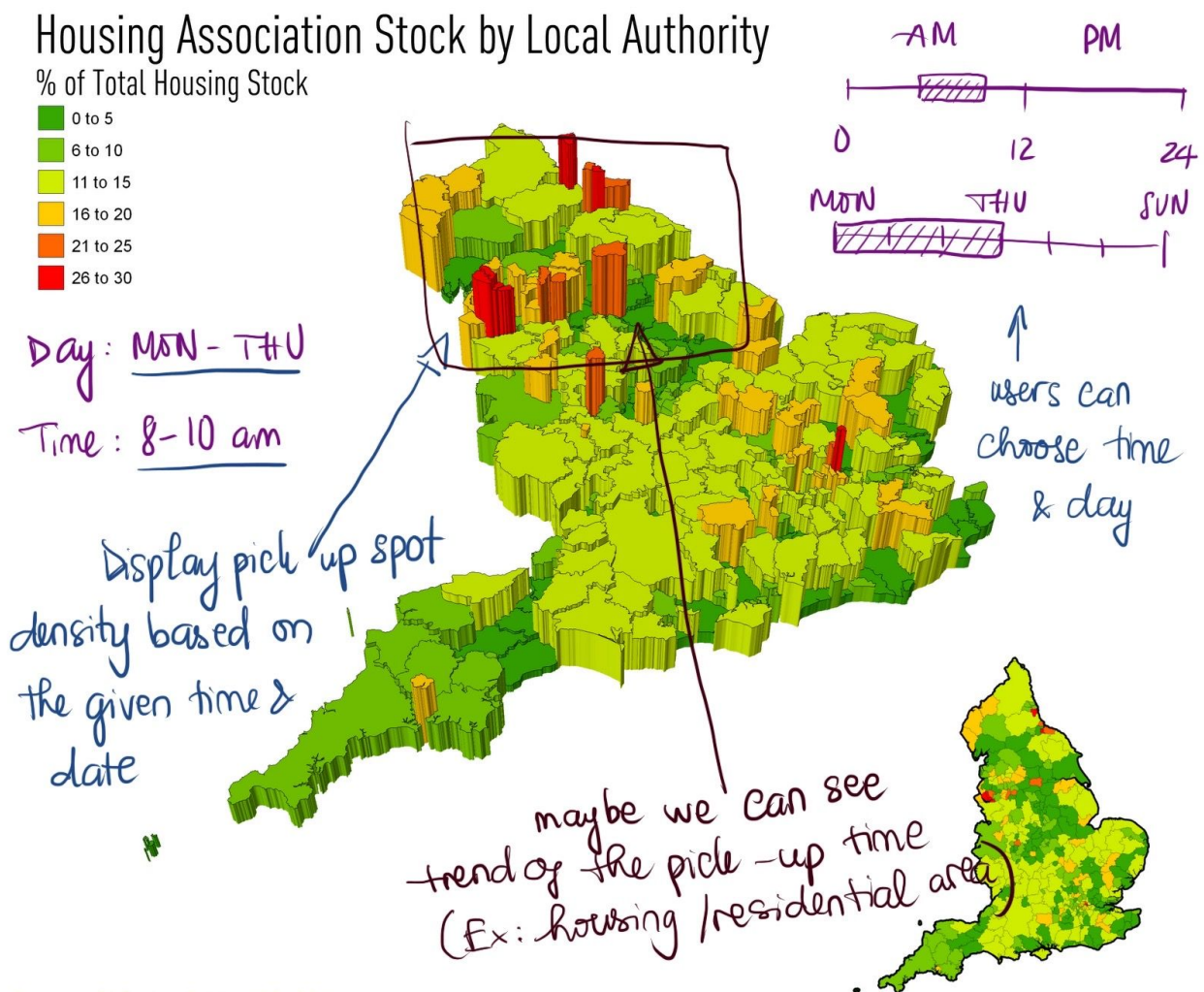
- Another option is using a 3d map visualization as attached below:
 - The height: representing the pick-up density
 - The color: representing area category (Example: schools, residential, work, etc.)
 - The flat map: representing the cities



Source: CLG Live Table 100, 2011

- Pros & Cons:
 - Pros: Can easily get insightful information based on the color and height
 - Cons: Might be hard to incorporate all the different data together. For example, processing longitudes, latitudes, and location category
- Similar to the previous one:
 - You can use brushing on either Time or Days of the week. The uber pickup points will show up or disappear on the map based on brushing area. A click anywhere on the Time or Day of the Week axis will undo brushing.

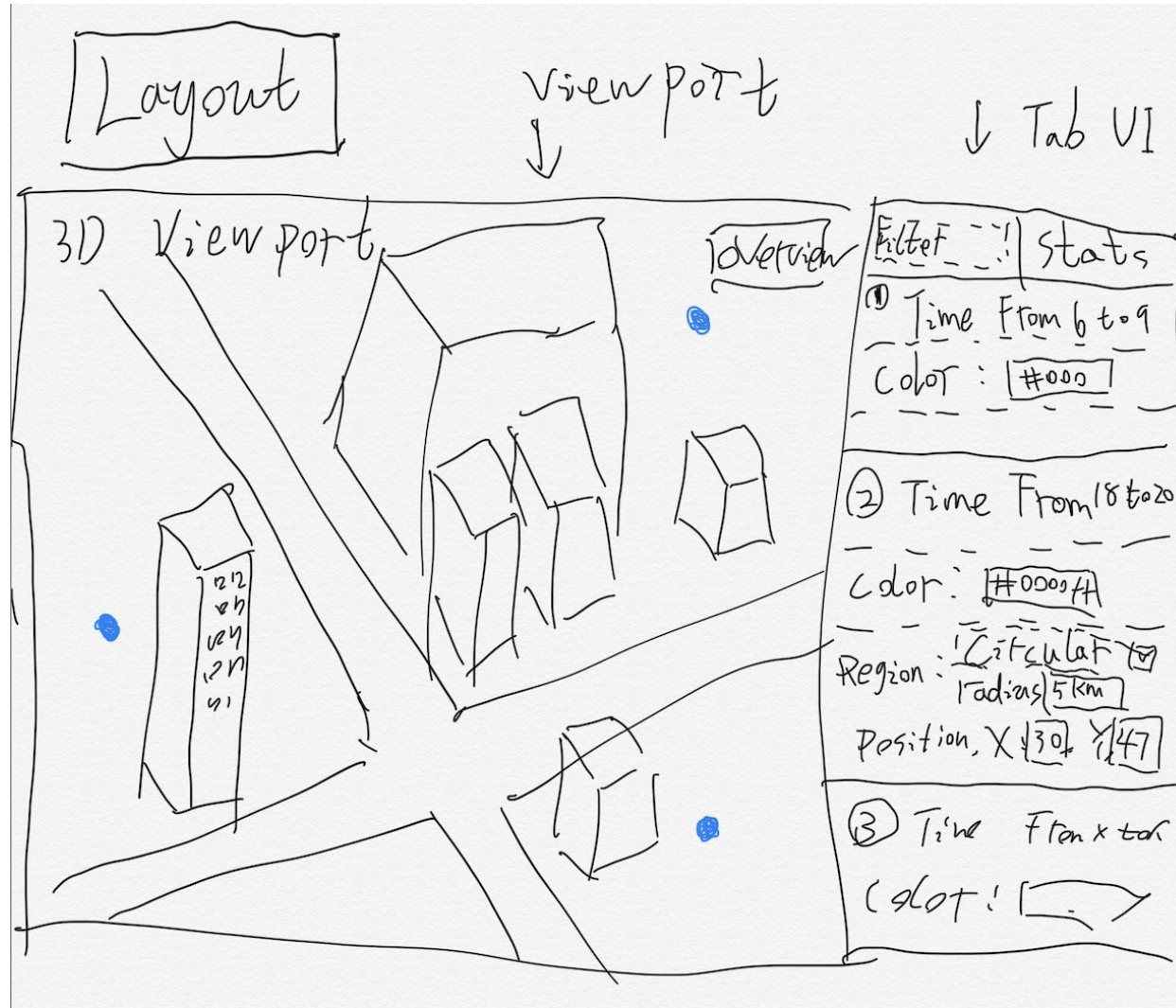
- The header on top of the map shows the selected Days and Time from brushing. By default it will be
 - Days: All Days Time: All times
- Any area of interest can be zoomed in by selecting a region. The zoomed map will be shown on the right side of the actual map. A click on the actual map will make the zoomed map disappear.
- A tool-tip will show the details of an uber pickup point on mouse hover. Tool-tip will show all the details of all points if there are multiple pickups from the same location.
 - Pickup points will be colored lighter or darker. The color intensity increases if a spot has many uber pickups.



Source: CLG Live Table 100, 2011

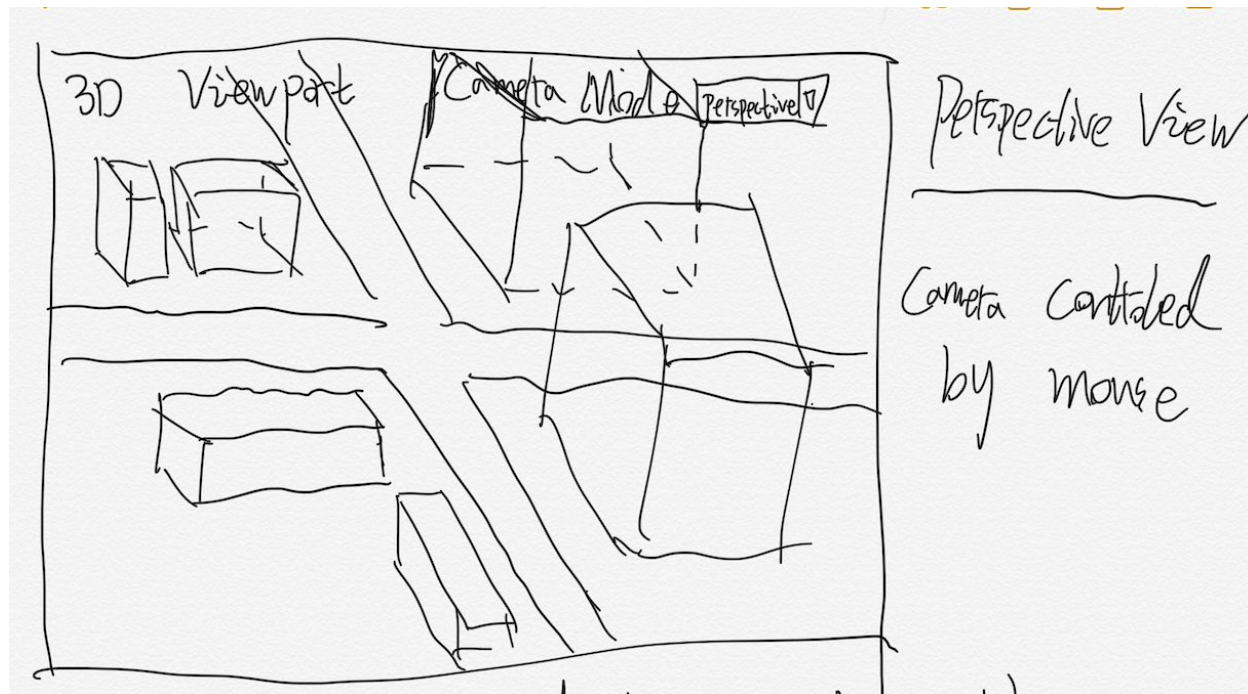
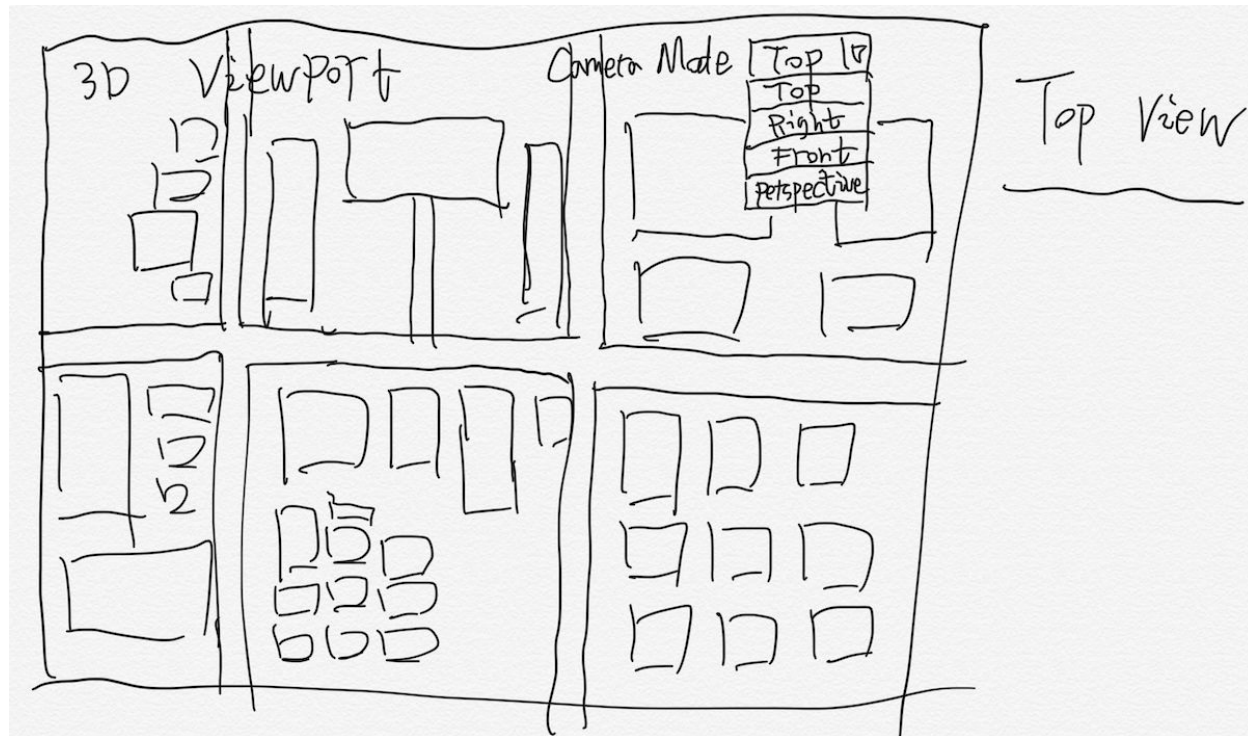
Design 3:

- The third design is mainly different in the operation to choose which data to display in map and how to display in charts.
 - Layout:

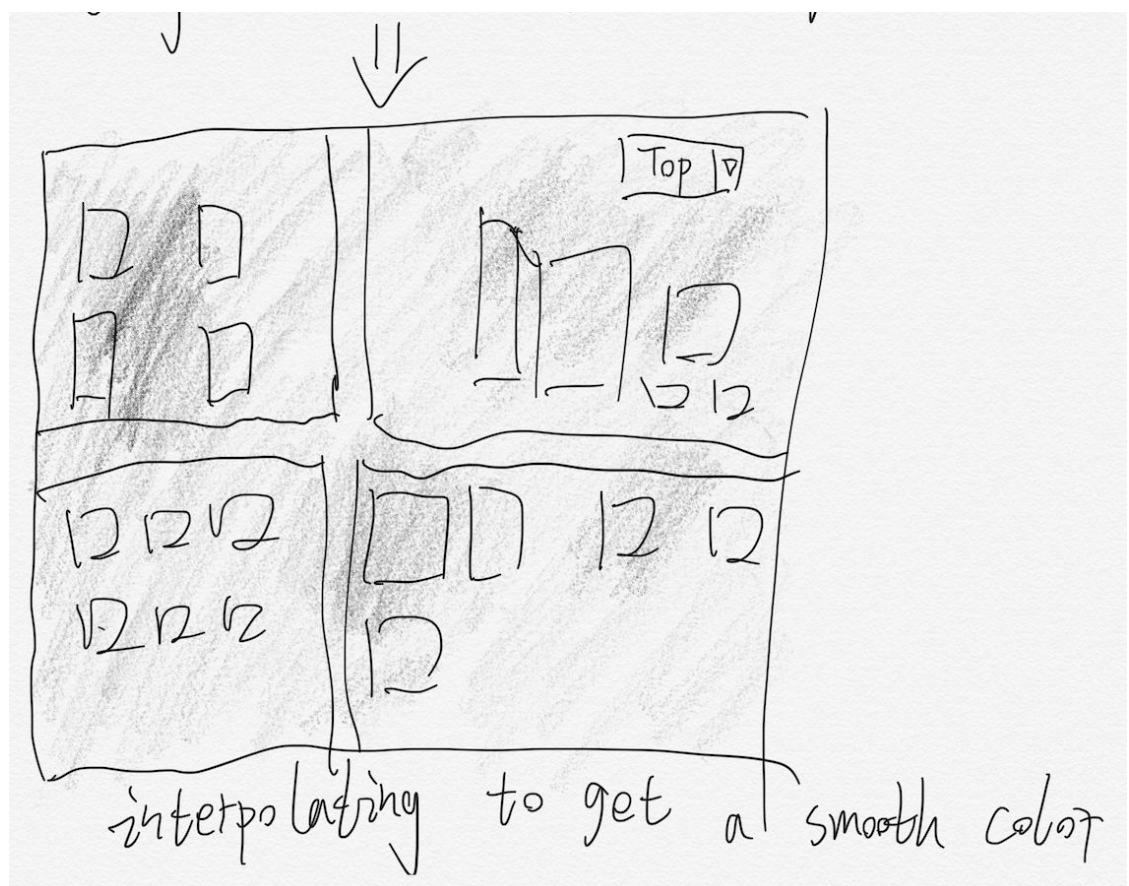
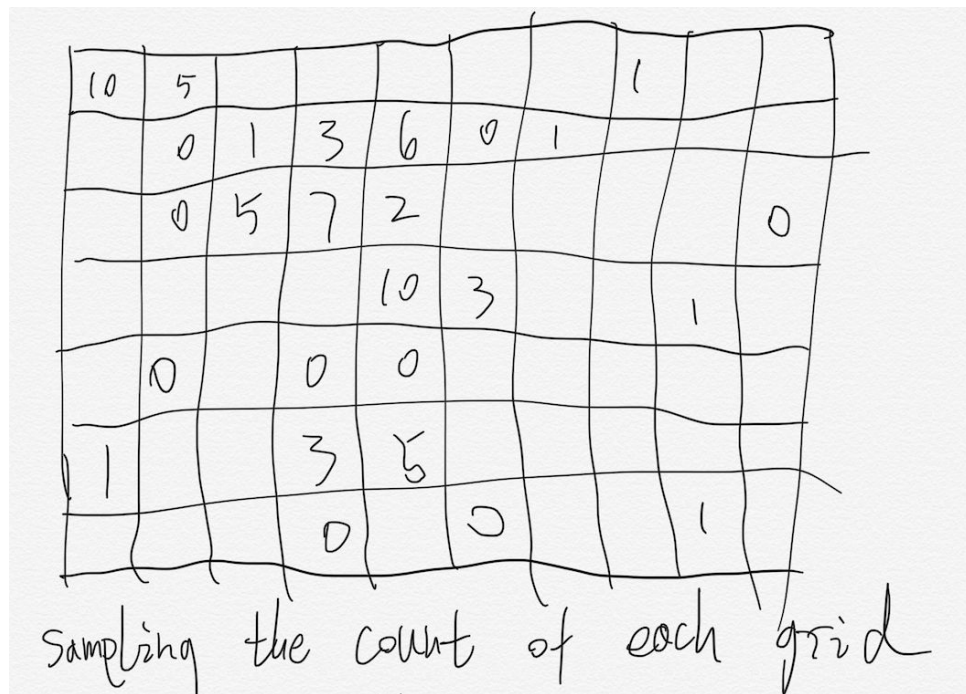


- Pros And Cons
 - Pros: Flexibility for exploring data with different insight via different options.
 - Cons: Take more efforts to learn how to use the tools.
- Focus

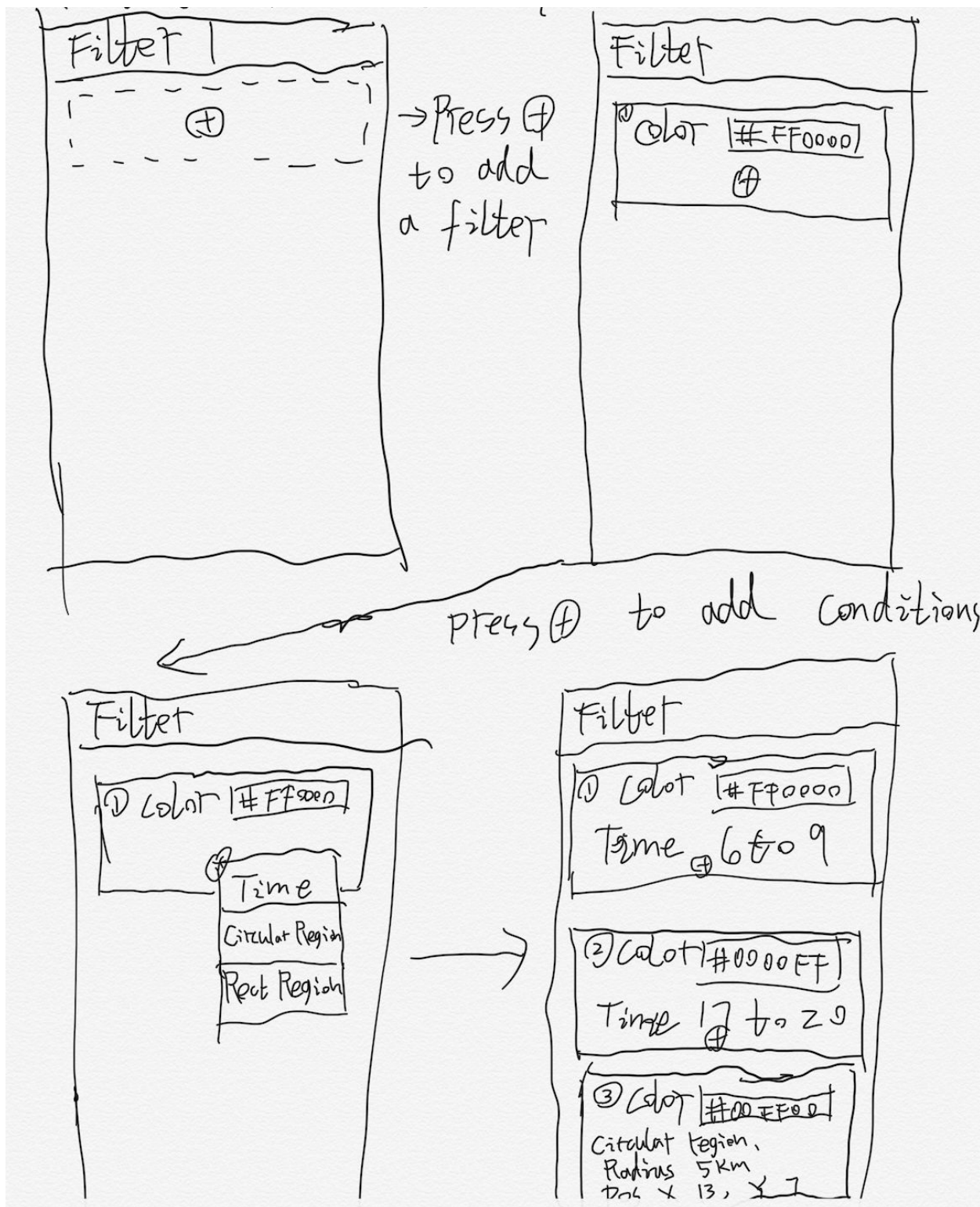
1. There are guide buttons to quickly set camera into a top view to get a flat map or into a perspective view to observe the city map with free direction and position.

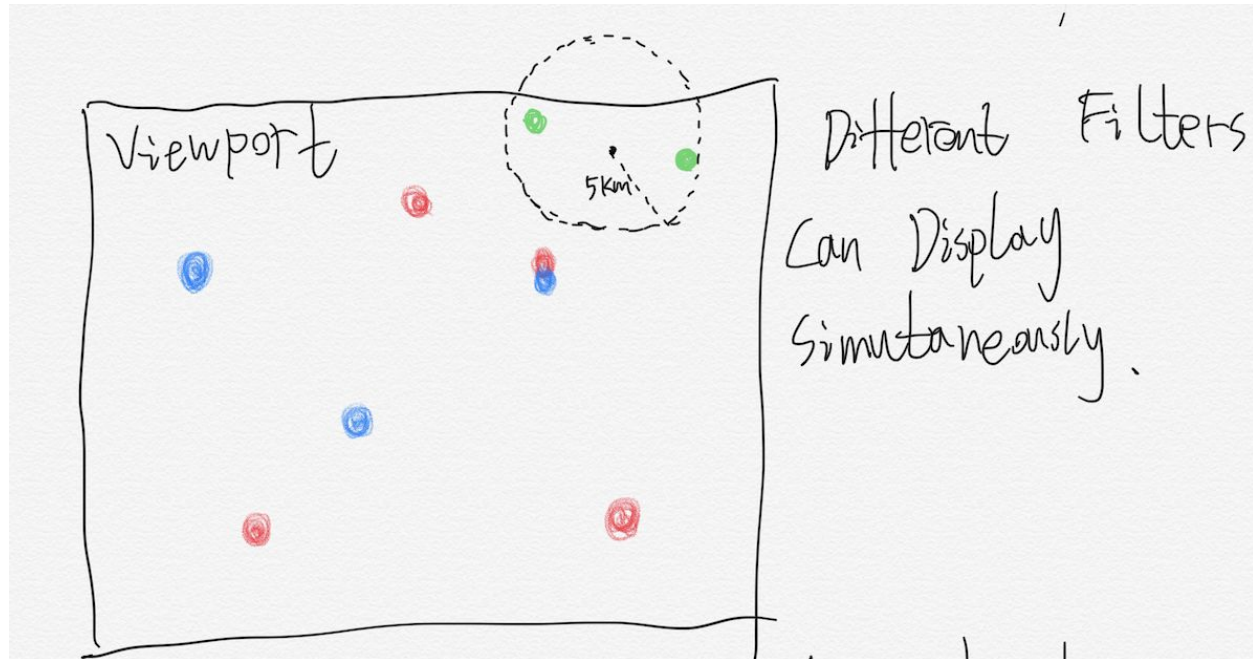


2. Sampling the data rather than directly drawing the point.

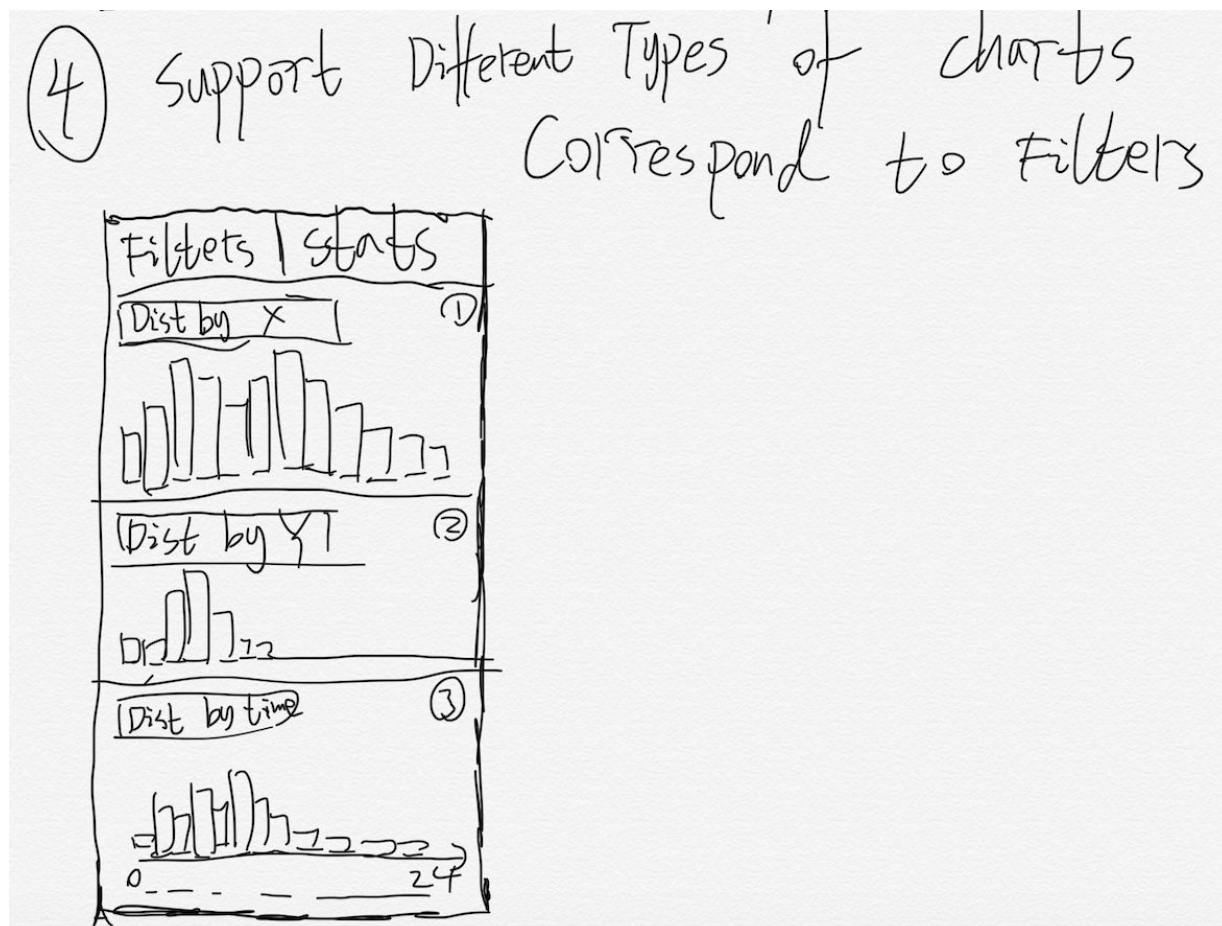


3. Filters with rich options to display different data points.





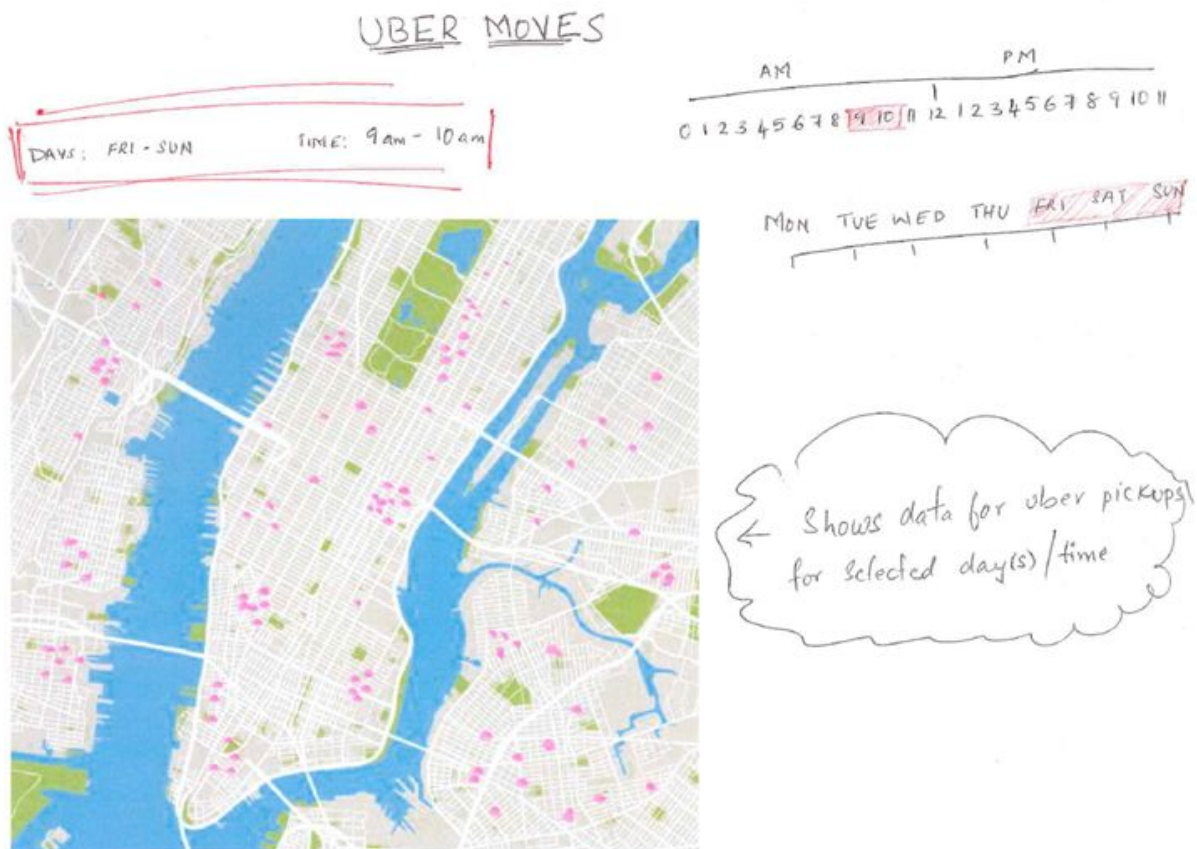
4. Support different types of charts correspond to different filters.



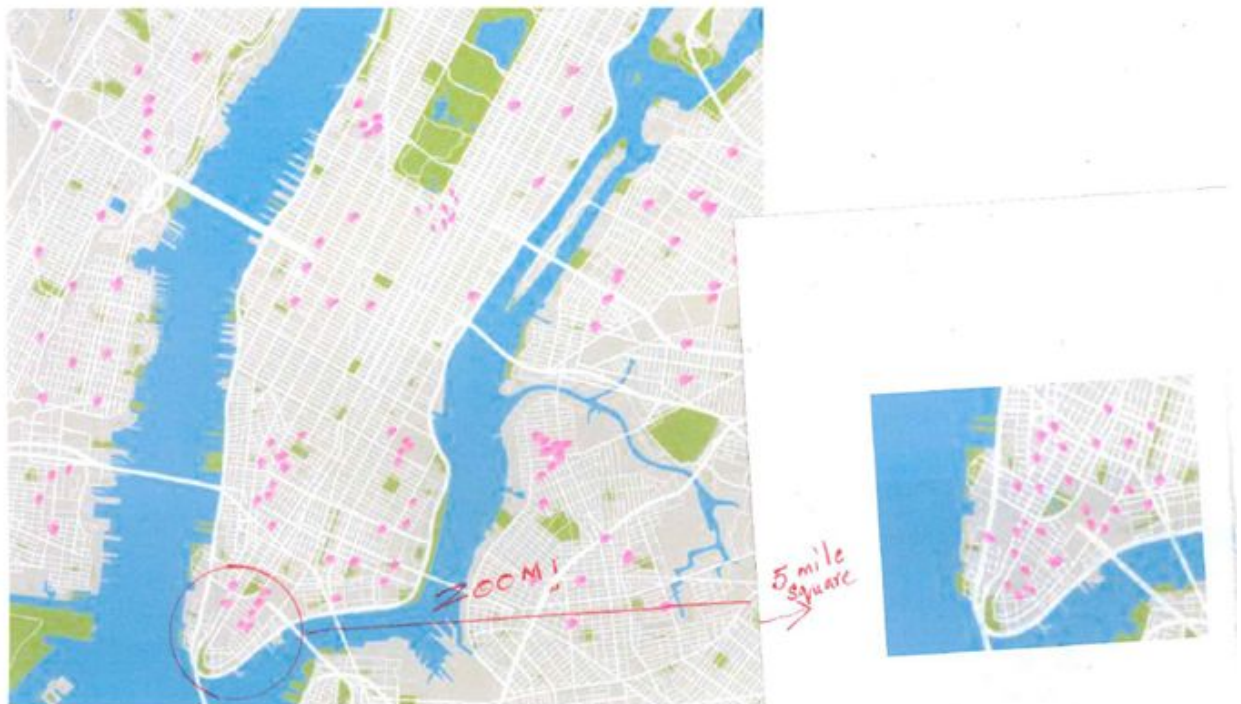
Final Design:

The uber pickups will be visualized as follows –

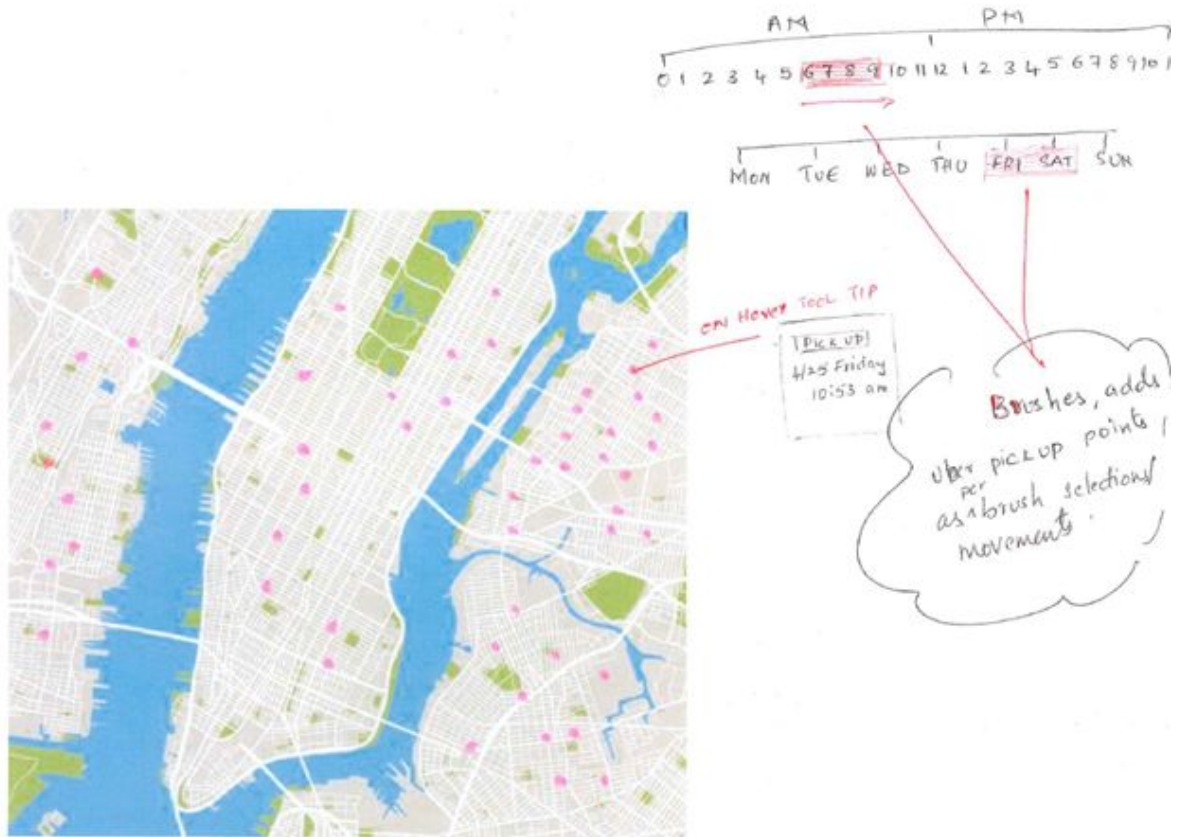
- All the pickup points will be placed on the New York City map as shown below -



- You can use brushing on either Time or Days of the week. The uber pickup points will show up or disappear on the map based on brushing area. A click anywhere on the Time or Day of the Week axis will undo brushing.
- The header on top of the map shows the selected Days and Time from brushing. By default it will be Days: *All Days* Time: *All time*.
- Any area of interest can be zoomed in by selecting a region. The zoomed map will be shown on the right side of the actual map. A click on the actual map will make the zoomed map disappear.

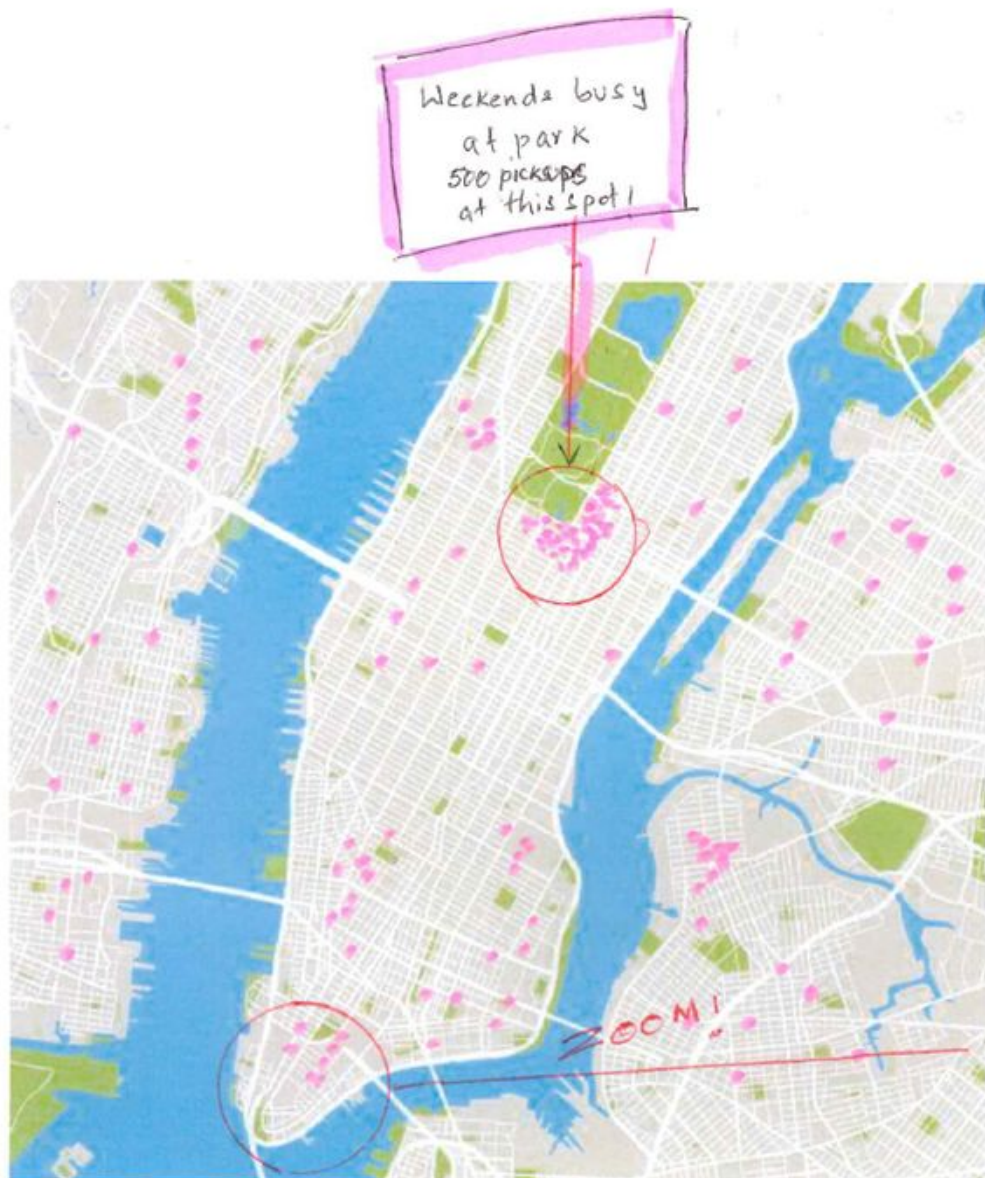


- A tooltip will show the details of an uber pickup point on mouse hover. Tooltip will show all the details of all points if there are multiple pickups from the same location.

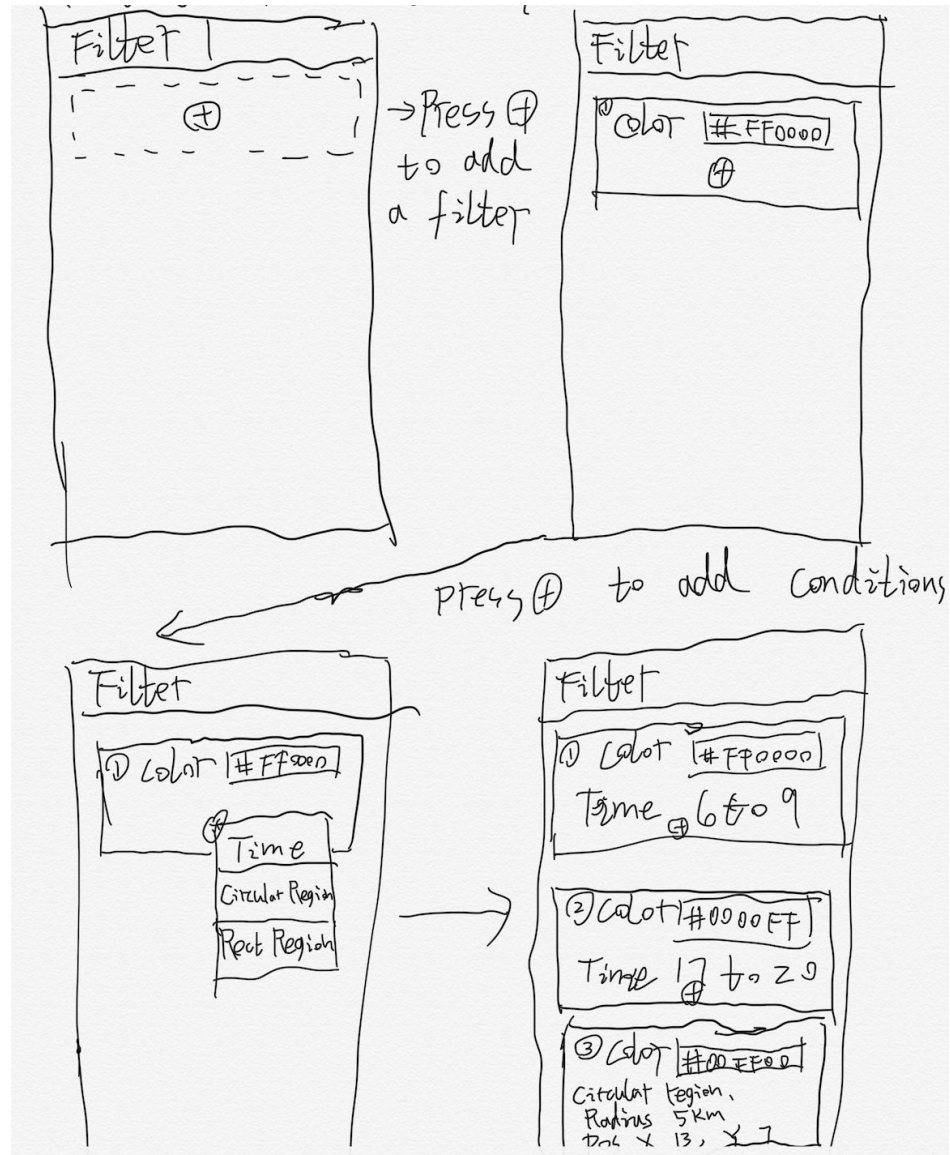


- Pickup points will be colored lighter or darker. The color intensity increases if a spot has many uber pickups.

Story telling - highlighting something interesting in the visualization!



Support User-Defined Filters

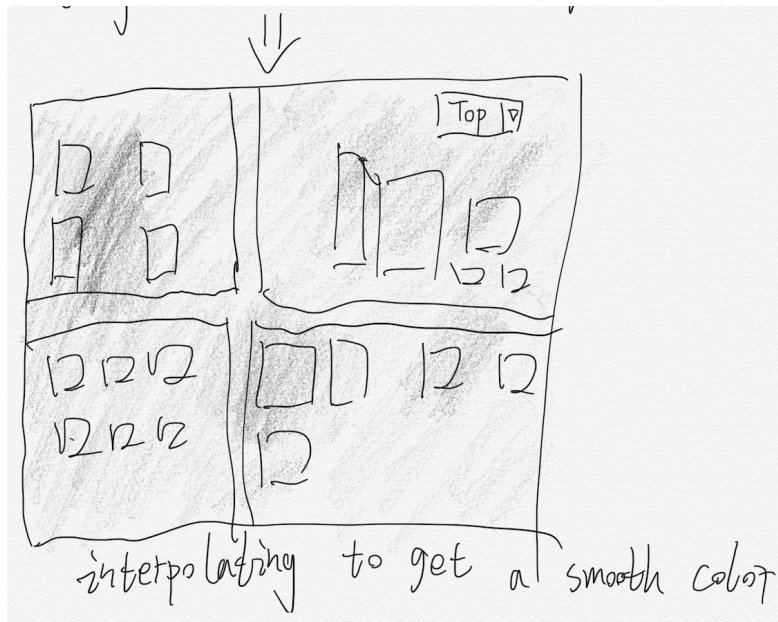
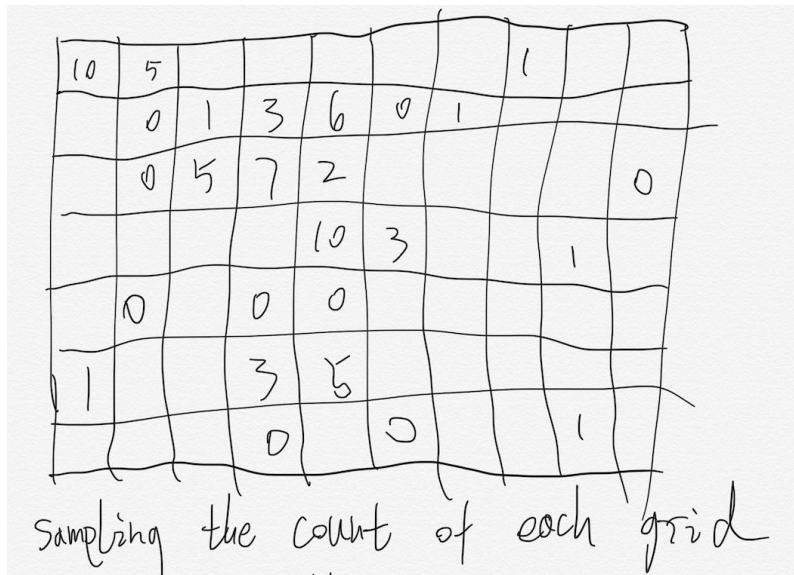


Support User-Defined stats visualization that correspond to the filters

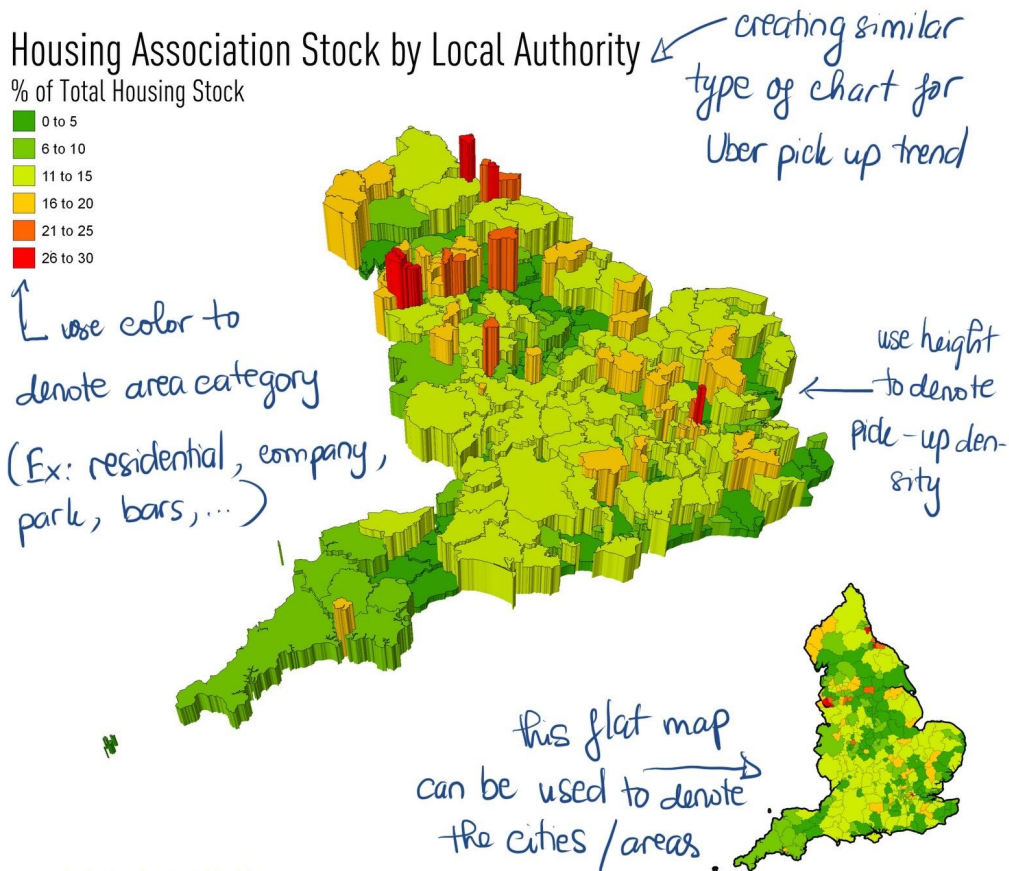
(4) Support Different Types of charts
Correspond to filters



- When the viewport is very large, sampling the data rather than directly drawing the point.



- Support 3D map view as an option which coexists with 2d map.



Source: CLG Live Table 100, 2011

Must-Have Features.

- Map of New York City filled with uber pickups shown as circles. More number of pickups from a location, darker the circle color.
- Brushing on time and days of the week.
- Tooltip showing pickup point information.
- Header section showing the brushing Days/Time selections.
- Storytelling – highlighting something interesting in the visualization.

Optional Features.

- Zoom into a local region
- User-Defined Stats Visualization corresponds to User-Defined Filters
- Encoding Category Data into our visualization
- 3D Map, 3D is complex and unjustified, need carefully design.

Project Schedule.

Project Schedule					
Work item	Week	Start Date	Planned Completion	Resource	Member
Write the experimental code to check the possibility to get the category data vis preprocessing.	1	10/28/2019	11/3/2019		Tianyu Li
Build the basic structure of the project, Including some basic scripts files, html files, css files, necessary data structures.	1	10/28/2019	11/3/2019		Tianyu Li, Mia Ngo, Dayanidhi Tandra
Finish the layout part of the project so that then we can do different modules at the same time.	1	10/28/2019	11/3/1019		Tianyu Li
Start to do the different modules based on provided interfaces.	2	11/4/2019	11/10/2019		Dayanidhi Tandra, Mia Ngo, Tianyu Li
Process Book Writing	2	11/4/2019	11/10/2019		Dayanidhi Tandra, Mia Ngo, Tianyu Li
Map of New York City filled with uber pickups shown as circles. More number of pickups	2	11/4/2019	11/10/2019		TBD

from a location, darker the circle color.					
Header section showing the brushing Days/Time selections.	3	11/11/2019	11/17/2019		TBD
Brushing on time and days of the week.	3	11/11/2019	11/17/2019		TBD
Tooltip showing pickup point information.	3	11/11/2019	11/17/2019		TBD
Storytelling – highlighting something interesting in the visualization.	3	11/11/2019	11/17/2019		TBD
Zoom - Zooming into local region.	4	11/18/2019	11/24/2019		TBD
Code Review	4	11/18/2019	11/24/2019		TBD
Testing	4	11/18/2019	11/24/2019		TBD