Visualization of Housing Sales Price in the Great Seattle Area

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ABSTRACT

In this project we combined Google Map API and D3 to create a visualization demonstrating the housing price change in the Great Seattle Area. Map is used to show the housing price information at different zip code locations. For each location, we used line chart to show the time series of changes in median housing price per sq. ft. from 1996-2016. Histogram was used to show the distribution of median house price in the current time and the housing price for the current zip code is indicated by a vertical line. Our visualization helps users in three perspectives: 1. compare the housing price in different area. 2. look at the historical change of housing price. 3. make decision in buying houses based on the price information.

Author Keywords

Google map API, D3, time-seris,Distribution, Decision making

INTRODUCTION

In the recent 20 years, the median housing sales pricing in the greater Seattle area has fluctuated dramatically. During, $1996 \sim 2007$, there was a steady growth in housing price. However, during the financial crisis in 2008, the median housing price in Greater Seattle area has shrank nearly 30% percent. In recent 5 years, the housing market has been gradually recovered from financial crisis. Recently, the housing price has increase by 50% and exceed the price before the financial crisis.

Along side with the housing price, there is a booming of IT industries in Great Seattle Area. Besides big companies like Microsoft and Amazon, Many start-ups choose their location to be in Greater Seattle Area. As a consequence, Seattle has a annual population growth rate of 2.8% each year, which is the fastest among all cities in United States. With more people moving to Seattle in the recent years, it is time to use the power of visualization to demonstrate the housing price. In this project our goal is to explore the housing sales price in greater Seattle area in the past 20 years. The data are available on Zillow website: `http://www.zillow.com/research/data/`. The data contains median for different types of housing (condo, studio, one bedroom apartment and etc) in city level, county level, zip code level and neighborhood level. We hope our project can help people making decisions on buying or renting a house.

RELATED WORK

Seattle Bubble

Seattle Bubble (`http://seattlebubble.com/blog/`) is a blog that contains recent news, articles and visualizations related to housing price. Seattle Bubble website mainly uses barplot and line chart to visualize housing price in Seattle. The most common visualization in Seattle bubble website is linear chart and bar plot. Line chart is usuasally used to represent the time seris change of housing price. The article Case-Shiller: Seattle Home Prices Surpass 2007 Peak uses linear chart to show the year over year change in Case-Shiller HPI vs time. The article draws the conclusion that the housing price has excceed the housing price before financial crsis. Barplot is used to compare the current month over month change in Case-Shiller HPI in multiple areas, such as San Francisco, Dallas, and etc. The barplot clearly shows that Seattle has the largest Case-Shiller HPI change.

However, Seattle Bubble website mostly focuses on comparing housing price in Great Seattle Area with that from other area. There's no comparision of the housing price in dfferent location within Great Seattle Area.

Zillow Website

Zillow website is a website mainly for housing sales and housing rentals. In zillow website, map is used to visualize the price and other informations related to each house. Although Zillow website is good at visualizing individual housing price, there is no historical information about the housing price. Nowadays, many people buy houses for investment and the price changing information is another key factor for them to make decisions. It would be better if the visualization can show the housing price changing information.

METHODS

Our visualization tries to address two of the most important questions for house buyers.

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- How is the housing value of this area comparing to its neighbors?
- What is the trend of the housing price in time?

To answer these two questions, we think a combination of map and line chart should work. Map is always successful in showing the spatial correlation. The figure belows are story boards we created in Tableau.

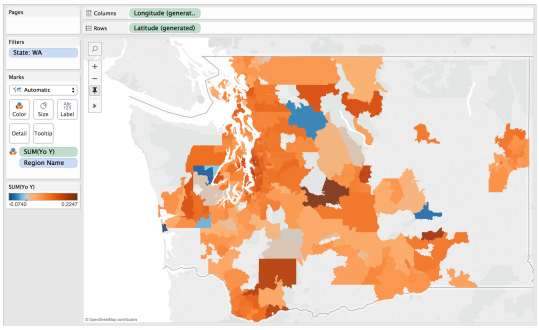

Figure 1. Map representation of the housing price created by Tableau. Oringe implies an increasing in the housing value, while blue inplies decreases.

We believe the most important information in housing price changes is whether its increasing or not, so we simplify the information shown on the map to be binary. Our design will have 2 type of icons that deliver the changing information. Furthermore, we create a animated sliding window with analytical graphs for those who want to learn more about the area.

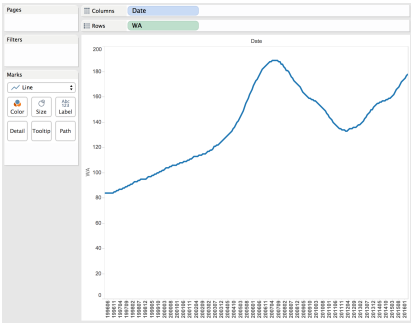

Figure 2. Line chart representation of the aggrigated housing price of WA created by Tableau.

Line chart is a good way of presenting temporal trend of the housing price. Since we have data all the way back to 1996, we could show the long term variations. The line chart example above is an aggregated version based all the whole Washington state, and in our visualization, we will break it into smaller area. With some experiment, we think it most appropriate to create our project based at the zip code level.

Result

- customize Google Map API

  Google Map API is a perfect starting point for this project. Its widely used in a variety of applications, so the user will master basic operations in no time. The drag and zoom functionalities allow users to focus on area theyd like to explore. We add customized features to demonstrate changes in the housing values. The style of the Google Map has been tuned for clarification and intuitiveness. For example, except important highways that house buyers might be interested in, we gray out roads to make them less visible. The center of the map is set to downtown Seattle, and the scale is properly chosen so that major areas are included. The whole theme is light and comfort, and it will not interfere with the features we add. Furthermore, we enhance the marker object in Google Map API by customize the icon, color and animation to better serve our purpose. Now the icon has two forms - an up-pointing arrow in green and a down-pointing arrow in red - that represents the housing price changes in the neighboring area. When the user moves the cursor to a marker, an info window will show up that displays the exact changes in percentage with respect to last month. Furthermore, we utilize the search box to interact with our customized markers, and each marker is clickable with a bouncing animation.

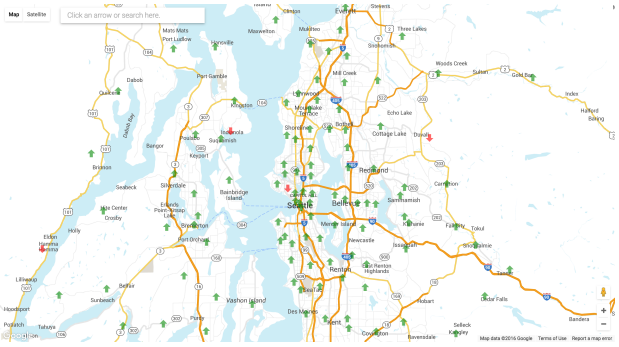

Figure 3. Initial view of the website, with markers and animations.

- Design interactive slide window

  Once a marker is clicked, the map will be centered at its latitude and longitude. In addition, a window displaying analytical information and graphs will slide out from the left side. This is done using the slidereveal library in JavaScript [1]. The sliding window will push the whole map to the right, but the clicked marker will not be lost. User could still interact with the map, and click other markers - information in the window will be updated accordingly.

- Adding data analysis plot

  Statistical summaries been show is very selective. We need to make sure users got the information they are looking for, but not overwhelmed by graphs at the same time. For the purpose of our visualization, we want to emphasis both short- and long- term changes in housing price. 3 sentences of summary are given right after the title. Line chart is very good at showing trends, and the median price per square-foot is plotted from 1996 to 2016. Finally, we draw a histogram of price per Sq. Ft. to illustrate the relative value with respect to the whole Washington state. Vertical line indicate the housing price at current location.

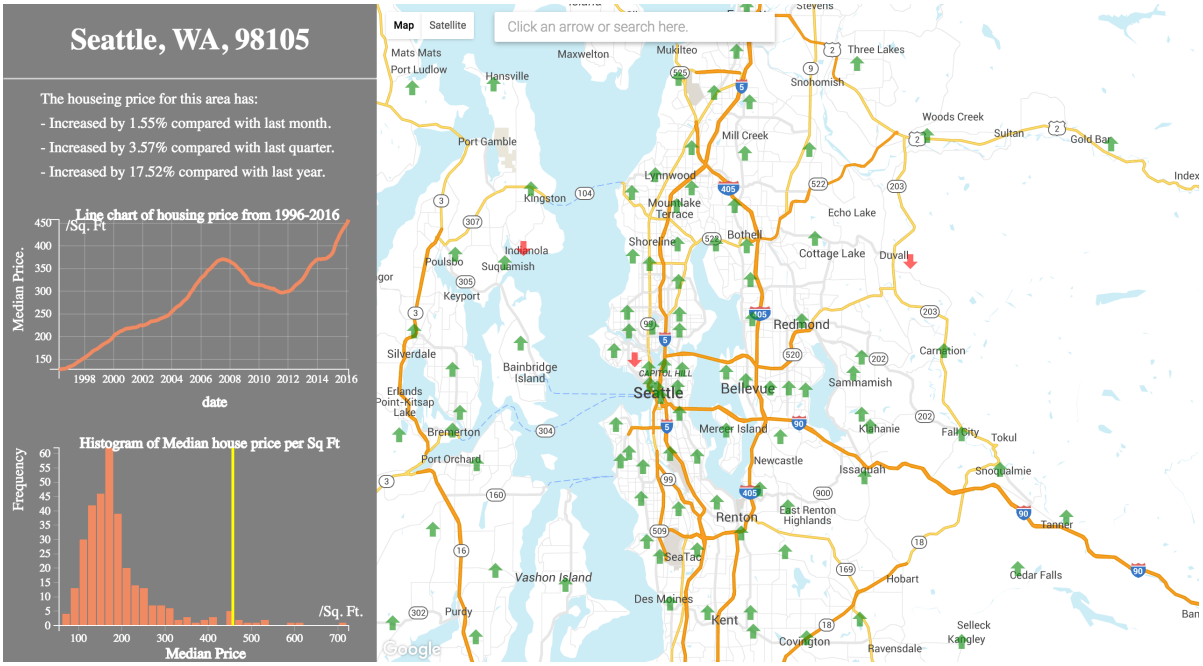

Figure 4. View when a marker is clicked.

Discussion

A lot of people were interested in our project during the poster session, and we think the main reasons are:

- We are addressing a popular topic that everyone is interested in.
- The design of map visualization and the bouncing arrow is eye catching and fun to play.
- The final output is visually clear and people could understand whats going on easily.

Different from the visualizations on Zillows website, our project focus more on changes. Right from the start, arrows on the map represent changes. The bouncing animation works very well with both up and down arrows.

Our visualization is successful in terms of answering the two questions at the beginning of the report, but people want to know more. We received some very good advices. For example, it would be nice if one can slide back in time and change the map visualization accordingly. Another person is interested in not only information of one location, but a bound of them. It would be nice if the analytical graph could be updated for multiple markers instead of redrew.

Future Work

1. Visualization for housing price with different types:

   Zillow website has median housing price for different type of houses such as condo, studio, one bedroom apartment and etc. For one zip code area, on the slide window, we can add a select box to to show the housing price for different housing type. Besides, it would be more interesting to include the zip code level housing rental price. We can transform the sales price data and rental price data (e.g. rental price/ housing price) to see if it is better to buy a house or rent a house.

2. Highlighting zip code area:

   Also a color map is messy to visualization, for zip code in the map, it would still be better to highlight the area associate with the zip code. One the mouse is over the arrow associated to the zip code, aera will be hightlighted. the highlighted color or opacity may correspond to the housing current housing price.

3. Data combination and aggregation:

   Currently our visualization only show the a single line for each area. It would be better if we can combine the information from mulitiple zip code areas. We can use the mouse to select a range of adjacent zip code area and compare the housing price change information. Also, it would be more interesting to do data aggregation. For example, want is the calculate the median, maximum, average for the multiple selected zip code area.

4. Adding other factors to the map

   Housing price changes depends on lots of factors. Common factors are school, company and crimal rate. It would be more interesting if we can add those factors into the map. For example, we can highlight big companies such as Microsoft and Amazon. Also, we can add a layer of criminal rate color map to see the correlation between housing price and criminal rate.

5. A generalization to other areas:

   For this project, our focus is on the great Seattle Area, at a zip code level. On Zillows website, one could find

housing data of the whole US, at state, city, zip code and neighborhood level. To refine this project, we might expand our domain to the whole states, and show different level of data with respect to the perspective of the user.

6. Other works:

   The arrows are not displaced on the map all together. When a user enters our website, the icon is dropping one after another with a short delay. This is done again by utilizing the animation feature of the marker in Google Map API. One could set the delay time, and the order of dropping is the zip code order in the data file. Presumably, one could order the data file in advance so that the appearing sequence includes a meaningful information. For example, the data could be order by the percent increase of the housing price, so that areas with more potential show up first.

References

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wat.github.io/slideReveal/

[2] Zillow Seattle web page: http://www.zillow.com/seattle-wa/

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Case-Shiller:SeattleHomePricesSurpass2007Peak