China's Property Market Visual Report: An Interactive Web-based Narrative Visualization for Data Journalism

Yining Nie[1]*, Siming Chen[1]*, Xiaoru Yuan[1]*, Zhimin Huang[2], Chan Ka Wai[2]

[1]Peking University; [2]Caixin Media

ABSTRACT

Narrative visualizations are powerful tools for storytellors, like journalists, to convey an intended story. For this purpose, the prime task of visualization is to communicate the content with the audience effectively. Here, we present the design of China's Property Market Visual Report, a web-based visualization project that adopts 3D visualization, matrix and annular histogram to illustrate the fluctuation of China's property market in a decade. The intuitive interactive visualization and generated reports enhance the story telling process. This poster describes our inspirations and expounds how to combine multiple visualization methods together in a particular narrative visualization project.

Keywords: Narrative visualization, data journalism, storytelling, interaction, visual design.

1 INTRODUCTION

Information visualization techniques have been widely used in science and research field, which emphasizes more on data analysis and data pattern extraction. Recently, with the increase demand of data comprehension, information visualization techniques have been applied in the field of industry, such as journalism, sports, finance, and education, etc. For industry field, the key point of information visualization is to present data in a clearer way to provide an easier understanding. Especially for the press industry, the general readers, unlike experienced experts, are not trained for data analysis. It is a challenge for the general readers to discover patterns or derive insights from the data.

To address this issue, narrative visualization was developed. E.Segel and J.Heer described seven genres of narrative visualization: magazine style, annotated chart, partitioned poster, flow chart, comic strip, slide show, and video [3]. These methods have been widely used in news reports, usually in the form of diagrams, charts and motion graphics embedded in a larger body. Recently, with the development of data manipulating libraries (e.g. D3.js, Leaflet.js, ECharts-X.js), practitioners such as designers and journalists have set out to combine more interaction strategies into narrative visualization works, e.g. the projects published by Wall Street Journal [4], New York Times [5] and BBC Visual Journalism [6], etc.

In our work, we combined a series of visualization techniques including a WebGL based 3D map, a linkage matrix and an annular histogram calculator into a narrative visualization entitled "China's Property Market Report". It is a trial to use narrative visualization for a deep journalism report with the real world case. We deployed our work online [1]. Through this project, we set an example on how to use visualization techniques in narrative reports. The following part describes the design and

*Yining Nie, Siming Chen, Xiaoru Yuan are with Key Laboratory of Machine Perception (Ministry of Education), School of EECS, Peking University. Yining Nie is also with School of Software & Microelectronics, Peking University. E-mail: {nieyining, csm, xiaoru.yuan, }@pku.edu.cn.

implementation in details, and concludes with the insights into narrative visualization's impact on journalism.

2 PROJECT DESIGN

In this project, editors collected property market data of 70 Chinese cities, including the monthly housing prices, month-on-month (MoM) index, average household disposable income and annual policies from 2005 to 2016. The project is developed on both PC and mobile platforms, with two different GUI principles. For mobile version (Figure.1 a), several unsuitable functions (e.g. most control buttons) are removed [1].

China's Property Market Report consists of four main pages. The first page is the cover and title. A carefully designed colour palette (Figure.1 b) is used to provide a semantically consistent color encoding. A theme picture (Figure.1 c) subtly matching with the color palette was used as cover to attract the readers and introduce the interesting topics of the later pages.

Figure 1: (a) Mobile version, (b) Color palette, (c) Cover picture.

The cover is followed by three different views sequentially visualizing the data: 1) 3D map view, 2) Linkage matrix view, and 3) Annular histogram calculator view. In order to help users understand how to operate user interface, optional guidance notice boards (see Figure.2 d) are provided in each view. Related policies are listed to the timeline in 3D map view and Linkage matrix view, as government policies have important influence on domestic property market.

For the WebGL built 3D map view (Figure.2), the design goal is to help readers understand the housing price of each month in different cities easily. Monthly changes of property price are shown on an interactive 3D map (Figure.2 a) and updated with the timeline (Figure.2 b). Users could brush the time range and play animations. Linked with these operations, line chart, 3D map and tips board will change accordingly to show current trend. Users can look though a city by selecting from a pull-down menu (Figure.2 c) or hovering on the map.

In linkage matrix view (Figure.3), we focus on presenting the MoM index to highlight the changing patterns with an overview matrix (Figure.3 a) for each city and the detailed comparison timeline (Figure.3 b). MoM index is characterized as a matrix. The x axis represents time (unit is in month), the y axis is the city, and the density encodes MoM index rise. When hovering on each

rectangle, a notice board will provide the MoM rise and average price of the current city in that month while the timeline will show the details.

Figure 2: WebGL-based price map is a motion 3D scene links with a timeline. (a) 3D scene, (b) Timeline, (c) Drop-down menu, (d) Tutorial board.
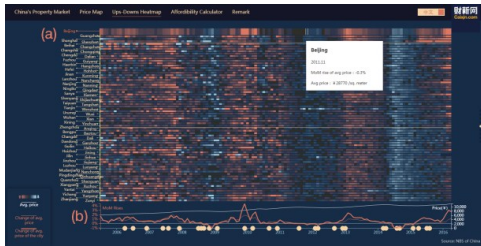

Figure 3: Linkage matrix is an operable matrix links with a timeline. (a) Matrix, (b) Timeline.

Figure 4: Calculator is an annular histogram chart illustrates income-to-price ratio in each city. (a) Annular histogram, (b) Calculator.

Except for the interactive spatial temporal visualization of the property market price, we also provide a visualization that allows users' participation. In annular histogram calculator view (Figure.4), we focus on relating the average household disposable income with housing prices. The concept of income-to-price ratio (time required for a family to purchase a standard flat in a city) is introduced to help citizens understand the housing problem phenomenon. Each bar surrounding the circle represents one city's income-to-price ratio (Figure.4 a). Users can type in their information to calculate their own ratio and compare with the average ratio (Figure.4 b). The resulting year indicates how long an ordinary family can afford a house.

Figure 5: A typical report page with infographics.

Illustrative reports (Figure.5) are placed next to each visualization views to explain the history and transformation of China's housing system. Cited articles and infographics were added to these reports, with interactivity markers indicating potential interaction.

There are several interesting findings from the users. For example, the 3D price map view shows a regional disparity: the cities in eastern region (most first-tier cities locate in eastern regions) have a higher property price and sharper turbulence than the cities in the central and western regions (Figure.2 a). In the linkage matrix, cities were ranked by city size. We could find that in first-tier cities of China, the prices increased beyond control in 2015. According to the timeline, we could find that in 2008 and the mid of 2014, the growth of China's property market has slowed down due to government's intervention, which also indicates that government policy clues have decisive influence to China's housing system.

3 CONCLUSION

In this poster, we provide a visualization project which integrates multiple narrative visualization techniques to present property market datasets. To narrate the stories of the housing market, we provide intuitive visual designs for users to explore the spatial temporal patterns of the housing price. Further, we also add illustrative reports and visual guidance through visualization views to enhance understanding. Users can discover additional statistics and stories by operating these visualization views. These features make this project qualitatively more like "stories" rather than data tools.

4 EARLY EVALUATION AND DISCUSSION

The project was published in Caixin Datanews (a Chinese press) in December, 2015[1] and was awarded as 2016 SOPA "Excellence in Digital News" [2]. Judges commented this project as "*The sheer amount of data crunching for this project is admirable ... this package uses code but vivid numbers to approach one of the China's most important economic and social topic, deciphering it from so many lenses that any Chinese resident can both get a comprehensive view and information relevant to him/herself.*" Since deployed online, over 4000 users visited this project, and user average stay time is over 7 minutes. At this early stage, we contribute this success to the emphasis on immersive and narrative visualization. In the future we will summarize the general design principles and lessons learned for the data journalism from the proposed application.

5 ACKNOWLEDGEMENT

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