Be Safe LA

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Abstract. This paper presents visualizations of crime data in the City of Los Angeles. The motivation behind this visualization is to look into the crime trends, types and victim's profile, and that is more than just a general idea or stereotype. People care about safety around their neighborhood, thus we provide visualizations from different perspectives including by area and by walking route. The dataset we used is very large and enough to show the overall crime statistics. This paper lists the topic we are discussing, what we have done with the crime dataset, and the visualizations we used to summarize and present the data.

Keywords: Information visualization, Crime data

1 Introduction

1.1 Topic

With frequent occurring of safety accidents and relative news reports, more and more people tend to be concerned or even anxious with safety problems. However, city security issue still seems like a vague idea for most of people.

Our visualization would provide further exploration on increasingly severe safety problems from different angles such as overall trends about the number of crimes based on time, areas, crime types and kinds of victims. At the same time, the visualization also realized showing safety statistics and analysis by routes with selected start and end points.

1.2 Audience

Our audience could include LA residents, tenants, travelers or even police. For local residents, our visualization could help then have ideas on safety around where they live so that they can take necessary preventive measures. Tenants could get inspiration from our visualization to rent in the safest place around their desired area. For travelers and pedestrians, our visualization would provide safety suggestions according to their routes. Police would also be able to improve the deployment based on our visualization.

1.3 Related Work

Los Angeles Times has a database and its visualization for crime data in Los Angeles neighborhoods[1], with crime types and their severity marked on the map of selected area. It is up-to-date and provides alerts of recent violent crime in the chosen neighborhood. They also made The Homicide Report[2] listing homicides in the last 12 months on the map and all the victims, attached with news report if they have covered. Also an web service called SpotCrime[3] provides crime data with different types of crime showing up on the map around the location given user's query.

1.4 Originality

Exploration based on selected year and area is our original work, since it provides overviews based on user's selection of several combinations of years and neighborhoods. Also the section of crime cases by route is original, focusing on people's daily safety issue and providing a useful tool to explore the crime data around the living area that they care the most.

2 Dataset

Crime Data from 2010 to Present[4] This dataset reflects incidents of crime in the City of Los Angeles dating back to 2010. The dataset has 1.62M rows, and each row is a crime incident. Each crime incident has several fields that we can use for our project.

The fields we use include *Time Occurred*, *Happened Area*, *Crime Type*, *Victim Information*, and *Location*.

LAPD Divisions Boundary[5] This dataset contains administrative districts of the Los Angeles Police Department. The LAPD has 21 Community Police Stations referred to as Geographic Areas within the department.

2.1 Preprocessing

The original dataset is large and hard to grasp key information at a glance. So we need to summarize the data for visualization.

To illustrate overall trends of crime, we summarize the number of crime incident in each month, top crime type of the year, and victim statistics.

To compare crime cases between different areas, we classify the crime incidents by Area ID.

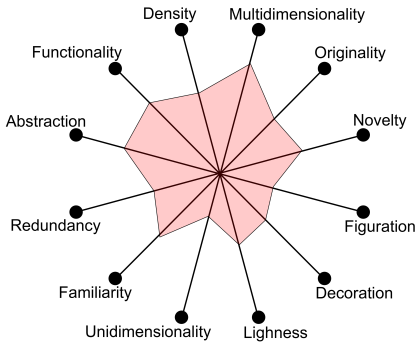
We want to show crime incidents along the walking route that user choose. There's no need to show all the incidents from 2010 to present. So we narrow down to recent happened incidents, from Oct. 2017 to present.

3 Design

3.1 Visualization Wheel

As a whole, The visualization comparatively focuses on the upper half of the Cairo's wheel which has been built based on the design principles of Cairo's wheel[6]. The visualization is more abstract than figurative because most of referents applied are conceptual tools such as bar, pie and line rather than vivid physical realities. These informative charts also make the visualization denser and more functional. Also, this visualization tends to be multidimensional and novel due to different layers of depth and forms used for encoding data. People could get a good overview as well as deep understanding of the overall data from various angles based on the familiar charts and original route function in the visualization.

Fig. 1. Visualization wheel.



3.2 Overall

The first part of visualization analyzes crime data at the big picture and could be divided into three aspects: time based, victim based and crime type based.

In the time based section, we could get some conclusions either from years or months based on the area chart, for example, it is easy to discover that the number of crimes went down slowly from 2010 to 2013 and increased slowly from 2013 to 2016 and tended to be lowest in first several months of each year.

As we can see in the part of victim, crime records could be explored by bar chart from three attributes: sex, age and descent of victims which are showed in the pie chart. For example, for each year from 2010 to 2016, the number of male victims is greater than female victims and the number of victims in 18 to 64 years old would larger than other age section. Besides, the number of victims

of black, Hispanic/Latin/Mexican and white would larger than other descent section from 2010 to 2016.

While in the crime type option, it is obviously that Battery-simple assault tended to be the most common crime type from 2010 to 2015 which is demonstrated in the Dendrogram combined with Bar Chart.

Audience are able to obtain an overall as well as multi-angle understanding of crime data from these familiar and popular charts in this part.

3.3 LAPD Division

This section is divided into two halves on the web page: the choropleth showing number of crime cases in 21 LAPD divisions, with colors suggesting the severity in the area; the right half consists of a line chart representing overall crime trend, a bar chart for 24 hours crime occurrence counts, and pie charts together with bar charts for victim's demographics and crime type statistic.

User input includes year selection in a menu, and area selection on the choropleth map. When a specific year is chosen, all the visualizations in the section will change accordingly, showing the trends and statistics of that year. In addition, when an area is chosen on the map, it will be highlighted and other charts show the subset data of that area in the particular year. With this interactive feature, user can get more detailed and desired information than merely some static charts. This part of interaction is implemented by d3.dispatch, which is D3's event listener and handler.

On the design consideration, to make the visualization clean, we use tooltips with mouse hovering on the pie charts and bar charts of demographic, while not using it on the above line chart and bar chart for overall trends, for they already consist of ticked and labeled axes, and to avoid abuse of tooltips.

3.4 Route

This section shows crime incidents along the walking route based on users' input. Users select start point and end point on the map, then we use Google Map Directions API[7] to calculate the walking route between the two points. We don't need to show all the crime incidents from 2010 to present, so we only use the data from Oct. 2017 to Nov. 2017.

The location field of crime incidents are only provided to the nearest hundred block in order to maintain privacy, so there will be several incidents happened on the same location(same latitude and longitude). We use circles to represent crime incidents on the map, and use the opacity of circles to represent the number of incidents. When users click on these circles, we show the details of incidents by bar charts.

4 Development Plan

D3.js[8] is a JavaScript library for manipulating documents based on data, which we use to construct graphs. We use Bootstrap[9] to control responsive grid layout

system(when browser resizing, the grid adapts automatically) and CSS style of interface components like buttons and navigation. Google Map Directions API[7] provides the walking route based on users' input.

5 Conclusion

The main goal of the project is to summarize the large crime dataset in a clear, visual fashion, to provide detailed overviews and to make safety suggestion using visualizations. Target audience basically is everyone living in the city, from residents to police, as well as travelers, safety is the first priority. We process the data and visualize it in various perspectives, so that people should not feel overwhelming looking at the 1.6M crime data table. There is so much interesting characteristics of the data revealed by our visualizations, that worth for users to explore by themselves.

References

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