

Los Angeles Accident Analysis and Highway Safety

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Abstract. Traffic Safety is always a highly concerned topic in Los Angeles. Freeway is part of daily traveling of most LA people. To help LA citizens knows highway traffic better. We collect traffic incidents happened in 2017 reported by California Highway Patrol(CHP). We've done several data research and analysis and we wish to share this knowledge to help people have safety driving.

Keywords: Los Angeles · Traffic · Accident · Data Visualization

1 Introduction

There is roughly 170 thousands of collisions happened on freeway in Los Angeles county every years. In another word, there is 438 recorded collisions per day. This is a crazy number but the truth. A collision results in tremendous lost and and possibly cost daunting due process. Our team aims to provided knowledge of dangers on Los Angeles freeway to clients to ensure people beware of possibly coming dangers. We describe our visualization in Section 3, details of our Systems in Section 4, and related work in Section 5.

2 Data Source

California highway incidents dataset(CHPD) is recorded and reported by California Highway Patrol. The database is hosted and managerd by University of Southern California Viterbi InfoLab. CHPD collects Los Angeles highway incident records since 2014. There are 1.4 million rows(incidnets) in total.

3 Approach

In this section we are going to describe design and technical considerations of each component in our website. We also going to briefly describe our implementation and our evaluation of each visualization parts.

3.1 Welcome Page

This is a welcome web page when users visit our web page. We briefly describe our purpose and works to give our user a big picture of this project. We also provide a link to presentation slide at the bottom of this page.

3.2 Danger Area Map

Value of Chart This map aims to visualize geometric distribution of collisions happened in Los Angeles in 2017. It is a d3-map. Collisions are clustered by nearest intersected local road as red dots. The larger the red dot means the more dangerous the section is. Figure 1 shows a snapshot of our Danger Area Map.

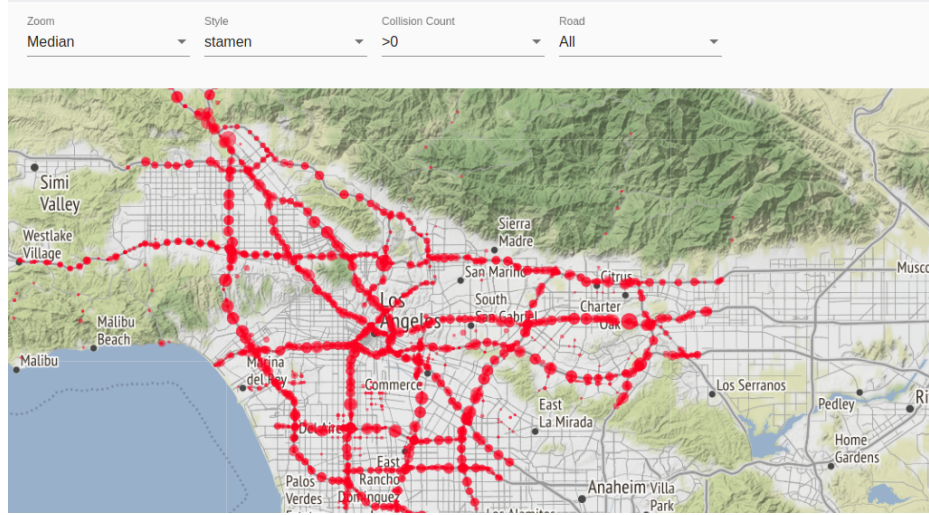
Design Consideration We provided two map style options and two filter options to our users. The zoom option provided three zoom level to our clients. while low level zoom provides a general view of LA, high level zoom provides detail view when client wanna dive into their neighborhoods. The map type option provided Openstreetmap and stamen tiles selection for our clients. While stamen map provide terrain information, Openstreetmap provided more road information. Collision counts filter shows danger zones which achieve accumulation count with user selection throughout the year. Road filter show data only on specific road of user selection. To show detail counts of each zone we implement tooltips when clients hover on corresponding red dots.

Evaluation This map shows only one thing the danger zone in geometric space. We make sure people don't get distract by too many information to digest. To avoid over-plotting, we provide filters to the chart which could be customize by clients. Details of zone only shows when clients hover on red dots.

3.3 Daily Risk Chart

Value of Chart This line chart describes, in the year of 2017, number of collisions happened at each hour of day and freeway. It is a d3 line chart. Collisions are clustered day of hours. Figure 2 shows a snapshot of the Daily Risk Chart .

Design Consideration We have more than 15 highways, showing them in a single would be a disaster of over-plotting. By the words of Elijah Meeks [3], its a bad idea to use categorical color like d3-categorical20. Thus, we separate freeways in to InterState/IntraState types and divide origin chart into two. The button at the top trigger the switch going back and forth of types. We add pop-out effect when clients hovering on those lines and legends to decrease visual query mapping lines and legends. We also provide show/hide function when clients click on legends. Last but not least, We implement vertical line and actual number pop-out when users hovering on hour of days, which decrease visual mapping to the y-axes when user comparing between freeways.

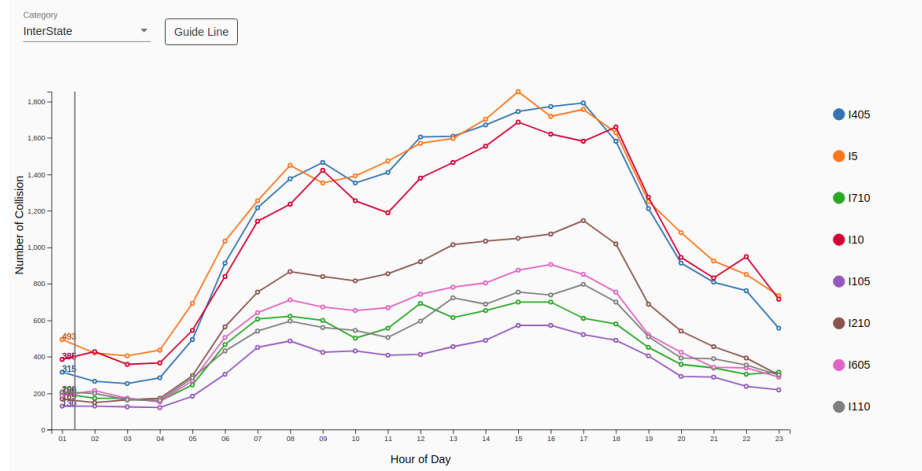
Fig. 1. Sanpshot of Danger Area Map

Evaluation This map shows only one thing, the danger zone in hour of day space(time). We make sure people don't get distract by too many information to digest. To avoid over-plotting, we provide filters to the chart which could be customize by clients. To reduce visual queries, we implement several pop-out effects. Categorical data could be confusing we have more than ten categories, thus we divided origin chart in two.

3.4 Danger Ratio Chart

Value of Chart This chart aims to visualize danger frequency ratio in the past year. It is composed of d3-pie chart and d3-hierarchical bubble. Collisions are classified by CHP code. while CHP code are flat categories, we further build a hierarchy structure which is more human mind friendly. The hierarchy bubble chart on the right visualize our hierarchical data. The pie chart on the left show accurate ratio of children when users click on the corresponding bubble. Figure 3 shows a snapshot of our Danger Area Map.

Design Consideration We build hierarchical bubble to help people understand different kinds of danger incidents. We use pie chart to display ratio. We implement legend and title to reduce visual queries. We add pop-out effect to remind users they could interact with our bubbles. We implement tooltips to show details dynamically to avoid over-plotting. We use gradient colors to implies level of hierarchy. We use percentage format to ratio.

Fig. 2. Sanpshot of Daily Danger Chart

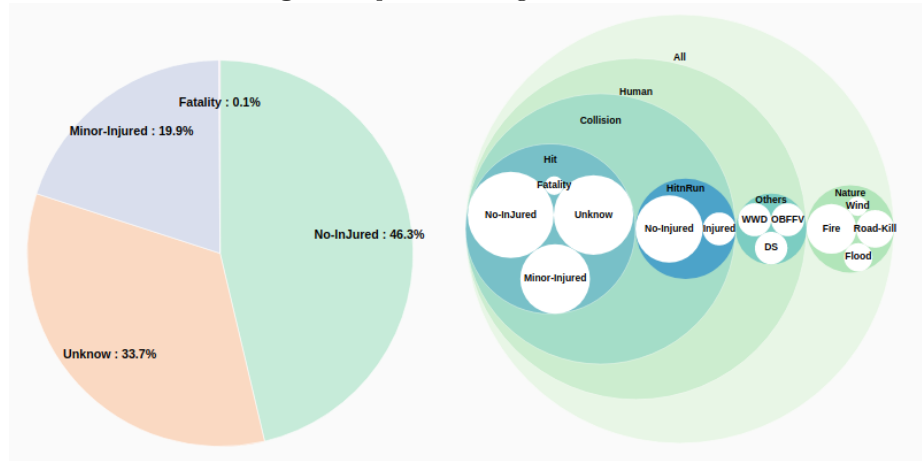
Evaluation This chart shows only two things, together they tell a self-complete story, the danger hierarchy and ratio of dangers. Colors are carefully selected by d3-chromatics. Filters to the chart which could be customized by clients. Details of zone only show when clients hover on red dots.

4 System

We use Angular2 framework and typescript language, which is a strictly structured environment that encourages developers working in this good and clean coding style and habit. We use Bootstrap and Angular Material to draw the layout and components of our web page. We use Angular Material theme to style colors of our pages. We build production version with help of Angular-cli. We put data in the assets which serve as a simple fake backend-server. Last, we host our app on USC Student computing Server.

5 Related Work

There are tons of analysis and web visualization on the internet. Most of them present their discovery by static charts and blogs like Aceable [1]. NBC4 I-Team [5] do provide an interactive hit-and-run chart on their web-site showing geometric distribution of hit-and-runs. UC Berkeley MIDS team [6] provided a nice analysis on 2017 CHP Traffic data with d3 visualization, too. They do have geometry space and time space visualization. We provided more details of these information on each freeway while they provide only the general view. They provide injury level ratio with bar chart, while we provide more different view on hierarchy of dangers and display ratio with pie charts.

Fig. 3. Sanpshot of Danger Ratio Chart

6 Conclusion

We are one of few teams publish a free public dynamic LA Collision visualization web app. We also provide new perspective of view the CHP incident dataset, which no other have done. Our design and topic are careful craft. We aims provided concise useful knowledge for client to digest within a short time.

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