Public Security in Austin - Visualization of Crime Events

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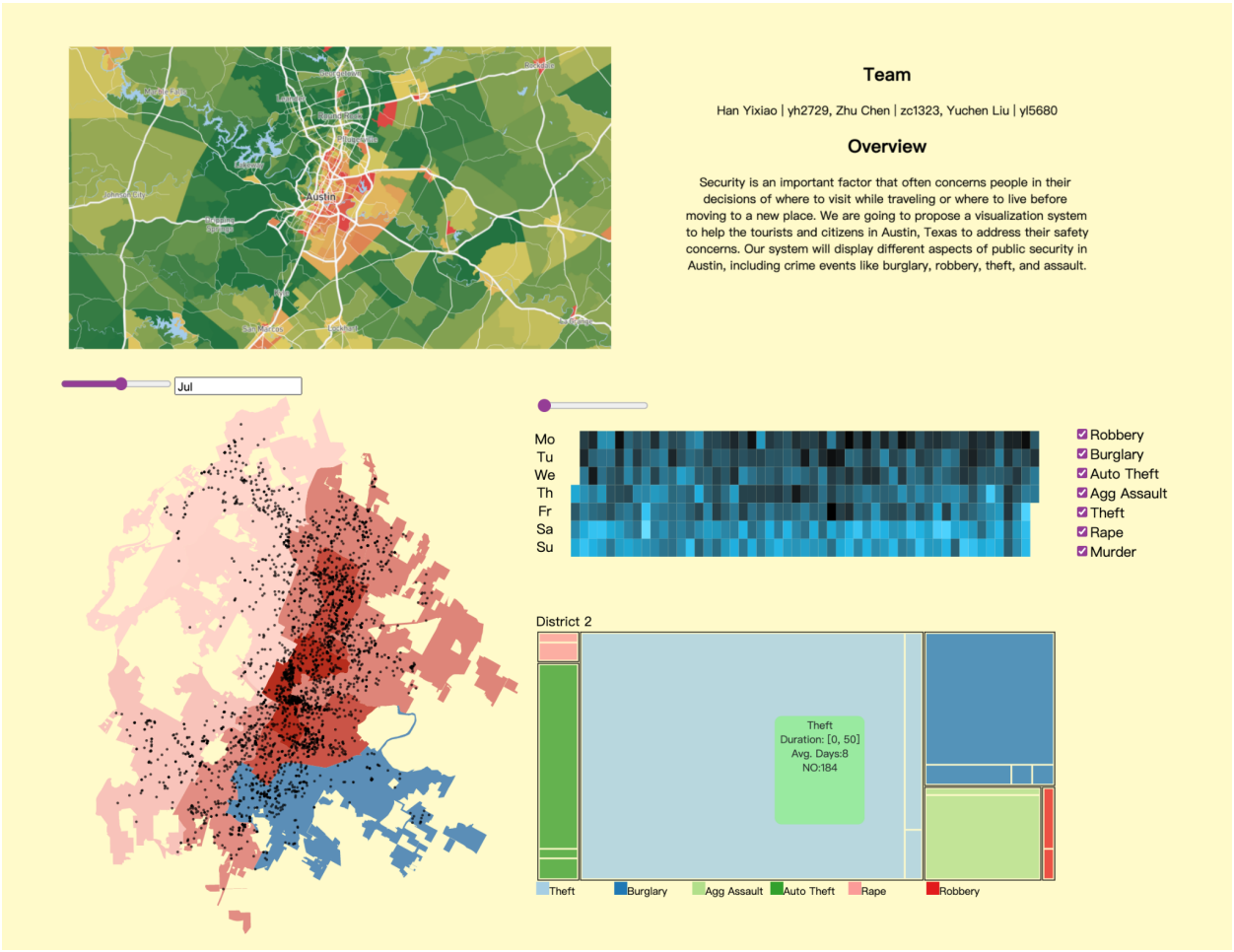
Overview

Security is an important factor that often concerns people in their decisions of where to visit while traveling or where to live before moving to a new place. We are going to propose a visualization system to help the tourists and citizens in Austin, Texas to address their safety concerns. Our system will display different aspects of public security in Austin, including crime events like burglary, robbery, theft, and assault.



Description of Dataset and Processing

URL link to the Resource of the data: [Annual crime of Austin, TX]

We use the Annual Crime of Austin as our dataset. We will visualize a dataset of approximately 380,000 crime records. We will use Offense Description (categorical), Council District (Categorical), GO Report Date (ordinal), Longitude (quantitative), Latitude (quantitative) and so on. We have some basic data processing to convert strings to numbers. This data conversion includes Longitude and Latitude so that they can help draw dots on the map view. We also convert Council District to be integers so that we can have an array indexing of them to save crimes for each district. See the data type and detailed description in the following chart.

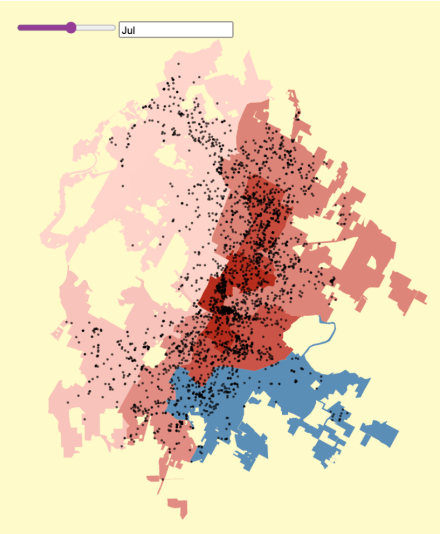
Attribute	Description	Data Type
Offense Description	Crime types(theft etc.)	Categorical
Council District	Crime location	Categorical
GO Report Date	Crime report date	Ordinal
Longitude	Longitude of the crime	Quantitative
Latitude	Latitude of the crime	Quantitative
GO Location	Incident location (rape locations are excluded to protect victims)	Categorical
Clearance Status	Codes used to identify if a crime was solved C=Cleared by Arrest O=Cleared by Exception N=Not cleared	Categorical
Clearance Dte	Crime clearance date	Quantitative

Goals and Tasks

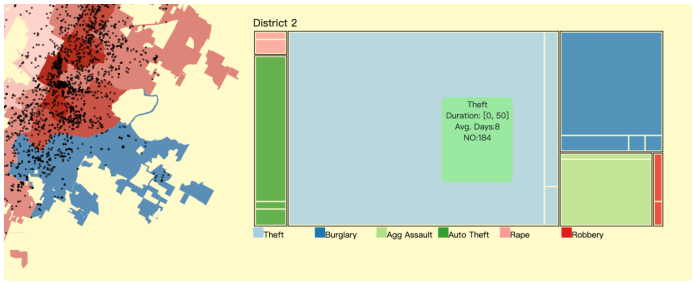
Security is the key factor of living qualities. Many crimes are happening in many corners of the world. To improve our life qualities and reduce anxiety about safety, it is important for us to know clearly about our surroundings and think carefully before deciding where to live. Suppose Tom and Jerry are the parents of their children living in Austin, and they plan to select a high school for their children. They want to know which district of Austin could be safest so that our children are most likely to be free of any crime. Our visualization systems will show the danger levels for each district in different time frames. Plus, the crime types and respective quantities would be displayed correspondingly based on districts.

Description of Visualization

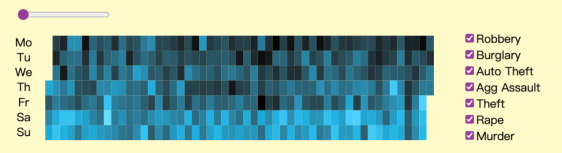
Main Views: Map View, Calendar Heatmap, Treemap.



As the sketch shown below, we will split our observations into different time frames by sliders in the first place based on 12 months. The map view would be our main view, which uses mark area and point, channel color saturation and spatial position, and it contains all the districts in Austin. We plotted data points of that month into the map based on its longitude and latitude. To perform a better visualization, we will add color saturation (red) to inform the danger levels of districts. By scrolling the slider, the map will present the situation of each month. When the mouse clicks each district, an additional Treemap will be displayed.



For the Treemap, the color represents each type of crime in the region you selected. Here, we used the mark point, as well as channel 2-size and color hue. Then, we separated each crime according to their time duration from Report Date and Clearance Date. The size of the square in the Treemap shows the number of each crime in that district. After calling the treemap, users can further click on a specific square in the treemap to see more details about this specific category of crime in that particular region and time. In other words, once the user clicks on a square in the treemap, a tooltip would come out, showing the crime type, the clearance duration that the data falls in, the average clearance duration and the total number of crimes in that square.



To further investigate the regularity of these crime events, we will also add a Calendar-like heatmap categorizing events into different groups based on their occurrence time. This view uses mark point and channel position and color saturation. The rows and columns will be arranged like a calendar, where rows are weekdays and columns are all the weeks in 2015. The color saturation channel used in this map is sequentially segmented and expected to reflect the frequency of crime events. Besides, we also create seven checkboxes to allow users to select the types of criminals they want to take a close look at. If the color of the whole map becomes vague after deselecting some crime types, users can use the slider above the picture to darken the color of the whole map to further better distinguish the density patterns. Through this, we can have an understanding of how the number of different types of crimes change on certain days of this year.

Moreover, we built strong interactions between the three views. By selecting a specific distinct and month, we linked our map view with our treemap. By specifying the types of crimes, our treemap would also change accordingly, which links our treemap with our calendar-like heat map. This way, our three views are tightly connected together, increasing the interaction both between the views and between the whole design and users. Users can view and explore the data according to their needs.

Reflection

We keep the original map view and heatmap view. Our final views slightly change from bar charts and pie charts to treemaps. We choose a treemap because not only the readers can acknowledge the comparison of crime type quantities, but also our treemap contains additional information about different crime durations under each crime category. Besides, we also link our treemap to map view and calendar heatmap, which strengthens the interaction between all the views and improves the interpretation of our project.

To conclude, from the map view, when we scrolling over all 12 months, we can directly find Districts 3, 4, 7, 9 have deeper color in their areas while Districts 6, 8, 10 have a more shallow color, meaning Districts 3, 4, 7, 9 have more accidents than Districts 6, 8, 10. If we want to choose a safe neighborhood to live in, we probably will choose Districts 6, 8, 10.
From the calendar heatmap view we can find that crimes happen more frequently on weekdays, especially on Monday and Tuesday. We boldly make a few assumptions about this phenomenon. The first possible reason is that people may tend to stay at home on weekends, which leaves less chance for criminals to commit crimes. The second possible reason may relate to criminal psychology which causes criminals to take a break on weekends and commit crimes intensively at the beginning of the next week. Therefore, we suggest citizens should be more careful and strengthen prevention on Monday and Tuesday.
From the treemap view we can see that theft is the biggest component of all crimes.