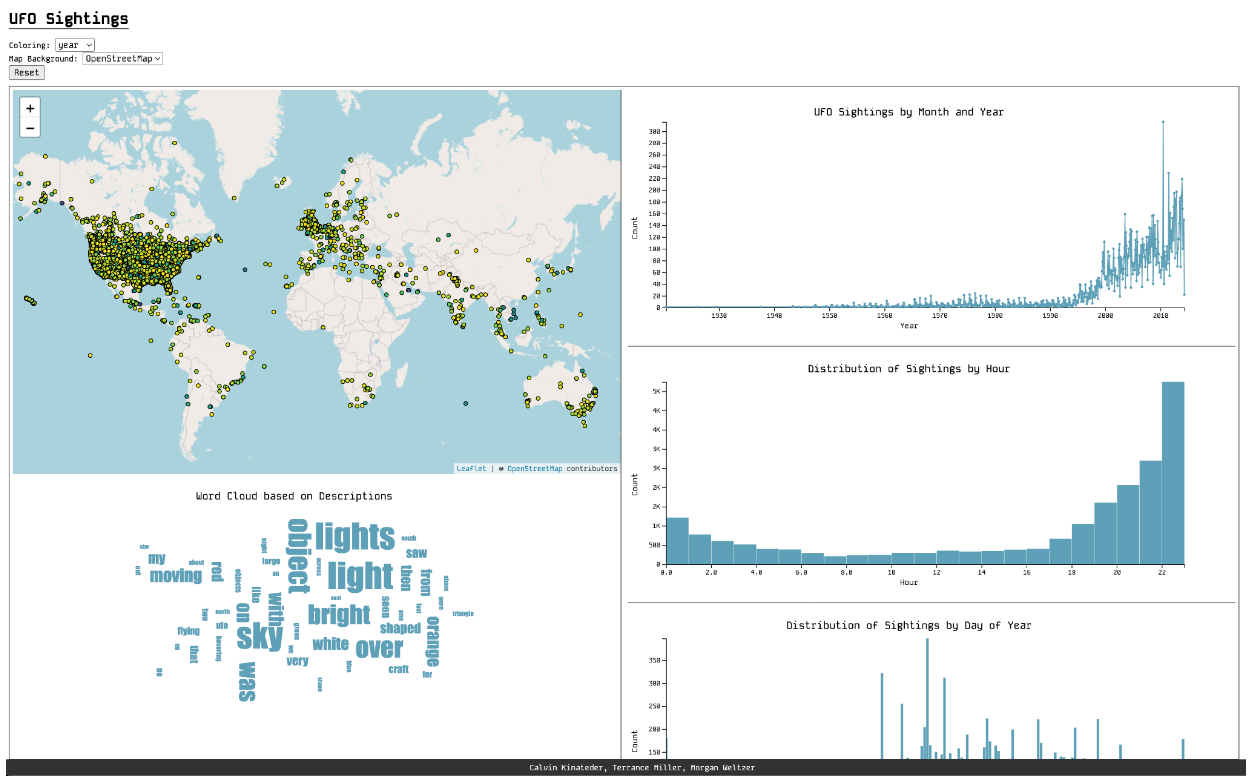
UFO Sightings Visualization


UFO Sightings

Coloring: year

Map Background: OpenStreetMap

Reset

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UFO Sightings by Month and Year
Count
Year
Distribution of Sightings by Hour
Hour
Distribution of Sightings by Day of Year
Word Cloud based on Descriptions
Leaflet | © OpenStreetMap contributors
lights
object
light
bright
sky
over
orange
white
moving
red
was

Motivation

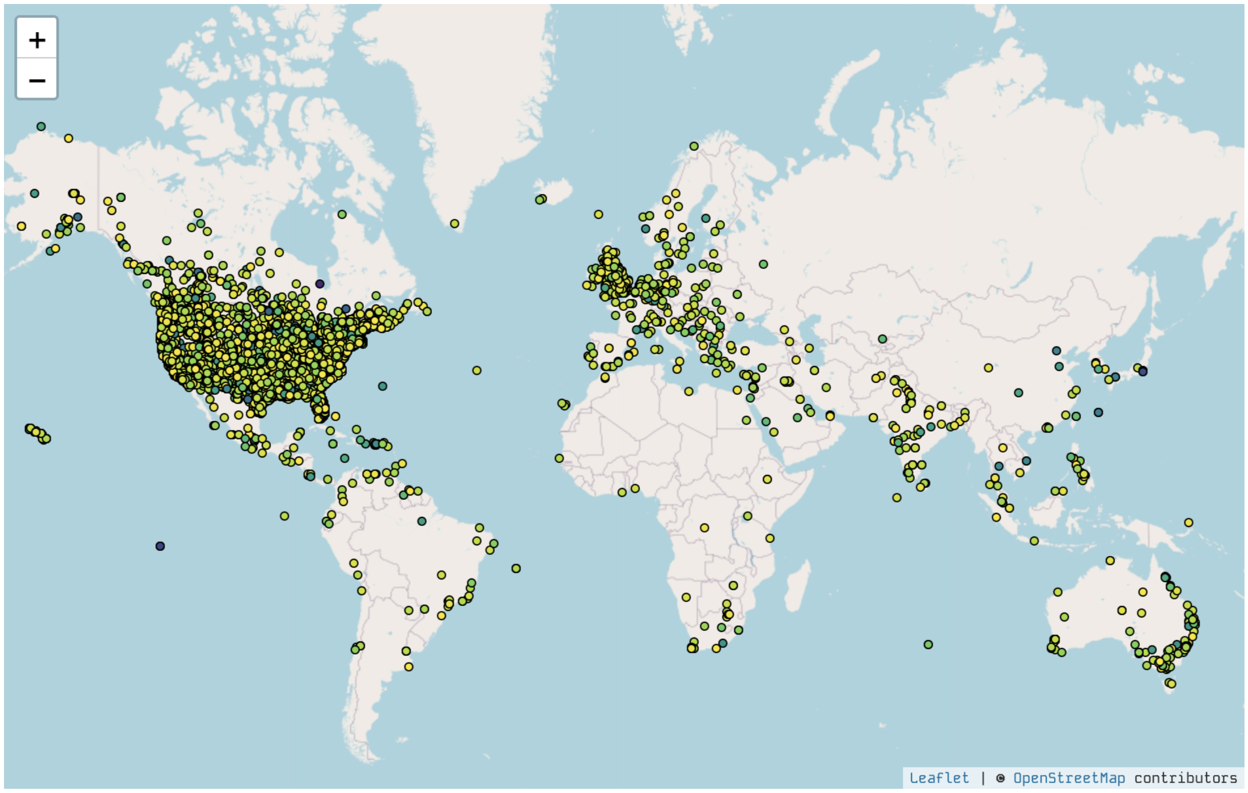
The purpose of this application is for users to be able to visualize and understand the distribution of UFO sightings throughout the world. The application contains a map, a word cloud, and corresponding distribution graphs based on the date, time, length, and shape of the UFO sightings. This application allows people to try and find correlations between UFO sightings by using the linked interactive visualizations to explore the data.

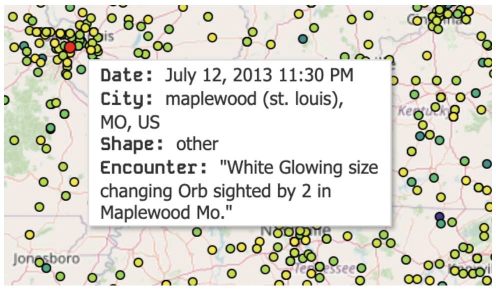
Dataset

The data used for this application is a collection of reported UFO sightings from the 1940's to the early 2010's. The data contains the specific location of where the sighting took place. It provides the country, state, and city along with the specific longitude and latitude so it can be located on the map. It also contains a description of the encounter and what shape the UFO was. The data can be used to visualize where UFO encounters are reported most frequently along with a brief description to possibly detect any patterns between sightings in close proximity. Because of memory issues (there are over 80,000 sightings), we take a random sample of 20,000 points at the beginning of each page load to help with congestion. This is enough to still show trends, but not enough to significantly bog down the application. The full dataset can be found here.

Visualizations

Map

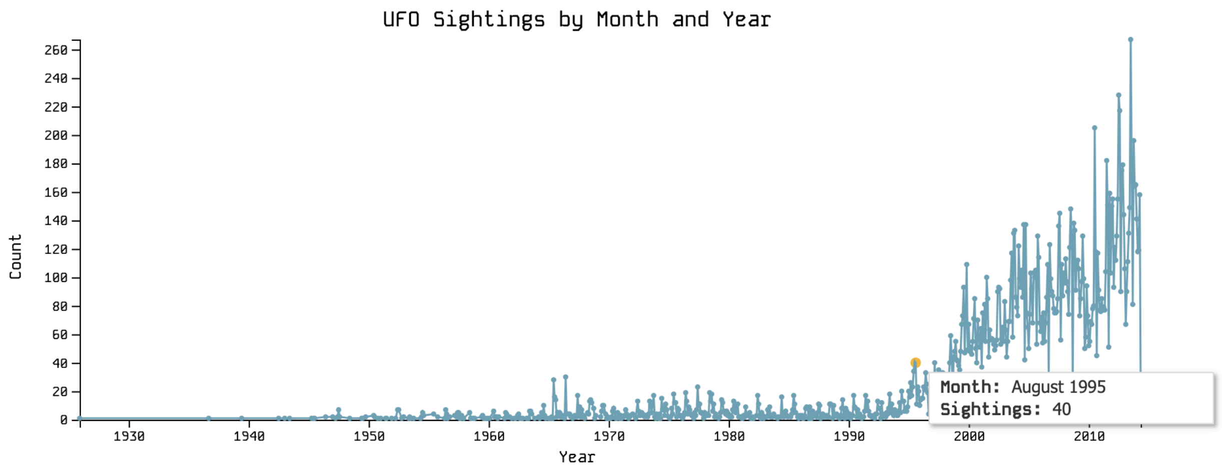



Date: July 12, 2013 11:30 PM
City: maplewood (st. louis), MO, US
Shape: other
Encounter: "White Glowing size changing Orb sighted by 2 in Maplewood Mo."

The map is the main view of the application. The user can pan and zoom around the map, as well as hover over individual points to view details about UFO sightings. The map will update to hide and show points in response to brushing on any of the distribution views.

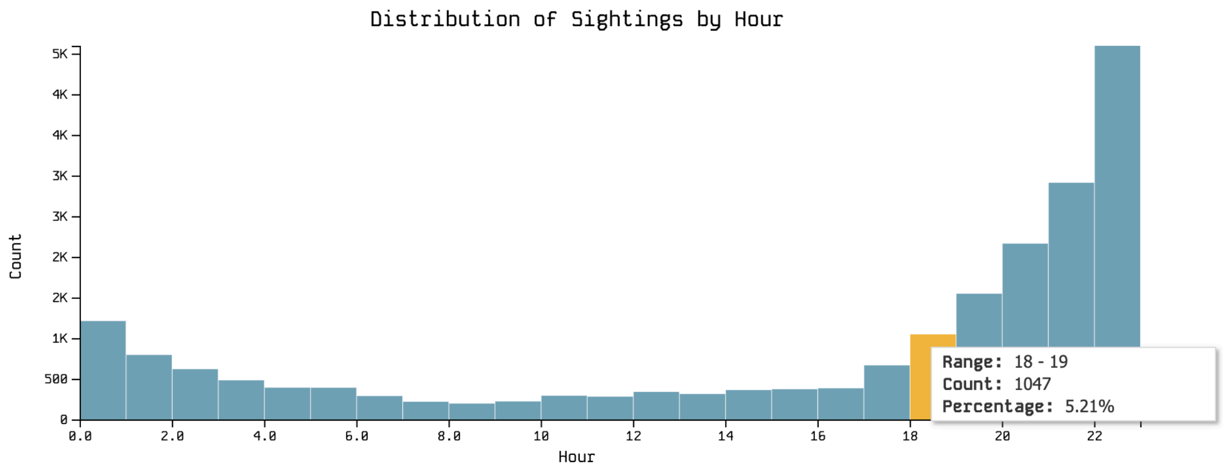
Colors on the map correspond to either the year, month of year, time of day, or shape of sighting, selectable in the controls.

Distribution of Time



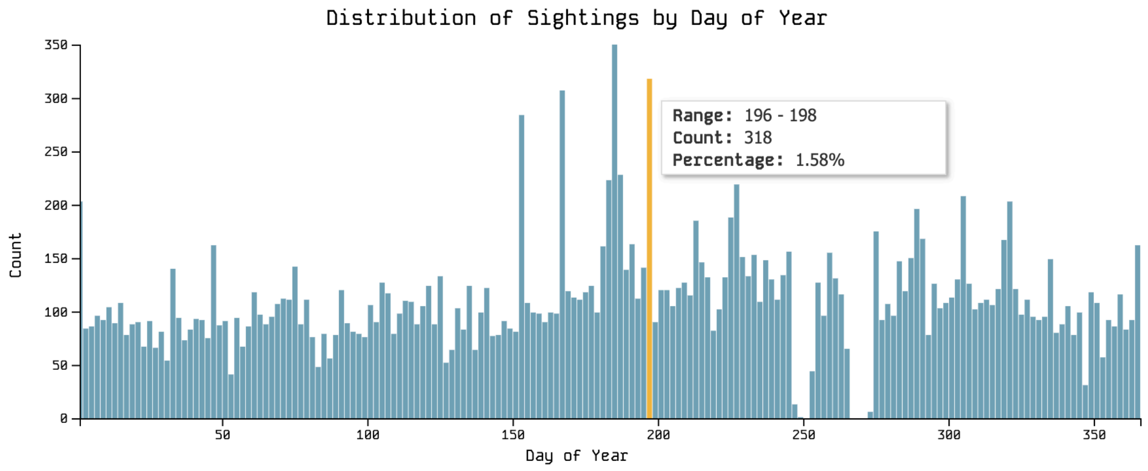
This timeline view is a line chart that displays the number of sightings per month over the dataset. The user can brush over a set of points to highlight on the map and world cloud, and click again on an empty area to undo.

Distribution of Time of Day



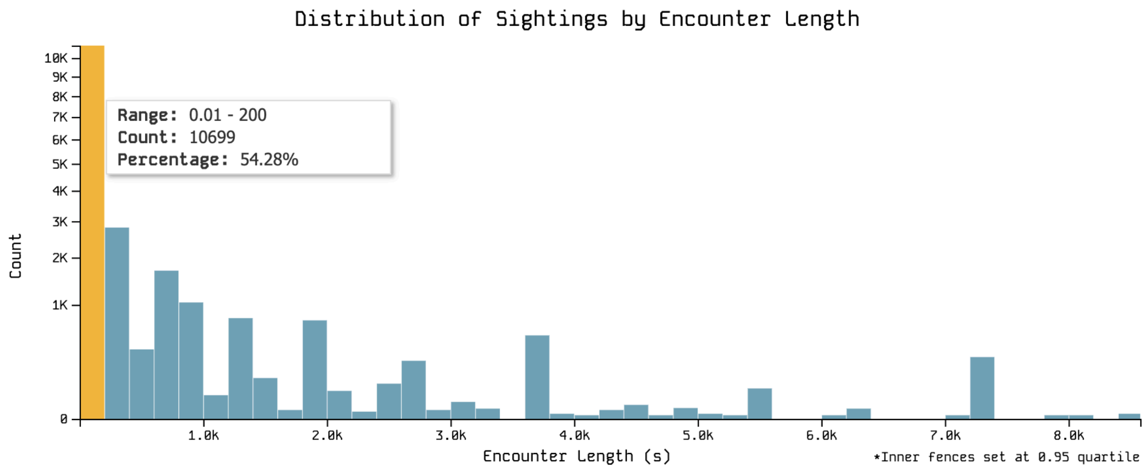
This view is a histogram showing the cycle of the time of day in UFO sightings. There are 24 bins, one for each hour of the day. The user can hover over the bars to view more details, as well as brush over a range to highlight on the map and word cloud.

Distribution of Day of Year



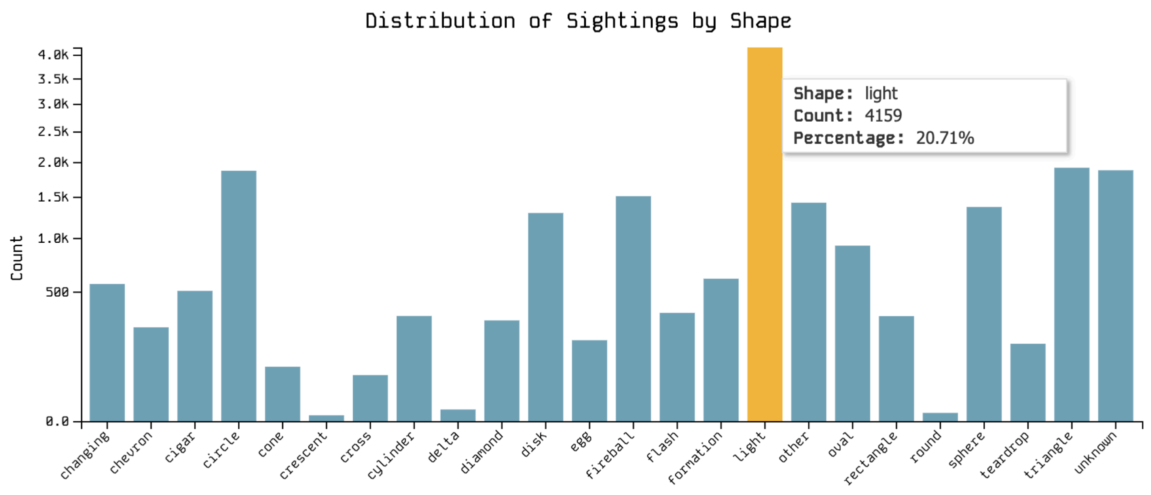
This view is another histogram that shows the seasonal nature of the sightings across all the years. There are 168 bins, one for every two days of the year. This was chosen to give enough granularity without being too hard to work with. Brushing works in the same way as the other visualizations.

Distribution of Encounter Length



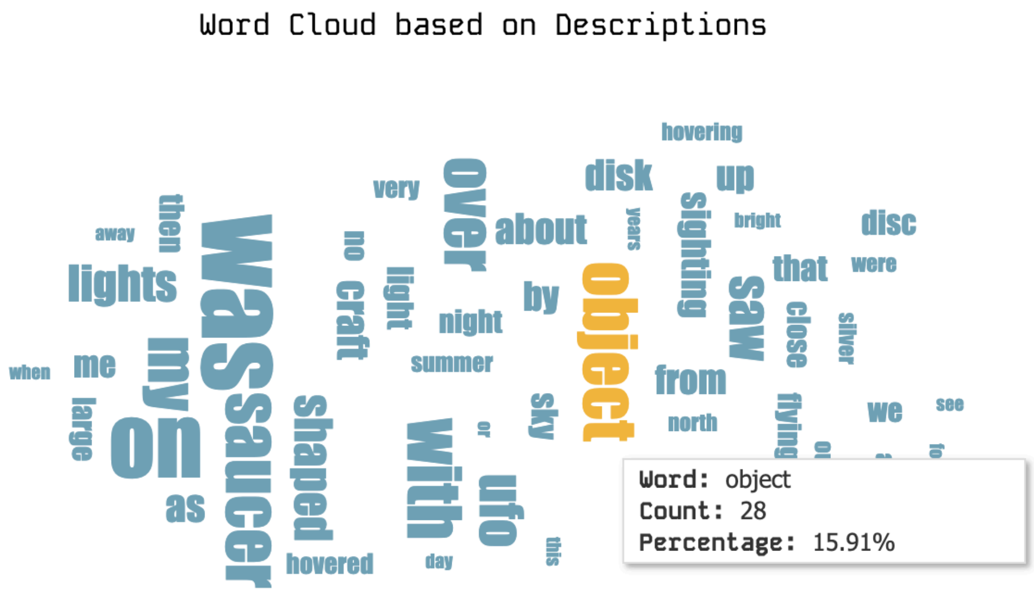
This view is a histogram showing the distribution of encounter lengths in seconds. The data had large outliers, so the data was trimmed down very slightly to ignore extremes. The scale on the y-axis uses square root curve, since there is such a wide range of lengths. Brushing works on this chart.

Distribution of Sighting by Shape



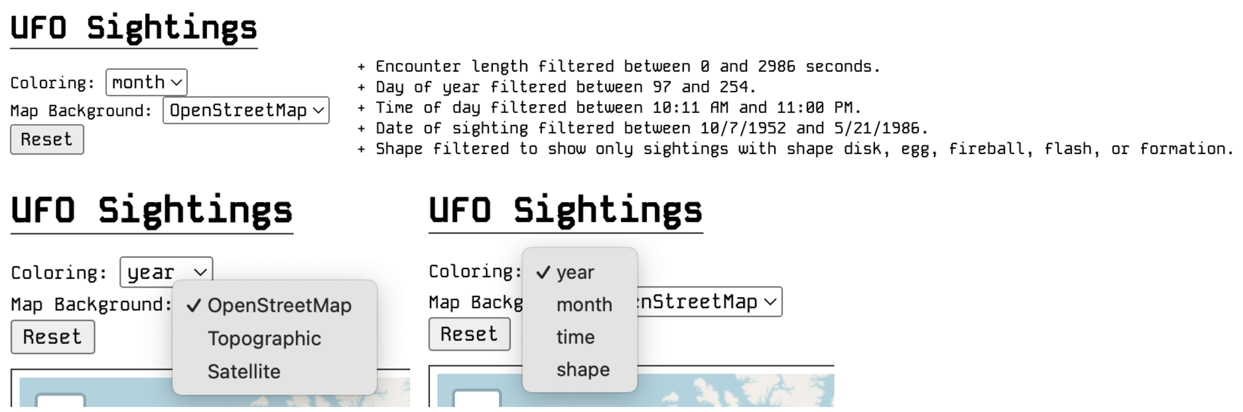
This view is a bar chart showing the sighting counts for each shape. Brushing works on this chart to update the map and word cloud.

Wordcloud



The word cloud is placed below the map since its data is linked with the graphs just like the map. The word cloud displays the top 50 most used words and its data will update accordingly based on any brushing you do to the graphs just like the map. It also contains a tool tip to give you the exact word count and percentage based on the top 50 words. This view redraws on each brush update to show the word cloud for all points in the given selection.

Controls


UFO Sightings

Coloring: month

Map Background: OpenStreetMap

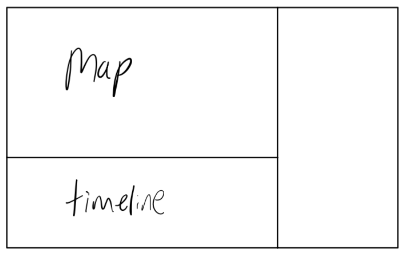
Reset

```
+ Encounter length filtered between 0 and 2986 seconds.
+ Day of year filtered between 97 and 254.
+ Time of day filtered between 10:11 AM and 11:00 PM.
+ Date of sighting filtered between 10/7/1952 and 5/21/1986.
+ Shape filtered to show only sightings with shape disk, egg, fireball, flash, or formation.
```

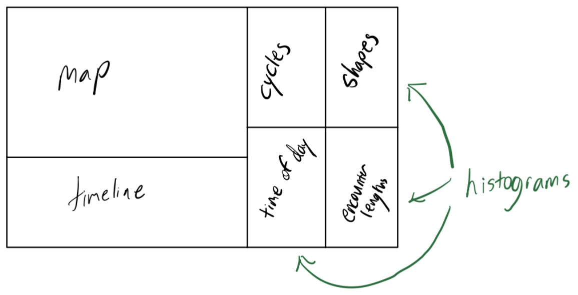
The controls are very simple. There is a drop down to choose the color scale for the map (year, month, time, shape), a drop down to select the map background (OpenStreetMap, Topographic, Satellite), and a button to reset all the views. When views are brushed on, and filters added, they will show up in the controls area (on the right). The user can hover over a filter and click to remove it.

Design Process

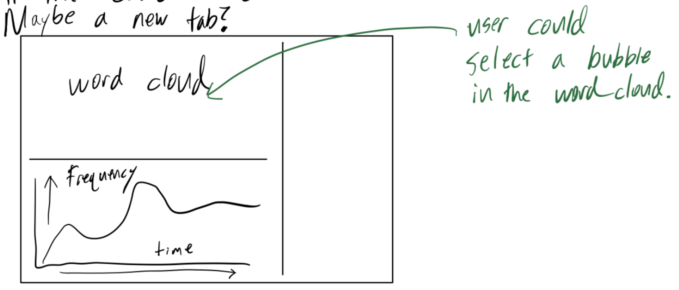
Here are some simple sketches we did to help plan out the project:

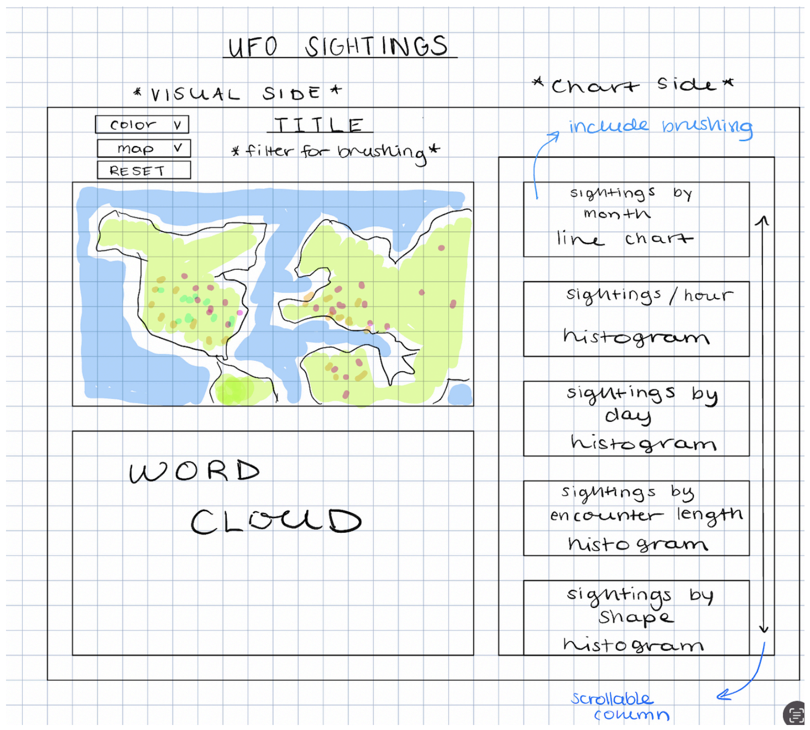


B goals



All three could be combined into 1 visual window.
Maybe a new tab?





UFO SIGHTINGS
VISUAL SIDE
chart side
color v
map v
RESET
TITLE
filter for brushing
include brushing
sightings by month line chart
sightings / hour histogram
sightings by day histogram
sightings by encounter length histogram
sightings by shape histogram
WORD CLOUD
scrollable column

It was very important that everything be visible on the same page, especially the main map and word cloud. We put the brushable graphs on the right side in a scrollable container, since they were static and didn't need to be viewed all at the same time. By keeping the map and word cloud always visible, we could ensure that they remained front and center while brushing.

Code Process

This application is based heavily on d3.js. The code is structured in an object-oriented way, while using a few global variables and functions to tie the views together. There are five main classes: LeafletMap (for the map), TimeLineChart (for the timeline), HistogramChart (for the 3 distribution views), BarChart (for the shape view), and WordCloud (for the word cloud). Each component was designed to be as versatile as possible without being too broad.

Getting the brushing to link with each view required a unique design. There is a global array called dataFilter that contains all the filters for the data. dataFilter contains a list of filters, up to one for each of the five right hand charts. When a brush is activated, a filter is pushed to that list, and when a brush is removed, its respective filter is removed from the list. Each time the list is modified, the map and word cloud are updated. Both classes iterate through the dataFilter and only display data that match the requirements of each filter (using an intersection).

For the word cloud we structured it to take in all the description data in an array, and then have a function (getWordsByFrequency) which counts how much each word is listed and then takes the top 50 to be displayed. Included are a list of excluded words like the, it, and I. To deal with the sheer size of data for sizing the words in the word cloud we add up the top 50 word size counts, and then divide by the total to get percentages for sizing, so we can keep the wordcloud to a reasonable size.

The code is visible here, and the visualization is hosted here.
See the demo video here.

Discoveries

This application allows us to discover many things about the data. The word cloud is especially powerful, analyzing text data in a way that is generally prohibitive when compared to normal graphs. Brushing across the graphs lets us narrow down observations. For example, you can see that most sightings happen late in the evening, around 11pm. This makes sense. More than half of all encounters are under 4 minutes long. There also seem to be more sightings in the summer. Also, most encounters are reported in developed countries.
There are countless inferences you can make using this visualization.

Contributions

Calvin

- LeafletMap
- Histograms, timeline, bar chart, word cloud
- Brushing and linking across figures
- Filtering logic and display
- Styling and positioning
- Controls and tooltips, button hook handlers
- Data cleaning and loading
- GitHub setup
- Documentation
- Sketching

Terrance

- Built code for the word cloud

- Helped with the application design process
- Documentation

Morgan

- Documentation
- Demo video
- Background selection on map
- Sketching