Exploration of National Park Recreation

CS-5630 / CS-6630 Visualization Final Project - 2015

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Have you ever considered exploring Nature?
like National parks?
Which parks provide better camping facilities?
or hiking?
Which parks have the most crowded visitation in Summer?
or in Winter?
How did nature tourism in America grow through the last 8 decades?
When was it actually established?
Which parks gained more popularity through the years?
and which gained less?
Our project answers these questions and more.
Enjoy!

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1. Overview and Motivation

Our project aims to allow users who may not have much knowledge about the National Park System in the United States of America explore information about them in a much more detailed and interactive manner than is possible with normal website or piece of written text.

The project was spawned by Hadeel's feeling that there are many interesting features to explore in places such as the national Parks in Utah but that people from other countries or states may not know about these things without some kind of introduction. From this came the desire to allow users to explore this information on their own but also guide them in a way, allowing them to explore without feeling lost.

Users should be able to explore and experience the data, guided at times by our motivation but also to find their own interesting facets of data, of which we are sure they are many to discover and as a result we felt interactivity would meet our needs better than static presentation of information alone could.

2. Related Work

When we were thinking of an idea for the project, we decided to implement a unique one also attractive to people in the same time. However, our choices of visualizing the project idea were mostly based on the theory presented in class. Our project focuses mainly on showing comparisons, thus, we were careful by choosing the tools and charts types that meet these purposes by making use of the Visualization principles.

We were also inspired by the examples in the official website of d3 library. However, the bulk of our inspiration came from the exploration of the ideas of comparison that was presented in our lecture sessions. We believed as a result of this exploration, that it was important when users were able to explore, that they be able to compare because of the nature of this process.

Our feeling is that users, allowed to explore and compare on their own are better equipped to leverage the technologies provided in web/interactive visualization and come to the conclusions on questions they have on their own in addition to finding answers to those we have proposed in our creation of the project. This sort of exploration is something we feel was a key point of some of the course work we participated in and had a strong influence on our desire to make something interactive for users.

While interactivity was important to us, we also wanted to be able to ensure that data presentation matched what we felt was good design in terms of comparative visualizations. Our

initial plans therefore, calling for some more complex view types settled on some tried and true methods we had used through our coursework up to the time of creating this project.

3. Questions

Through our visualization, specifically through the interactions, we help users answer questions about the national parks such as popularity, what times are best to visit, which are most crowded and which are not, and popularity of activities types for each park. Moreover, our visualization should show how the nature tourism was grown through the last eight decades.

These questions started initially due to curiousness when we saw the apparent wealth of information provided by the national park service but also evolved as we realized what data was and was not collected. Ultimately we answered our main questions and gained a few more as we went.

First and foremost in our visualization was the question of “Which parks are best for which things?”

We feel this question was a driving force behind the use of both the visitation and activity views. These bar charts serve to answer this very important question. This question however prompts a deeper question as to why these things may be the case and as a result we searched out social media information relating to the parks as well. Facebook likes and review scores give us a strong indicator of how people react to a given national park overall and we anticipate that as social media grows in cultural importance, that these sorts of metrics will prove even more valuable in the future. As a result we decided to augment our presentation in answer to this primary question with these data as optional ways to view the map.

Our next important question was, “How have the parks grown over the years?” and we feel we answered this quite well.

By allowing the user to explore from 1930 onward, we wanted to let the user explore how visitation grew in the years we showed. Having the nodes on the map size according to that year’s visitation was our deliberate design choice to accommodate the answer to this question and it proves to have some interesting results. We can see new parks appear through the years and gain popularity by using this method and it is a very interactive and interesting way to present the parks to the user.

One of our important questions was also, “What times of year are most popular?”

The natural assumption of course is that the summer, warm months are most popular for these kinds of visits and for the most part this is true. However, our visualization revealed that there are interesting occurrences in activities or visitation that occur not just in the summer, but

the winter months. As a result, we tried to make our comparative activities visualization reflect what we felt was the ability of users to examine these interesting trends more carefully on their own and with a set of parks they themselves chose.

As mentioned, due to the nature of our questions we wanted to allow users to select and compare not just all of the parks, but those they had a specific interest in. We feel like the selection methods and dynamic interactivity provided by these methods allows the users a degree of control in this regard, one that helps them not only explore the main questions, but explore them over the subset of parks that they themselves want to look into.

4. Data

A majority of our data about the national parks was procured directly from the National Parks Service website through their data gathering initiatives. The National Parks Service makes a number of important pieces of information available to the general public.

During the process of drawing the parks nodes, we found bugs in the source of national parks boundaries data, so we had to collect other resources to draw the parks on the map. We could parse the locations of parks, parks info, and land area from Wikipedia source. Facebook likes data were parsed directly from the National Parks Service website.

The data gathering process began with a visit to the aforementioned national park website. A sampling of utah's national parks and monuments was obtained for the purpose of prototyping charts and views in the visualization.

We chose to obtain the annual attendance, monthly attendance reports by year and monthly activity participation for each year as well because these reports embodied the quantities we wanted to explore in our visualization, with activities providing an interesting highlight and potentially fun to explore feature for our users.

The initial gathering however, revealed that data for month and activities did not stretch back as far as annual visitation records. While the latter started from 1930 until the present year, the service did not begin separating the data by month in the available reports until the years after 1979, the same year they began recording activity information.

While this aspect did prove a hiccup in our initial planning, we believed it was possible to still use all of the data effectively in our visualization.

The first attempt to deal with the data, as it came from the national parks service in CSV format, was to use an online tool that claimed it would parse csv into json objects. A quick scan of this tool by Tony Niven revealed that it was not robust enough to handle the formatting in the csv files as obtained.

This prompted a more direct investigation of the csv files manually and it was found that a variety of numeric formatting schemes had been applied in various types of reports, making this automated tool impossible to use for the given task.

Tony was then tasked with parsing the data into a useable JSON structure for easy loading into d3. This task consisted of two parts, an active parser and a simple control script, both of which were written in python.

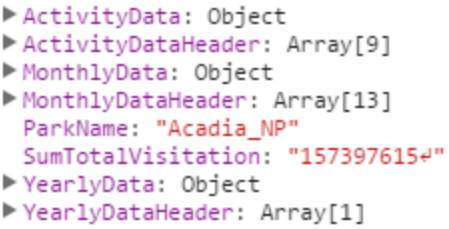
The control program was given the path to a folder and all park data was separated into its own park specific folder. The control program then feeds input parameters to the parser, which operates on the files specified and outputs a json object to the location of the control program itself.

The initial foray into this parsing technique revolved around the use of regular expressions. Each line was dissected by a regular expression until the quantities for each line were separated.

The headers for the CSV columns were obtained in a similar fashion as were park names. and each set of information was added to a json object under its own key.

In all, our JSON objects consisted of several internal sets of objects, one JSON object representing all data collected for a given park. Below is an example of the JSON objects from within the browser console.

Figure 4.1 - JSON Structure



As can be seen, each type of data was stored in its own object. A header object was also created to give names to each of the columns contained within the arrays of data. While this approach did not allow direct d3 data binding, it did allow for the data to only have to be loaded once and provided for access to a single object despite changing selection modes.

While the approach proved to work well enough, there were several updates that had to be made before the production of the data was finalized. First and foremost, the robustness of using regular expressions even after careful manual examination of the report files proved to be questionable. Updates were required to bring the computationally demanding task of properly separating and developing numeric quantities to place in the json output.

As a result, a major re-write of most of the parsing code was required and after an iteration or two, the parks were producing the correct outputs according to report data.

Once the parsing code was re-written, we moved forward with the decision to expand to all of the national parks available to us, leaving aside small sites such as national monuments in favor of the parks themselves. Data was manually gathered for all parks in the visualization by Hadeel for social media metrics, location, and physical land area dimensions while Tony

gathered the remainder of the parks from the national park service. Both of these tasks took several hours of work from the team members.

After the data gathering, the loading mechanism was modified to include data for all parks. Despite the fact that many parks have data back to the 1930s not all parks existed at the time and as a result, rather than additional data parsing, mechanisms were put in place to generate 0 data values for situations in which the park did not have data for a selected month or year. Additional work was performed to allow mapping from park id type names as detailed in the NPS reports to nicer names readable by the user.

Data is filtered in all views dynamically according to the month and year mode selection and the filtered data is fed to data bars for display and appropriate sizing.

5. Exploratory Data Analysis

Our initial explorations took only a few forms. First was the data output by the parsing programs in python. Using these it was actually pretty apparent just from outputting the JSON structures that there were cycles in the months that had more visitors attending various parks in the middle months of the year as compared to the winter months.

By only drawing the parks nodes on the map, we could notice the differences between the parks by their area land, and Facebook likes through the nodes sizes. And by tracking the bar chart updates when moving the years slider left or right, it's obvious which are popular through the years, and which are old. This gives us the indication of the success of our design. However, we need monthly comparison to show which seasons had more visitors attending through the years. We therefore made sure we went forward with adding monthly selection modes to ensure a more customizable user experience than we otherwise would have had. This initial exploration also helped us realize how important it was to show more than the parks in Utah, including important sites from around the United States to help anyone who wanted to compare parks on their own terms to find ways to do so.

These driving forces helped us to understand that some of the view ideas we had had before could be revised or outright replaced by the addition or change to views we had been considering. This resulted in the bubble chart and comparative bars section of the visualization.

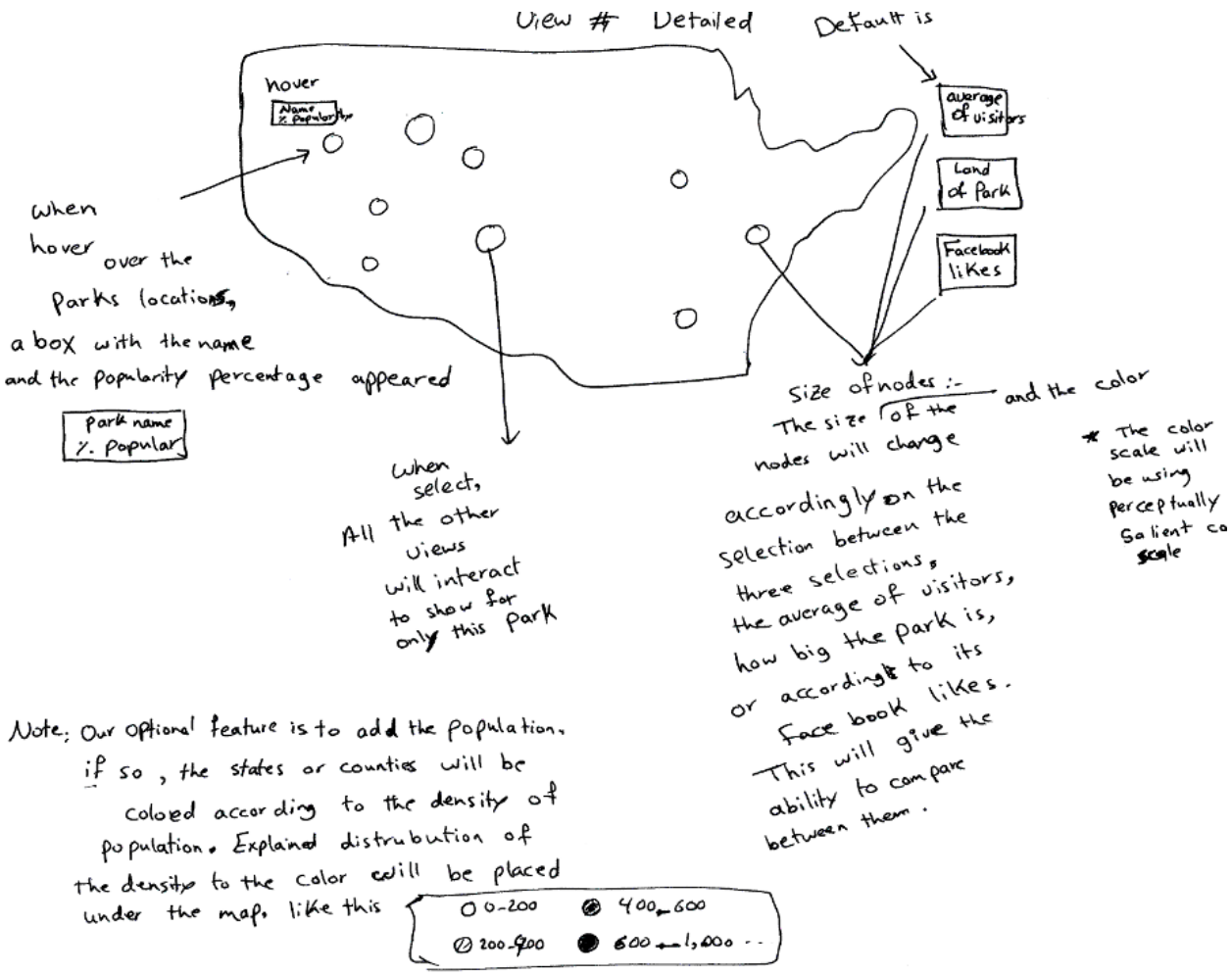
We understood early on when adding these views that the focus had to be on user interaction and involving the user in the decision making process. We also knew that due to some limits on the data in terms of how far back it went, we needed to gently let the user know that these functions would be available only after a certain point. The comparative views evolved quickly as a result and eventually we decided to add a 'select a bar' style system that allowed users to drive an overall selection with the map while focusing on a particular park by using its bars. This was the real culmination of work on this view and it all started due to the fact

that we gained insight to better understand what people would be interested in seeing due to exploring the data ourselves. Our node sizing on bubble and map charts, the tooltips, layout and selection methods were all driven by evolving design and we feel like this is one of the best aspects of this particular visualization.

6. Design Evolution

We considered several designs with few extra and different views from what we settled on in the project proposal, however, our base design was the same which is presented in the sketches as following:

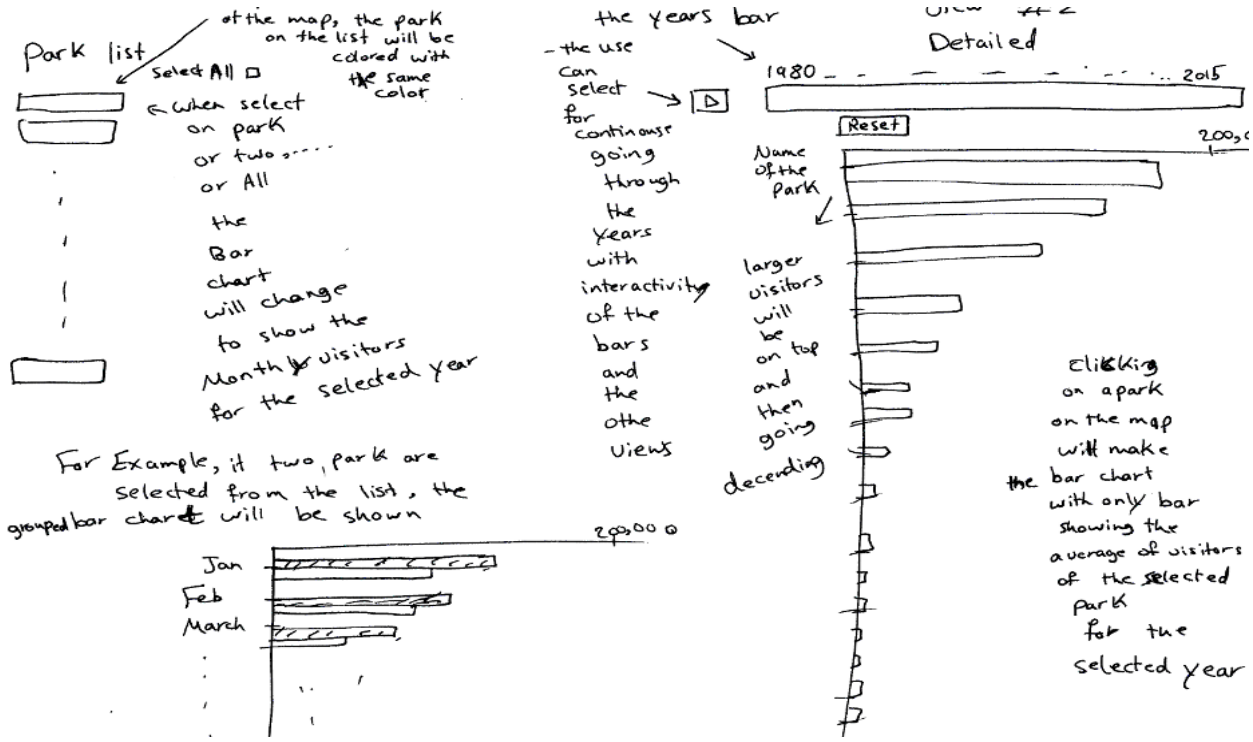
Base Design:



Sketch(1) Map View

From the outset we knew we wanted a map. Our dataset is national park data and as a result we felt it fitting to place the marks representing parks in the locations they would appear on a map. This view is designed to allow the users to see where parks are and also serves to relay some information. We planned to encode information about annual park visitation in the color and size channels of the dots representing the parks with this prototype.

Sketch(2) shows the view comparing each park to itself year over year, in addition to comparing this park to the others in the same time. By selecting multiple parks in the main view, where we have a list of them, the user can compare several parks at once or choose to keep only the park selected by a map click in the chart. The year bar in the updated version, which we moved out to control all of the views at once, will allow users to observe time trends. We chose to use the y-axis to plot the park name groups as it makes the parks easier to see when comparing them to each other.

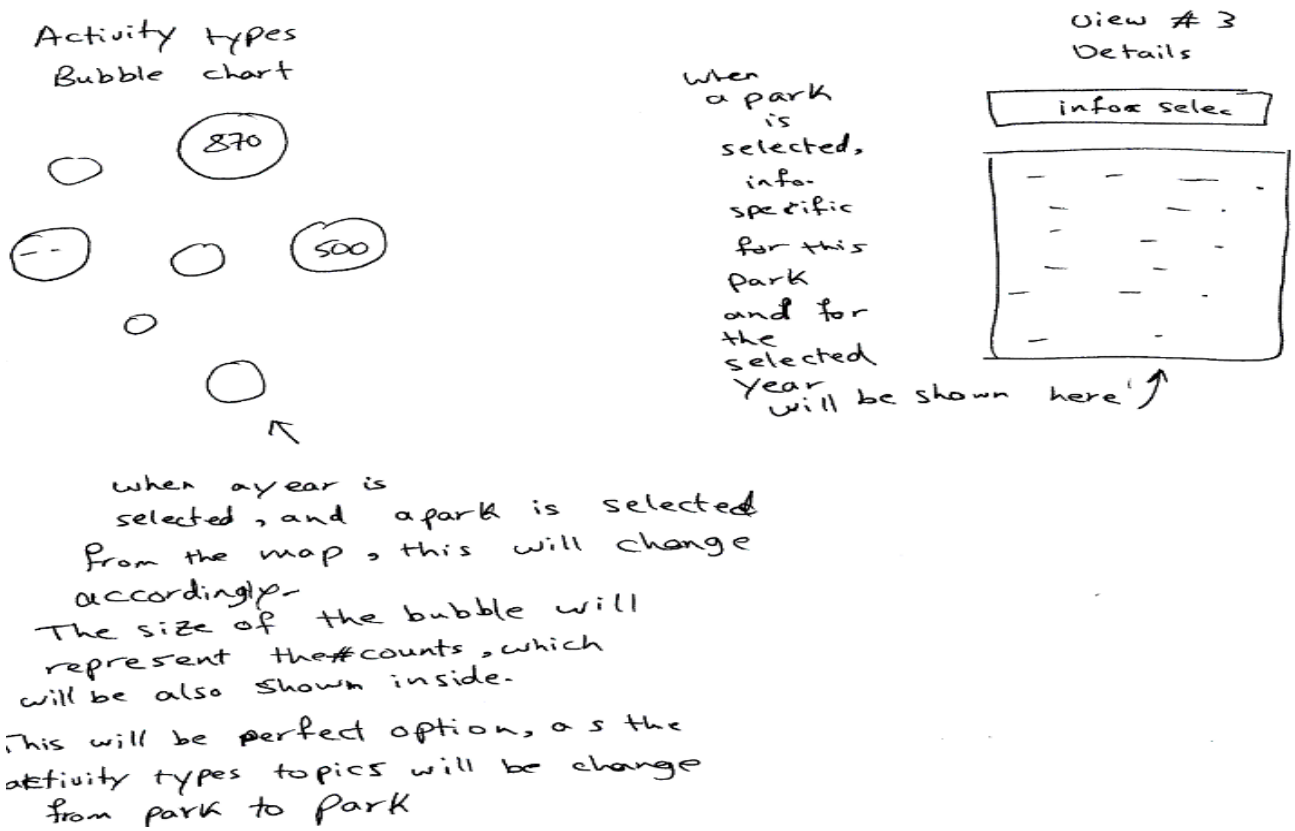


Sketch(2) Comparative park activity breakdown

The bar chart will use grouped bars to compare the various parks. We added a list of parks to the left hand side next to the map, this list is what a user could use to select multiple parks for monthly number of visitors comparison since the map view does not really lend itself to multi selection very easily. The reset button can be clicked to have the bar chart return to its default view. This way we feel we will be covering almost all the comparisons possibilities that

the user might be interested in. The map view will still control the primary set of bars displayed in the comparative bars and the contents of the bubble chart.

Since our activities data are specific for each park , we eventually felt that the bubble chart (Sketch 3) would be a good fit to show the types of activities for each park. The bubble chart aims to allow users to explore activities in a park in an interactive way, providing an information blurb about the selected activity along with numeric data. The data would be by month and year in this view as shown. Since we had some activity data we also wanted to give a sense of what a person could do in a specifically selected park too.



Sketch(3) bubble chart view

Essentially we chose a bubble chart for the activity display since they are good for presenting semi-related data that might not be suited for direct comparison. This allowed us to show the various types of data we had gathered about the parks without having to force non comparable categories into a comparative view like a bar chart.

Improved design decisions:

Map

We felt that the map was still the best way to give the locations of national parks to the user to show where they are, in the end we felt that this was something that uniquely required a map. However, we felt that the following updates would much improve the design of the map view:

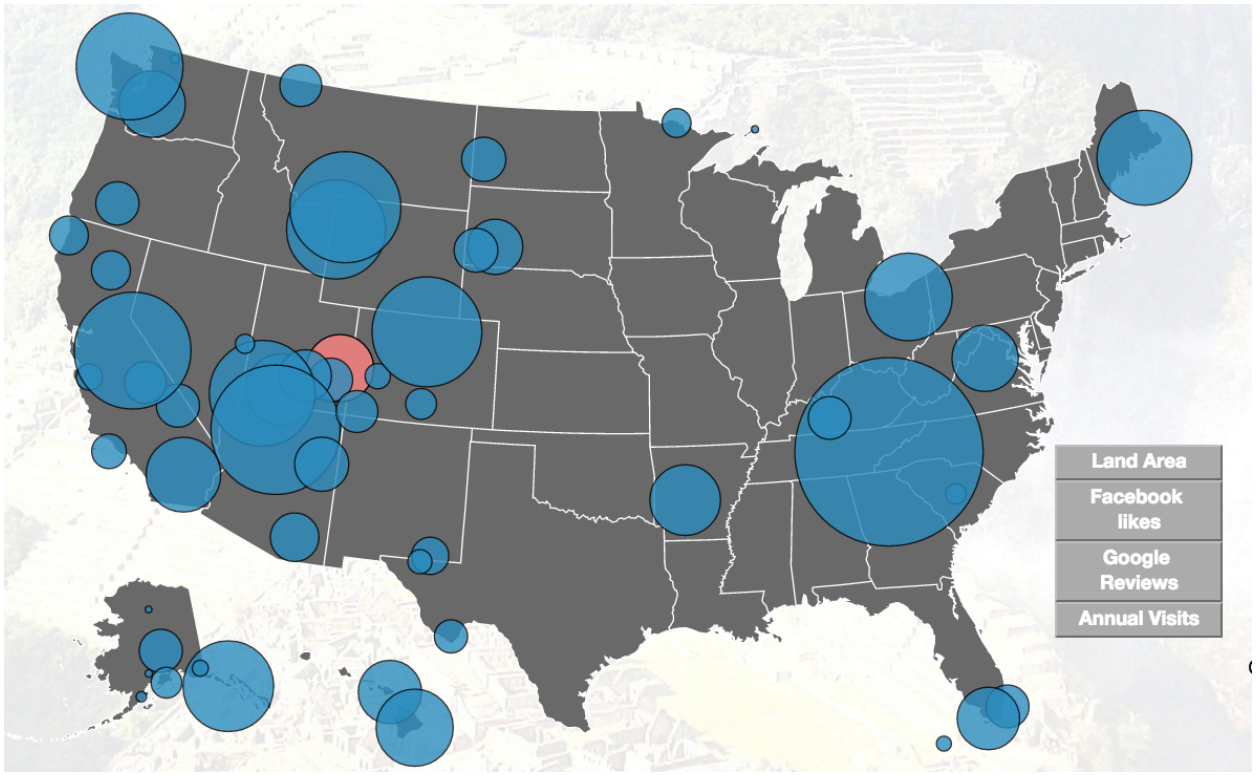
a. Extra nodes size Metric

We added another metric to control the parks nodes size; “Google Reviews” option. This would add extra feature the user can use for parks comparison. We chose this metric because most of the people would google the location of the place before their visit, this means general people will review the parks, and would not be limited to social media users. In the end due to this we felt that it would give more accurate reviews to the parks.

b. Multiple parks Selection from the map

We found that the ability to select multiple parks from the map itself would be more effective than having a list of the parks to select from. This was much easier for the user when they want to select multiple parks at the same time and from the locations they are interested in exploring. This was something we felt the list alone would not have delivered. While we set the default to “all parks selected”, the user can unselect parks by clicking on nodes or reset the selections to only one park using the “RESET Button”. The park chosen as a focus with our ‘click on bar’ selection method is also reflected clearly on the map.

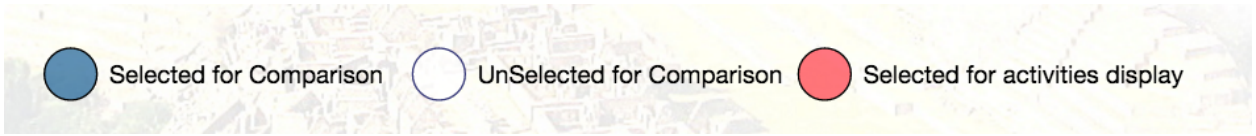
Figure(1) shows the map in it’s default setting. Blue circles indicate that the parks are selected, while red indicates a park is selected for focus in the activity view. Arches national park is the default selection for focus but the focus can always be changed by the user.



Figure(1) shows the map view in it's default setting

c. Convenient legend

Because of the different node types we decided to have a legend to help the user identify which parks are and are not selected, and which is selected for focus. This improved our design using the color channel. Figure(2) shows the legend which is placed under the map:



Figure(2) shows the map's nodes legend

Bar chart

We decided to incorporate some feedback from our consultation team session and decided that we could use stacked bars for some direct comparisons and having unique data for a specific park fleshed out more so in the bubble chart alone. We felt like the bar chart was one of the strongest ways to display data in comparison thanks to the length and position on a common scale. These two modes of display, being such strong indicators for the viewer, give

the best option for comparison. The bar chart was refined pretty heavily with some of the following additions:

a. ‘Reset’ and ‘All Parks’ buttons for bar chart and map views:

We had a problem when it came to select many parks at once because there are 58 national parks. We felt that it was better if the user did not have to manually click through every single park themselves before making any good comparison. If we had made all parks selected all the time, we would have had similar a problem when users, for example, wanted to focus only on a couple parks in a given state. Manual un-selection by clicking each park in the map was not a good option. We solved this by providing two quick selection options: The ‘All parks are selected’ option(which is the default) and the ‘reset to one park’ option. We found this was an effective and convenient way for the user to quickly select a large number, a few or a special set of parks that they were interested in.

b. Monthly visitation comparison

As discussed earlier, our base design was supposed to show all months in comparison for parks as a grouped bar chart. We decided this might be ineffective if the user wanted to select more than 10 parks at the same time. In this situation a grouped bar chart would take too much space to show monthly comparisons for a high number of parks. We decided to solve this problem by show a comparison for parks each month in a monthly mode instead. We found this was an effective way to help the user observing the changes through winter and summer season and months. When the monthly comparison mode is selected, the bar chart would then be updated for the selected month and the selected year.

Info Bar

To show the nature tourism growth of America through the last eight decades, and specifically the growth of the national parks, we added an information text pane about the selected decade. In addition to the map with annual visits metric for park nodes and the visitation bar chart, we decided this brief information would allow users a more immersive experience at very little development cost. It also presented us an option to balance the visual flow of the presentation rather than having the map off center. As in our original view sketches, we wanted to aim for the map being in the middle of the screen and this not only helped our users, but also our presentation style.

Bubble chart

Our bubble chart was chosen because we felt like the bubbles would easily map to categorical data. We accomplished this by positioning the bubbles separately and coloring them for a redundant encoding of the categories. We also felt like a bubble chart was good when

focusing on one park as opposed to several and allows the user to roughly compare some of the activities we were tracking from each park in a given month. Since we felt the internal comparison was a good aspect, we also opted to label with numeric values on each of the bubbles. Interactivity in the bubble chart helps to draw the user in and we met our plan to use this interactivity in displaying information next to it on right as well as drive our activity comparison view

a. Activity Comparison

For more effective comparison of activities, we decided to add a view next to the bubble chart to compare the selected parks for a selected activity. Since the bubbles are clickable, the user can start from there and select an activity to make the activity comparison view reflect data for this activity across the entire selection. This would help the user to easily observe the popular parks for a selected activity while at the same time learning which parks bucked trends or, were unpopular or even unavailable for a certain type of visitation.

b. Selection of activity display park from the two bar charts views

For Convenience, we decided the user should be able to select a park for focus in the activities view, map and bar charts. This can be accomplished from either bar chart with a single click. Either way, using the color channel, the park selected for focus would be colored in red in all the three charts; the map and both bar charts.

7. Implementation

When it came to implementation, we prioritized the visualization charts starting from the urgent- to-have features and ending with nice-to-have features. Eventually, we could successfully implement all the urgent features and most of the nice-to-have features.

In general, we started with Utah and surrounding parks only, but during this development, we realized we were excited to expand to the all the parks of the US for further exploration. We started with implementing the base charts; the map, visitation bar chart and the activity bubble chart. From there, we put a plan together to implement the interactive visualization and the rest of the features.

The following explains our key design and interaction elements.

Slider

The main tool linking each view together in our project is the slider that updates the year for the rest of the charts. First, we tried to implement the slider using html slider, however, to expand to the use of better style, we implemented a d3 slider as shown in figure(3). Information text to give visual feedback as to the slider progress was placed next to it, displaying the selected year.

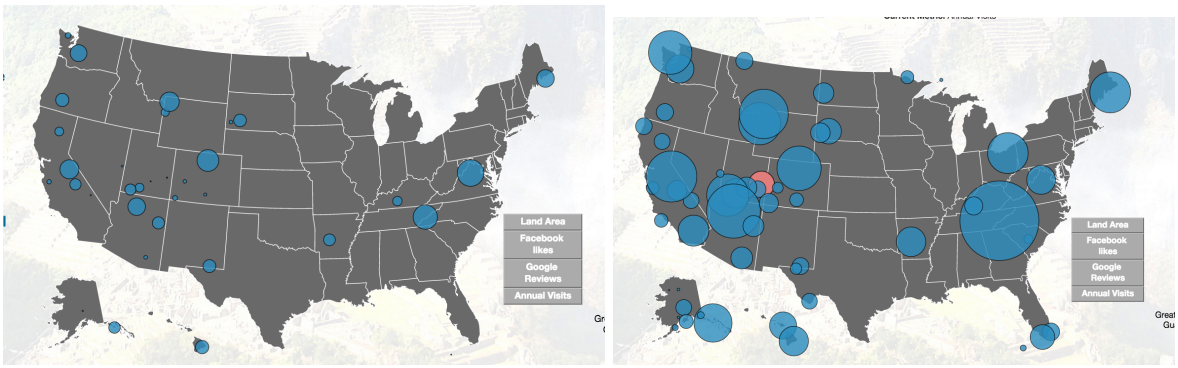
Figure(3): Selection of Year Slider

Map and Metrics for node sizes

We implemented the US map with states borders, with all US national parks shown by nodes where the parks are located. This makes locating the parks a user wants to explore by geographic region much easier.

One of our most immediate forms of interactivity are the buttons allowing the user to size the map nodes for the various parks according to different criteria. This was a simple interaction form that would relay information in a relative sense. We implemented four metrics for that purpose: Land area, Facebook likes, Google Reviews, and Annual Visits.

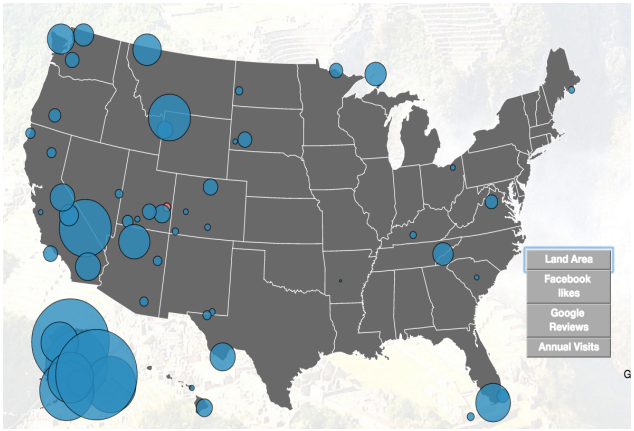
Figure(4) shows the map with the default metric; Annual Visits. We chose this metric specifically to show the growth of the national parks annually starting from 1930 till 2014. This helps give important geographic context in addition to the bar chart and the result is a more effective comparison. It lets the user to observe the establishment of new parks and changes in their popularity through the years by using the size and position channels. The goal is that a user will be able to focus on his or her interested state's parks by location to notice the growth.



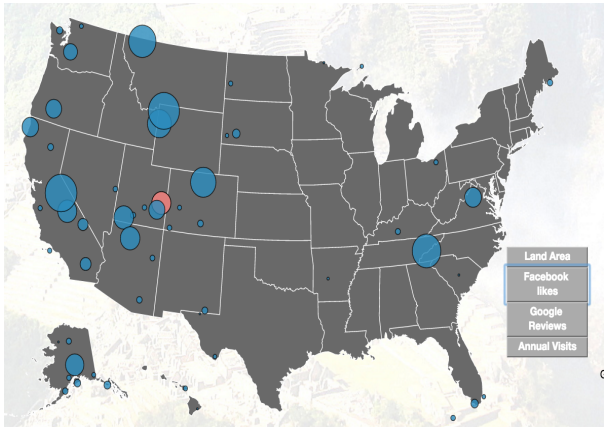
Figure(4): Map on the left shows the park nodes with annual visitation metric for 2010. Map on right shows the park nodes with the same metric for 1939

As noticed in Figure(4), there are interesting parks to note such as Great Smoky Mountains National Park that is located between North Carolina and Tennessee. This is a park that has a great growth through the years to become one of the most popular parks. On the other hard, there are parks that did not gain that kind of popularity such as Crater Lake in **Oregon.** Such observations will give an idea of the nature tourism in each state through the last eight decades.

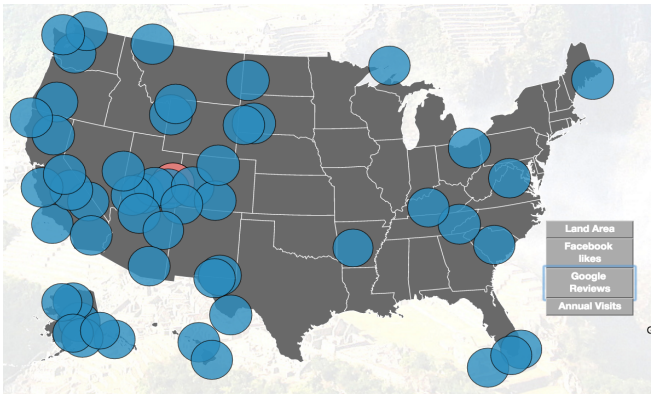
The three left metric are shown in Figure(5). They are fixed through the years, but they allow an interesting comparison for those who care about how large the park is, its reviews on Google and it's social media presence.



Figure(5)a. Parks nodes with Land Area Metric



Figure(5)b.Parks nodes with Facebook Likes Metric



Figure(5)c. Parks nodes with Google reviews Metric

Park visitation bar chart

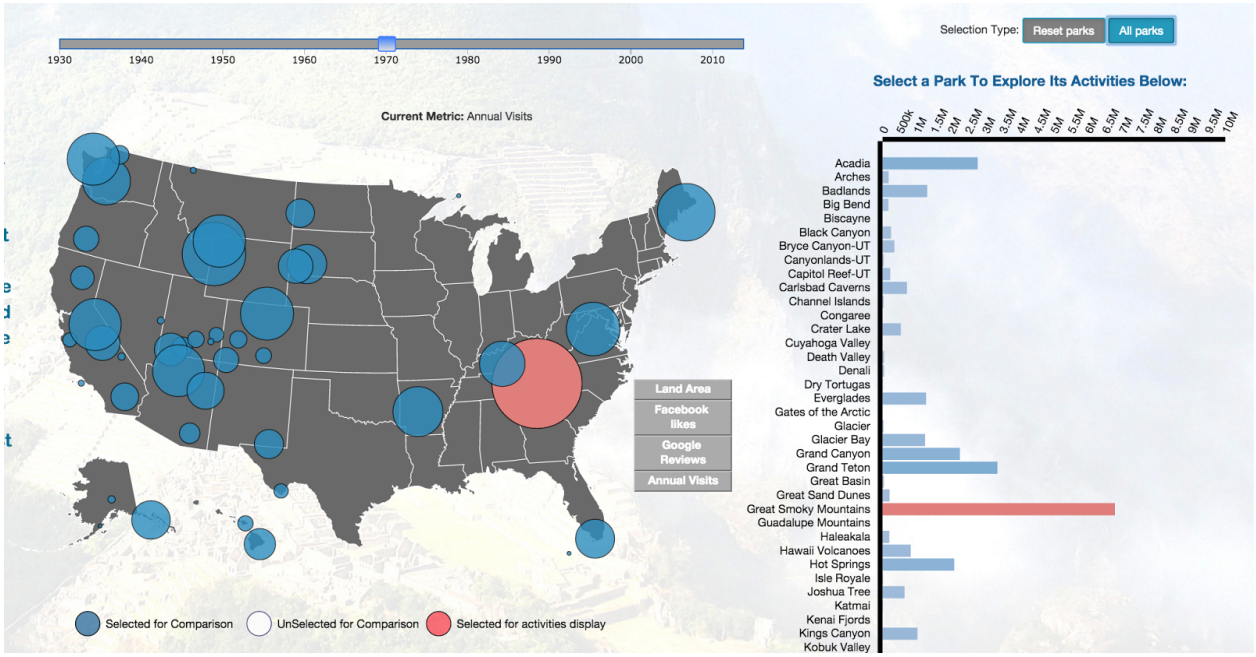
We implemented one of the main comparison tools in the project, Park visitation, with a bar chart. First, a bar chart with yearly comparison only, was implemented and updated by the selected year. Then, we put two buttons to switch between the yearly and monthly comparison. When either button is pressed, the park visitation bar chart will be updated according to the selected mode. The pressed button will be colored in a different shade for better indication of the current mode. We also added buttons representing the months to be used by the user. This

allows users to “scroll through all the julys” for example. We had considered a second slider for months but ultimately felt like a single slider with button augmentation was a more fluid user experience and presented our visualization more strongly.

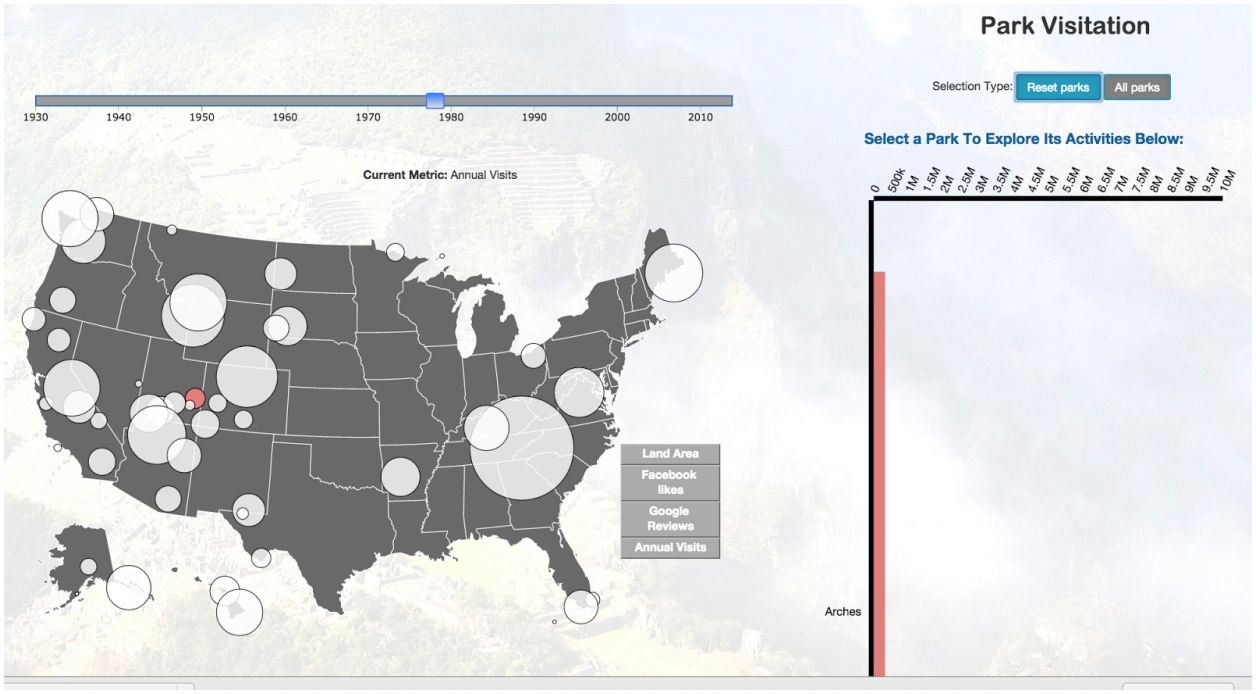
Park selection

As default, all parks are selected in the map and the park visitation bar chart views. To improve our design, we implemented two buttons representing two modes of selection, “All Parks” and “Reset to One Park”. ‘All parks’ gives the ability to compare all parks at the same time, while still having the ability to exclude parks by clicking on their nodes on map. Figure(6) shows the views when default, and when “All parks” is clicked.

The reset button will help the user to select parks of his or her interest without the need to deselect unwanted parks. Arches national park is the default selected park in this mode because it is our default focus park. Figure(7) shows the state of the views when the RESET button is pressed.

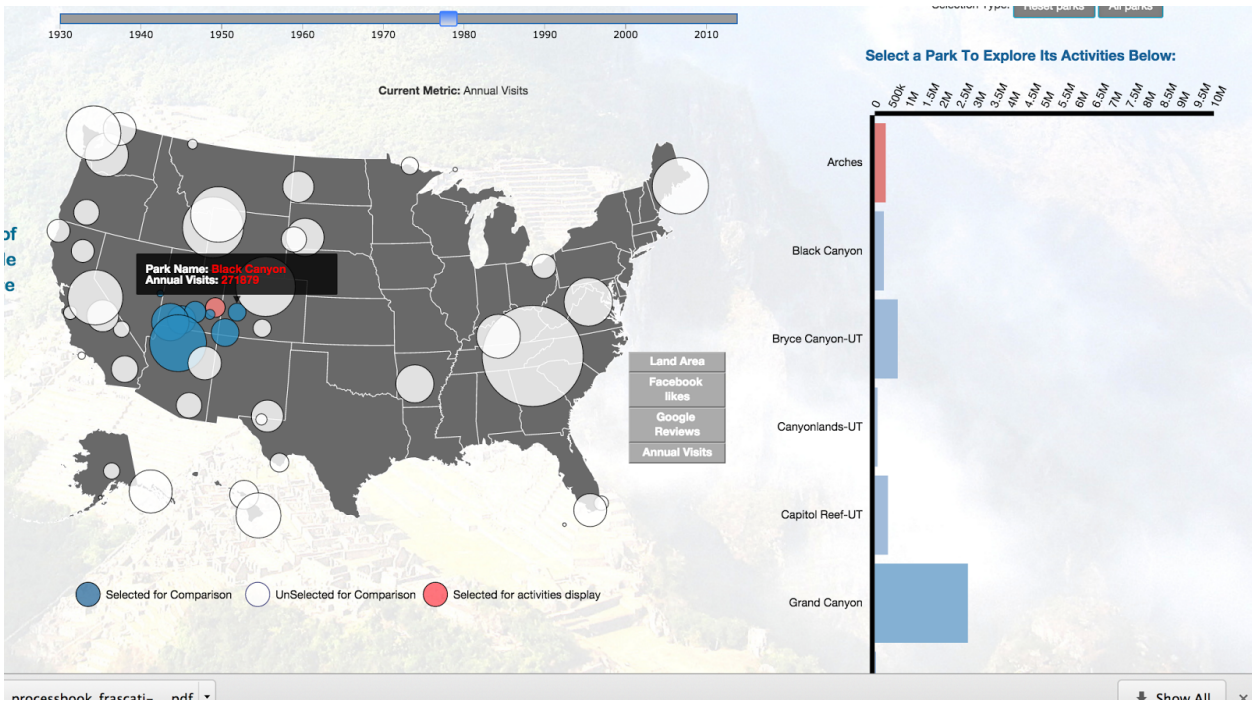


Figure(6) Map and Park visitation chart when select “All parks”



Figure(7) shows the map view and bar chart in Reset state

Figure(8) shows a selection of Utah parks. This was easily accomplished by using the reset button and selecting the parks of interest as described above

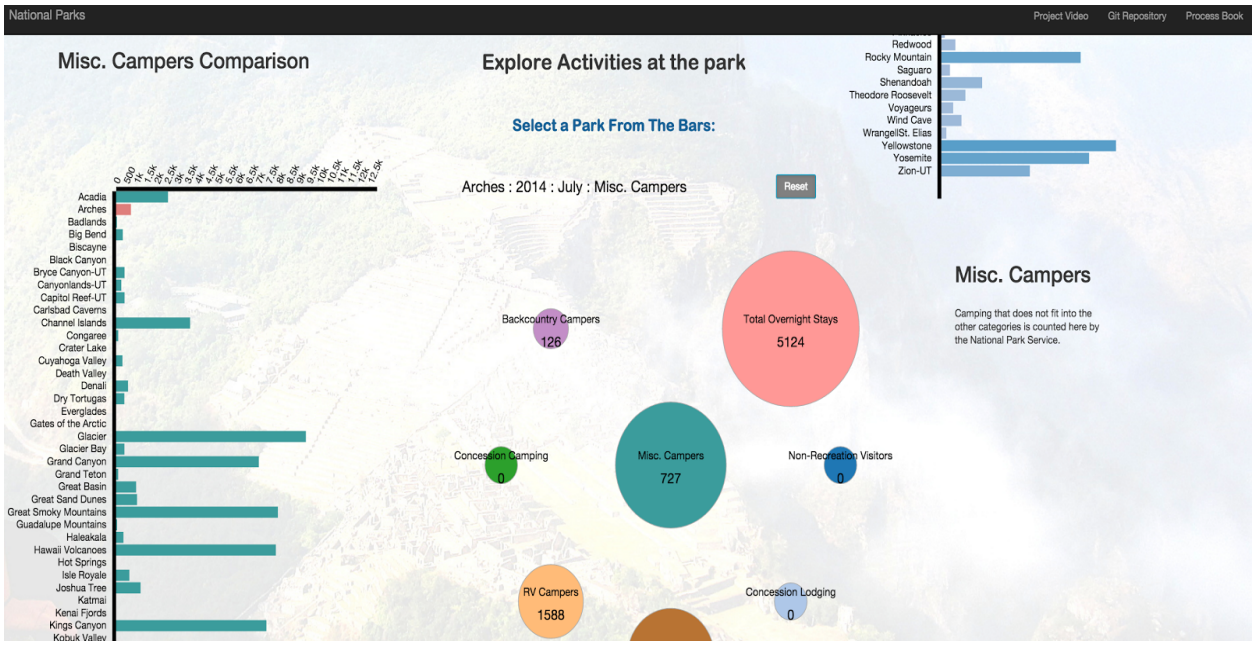


Figure(8) shows the map view and bar chart in for Utah parks and its surrounding

Remember that our legend shows the colors of the nodes status. We can see clearly from the above that this legend helps us rapidly categorize the nodes in question.

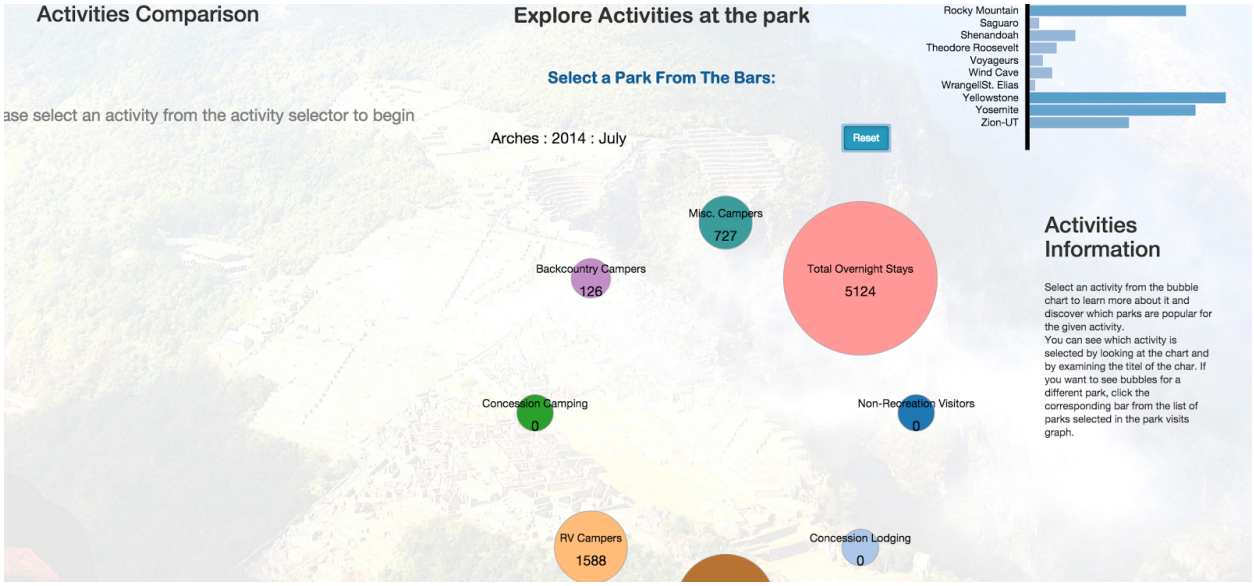
Activity bubble chart

Our bubble chart uses interactivity to select and highlight a specific activity by repositioning it to the center. Using this mechanism, the user is allowed to explore descriptions of various activities and also compare the counts of this activity to other parks. Figure(9) shows the bubble chart display activities for the focus park during the selected month and year while the activity comparison compares it to the rest of the parks. We adapted the color channel to highlight the focus park in a red color in the bar charts. By coloring the bars with the same color of the selected activity we felt we made our categorical selection of activity a redundantly encoded one and therefore easily recognizable by users. The activities Info bar on the right shows useful information related to the selected activity.



Figure(9) shows the bubble chart and the activity comparison for Arches national park

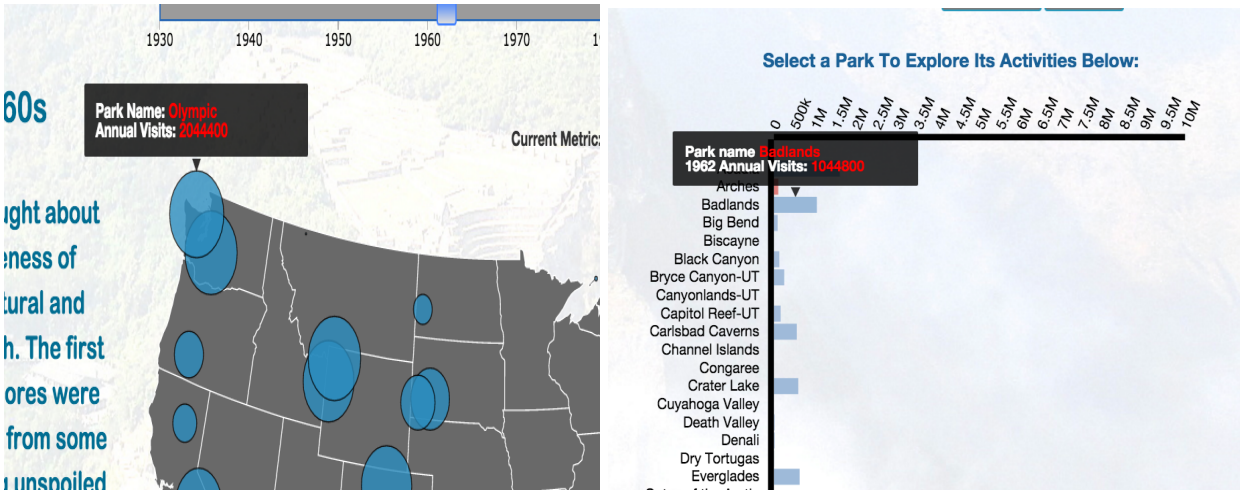
By default and when reset button is pressed, the user will need to explore the activities by clicking on one of the bubbles and select the desired year and month from the slider and the months buttons above. The default states of the bubble chart and activities bar chart are shown in Figure(10).



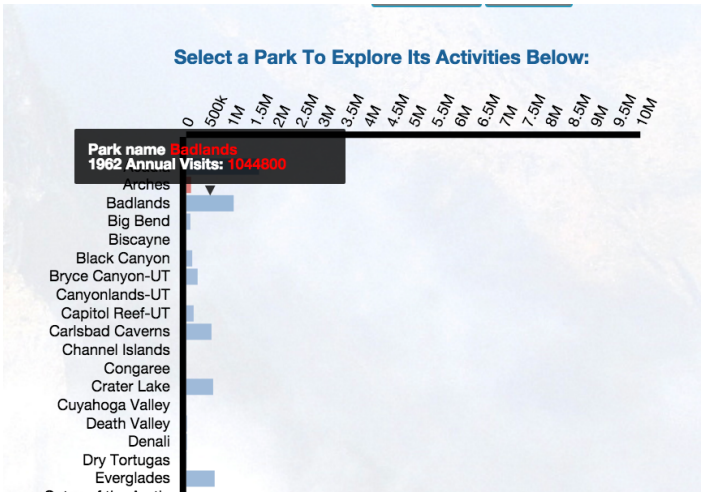
Figure(10) shows the bubble chart and the activity comparison in default/reset status

Tooltips

Tooltips have been implemented in almost to all the views for showing useful information. In the map for example, showing the park name as a tooltip is very useful way to connect the parks names with their locations. The following figures show tooltips examples for the different views.



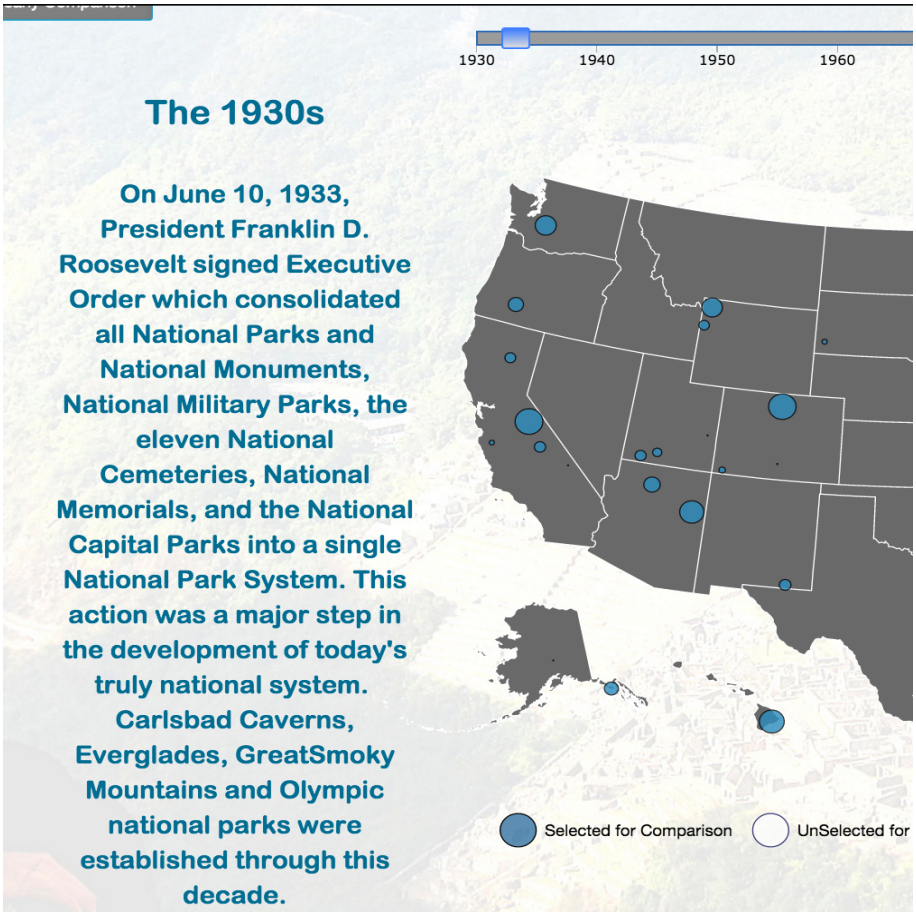
Figure(11)(a.)(b.) Tooltips for the different views



Figure(11)(c.) Tooltips for the different views

Info Bar

History information helps the user observe the national parks growth through the decades. By scrolling the slider, the info bar will be updated with the current decade to show brief history information and the establishments of new parks for that decade. Figure (12) shows the decade " The 1930's" which is the base year of the national parks system establishment.



Figure(12) History information bar for the 1930's

8. Evaluation

The data we recovered answered some important questions about the national parks which neither of us had known.

Regarding the history topic, America experienced remarkable prosperity with the national parks beginning with the establishment of one national park system at the 1930's and till nowadays. We saw a growing trend from the beginning with almost all parks, despite fluctuations. This is an indication that nature tourism in America is growing everyday.

We observed a lot of history by scrolling the year slider from 1930's till 2014 to make the nodes on map change under annual visitations view mode. We noticed the creation of new nodes on the map and bars too, which indicates the establishments of new parks through the years. The enlarging of other nodes and increases in other bars indicated strong popularity increases.

Through the map, we could also observe where the high growth took place and where less took place. The West and East coast of America had the most growth, while we noticed the lack of this growth in the middle of the US. We used the bar chart to display these changes.

One of our most surprising realizations was just how popular Great Smoky Mountains national park was through the years even though it's not too big in land area compared to the other parks. It was interesting because we had never heard of this park before but apparently it gets quite a bit of attention.

Another interesting observation is that Alaska has the largest national parks in the US, although the average annual visitations are the lower than all but Glacier Bay national park

We observed that through May to September, parks had great growth levels with average visitations around 1 to 2 million, which make sense because of the weather. However, we noticed that December has the most growth through the years, with average visitations reaching 9 to 10 Million. We concluded the reason might be the holidays in that month.

Using our activities view we found that there are surprising number of people for example, that braved the cold to go camping in the winter months in many parks. For example, in January 2014 we note that several parks in Alaska had people who braved the cold to camp in the backcountry, something neither of us expected.

We also found that parks on the west coast seem to have more camping going on than any on the east coast. This was interesting because one might not expect such a difference in how the parks operate or their services.

Still more interesting however, may have been the number of non recreational visits to the Dry Tortugas national park. This statistic prompted us to research the location a bit to learn more about why that may be. In the process we learned about a place that we never otherwise would have bothered to seek out. We learned about the maritime history of the florida keys in which the Dry Tortugas park is located and found out about the keys, their history and their interesting tropical climate. This was all as a result of an interesting bit of data in the visualization and strongly sums up why we wanted to do this visualization: Small interesting data points can lead to enhanced user driven learning and exploration above and beyond what we initially anticipated and it has made this visualization quite an interesting project for us.

Future Improvement

With the time limit while making this project, we have some features that we did not add but would see as beneficial to improving it. While we feel it is well done, we feel that as with any system of this kind, more detail would further expand our work's impact. We would really love to have added a zoom feature for the map and probably a brush too. We feel this would have added a quick way to select maps. Additionally, perhaps additional display modes for the maps

such as the topography or even showing the park boundaries etc would have added a strong bit of depth to the map..

One idea we considered was implementation of stronger individualized park information sections, showcasing photos of a park through the years and linking directly to its online website from the national park service. This sort of thing supports some of the “spur of the moment learning” that we had engaged in and we feel that could be a good addition to the visualization as a whole.

We also considered adding line chart tooltips for an overall of a park over the years or months. While our comparison view is strong, self comparison could be improved a bit by adding such a system. In the end we felt like it was a bit more work than we wanted to do and if not working completely, would have distracted our audience from the core mission of our visualization.

Success

We can say today that we were successful by making this visualization great and that it is working very well. We implemented far more than expected and we were able to face and conquer, all of the challenges we had through working on the project. Perhaps most importantly, we answered our own questions and gave ourselves new ones to ask. We hope our users can experience the same as they enjoy our hard work and dedication.

Sources

Many features of this project were adapted by the following sources:

1. General,D3 Library
2. Slider, D3 Slider
3. Map, TopoJSON gallery
4. Bar charts, bar graph elements from Mike Bostock
5. jQuery javascript library, jQuery
6. Tooltip, Tooltip from D3noob
7. Bubble chart, D3 Bubble chart
8. Queue Library, Queue Library for loading Data

Thank You

We would like to give many thanks to **Alexander Lex** for teaching us Visualization principles that made this project possible, and also for the valuable feedback.

Thanks too to the TA Zinnia Mukherjee for the valuable feedback and consultation.