University of California, San Diego

Cogs 121 Spring 2016

soloSD Final Report

Proposed by:

Team P

Allan Asis, Veronica Chen, Gabriel Gaddi, Alicia Ning, Michelle Nguyen

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Executive Summary

The problem we addressed with our project is the problem of social exhaustion. Introversion or the desire to be alone at times are rarely considered. There are also times when people leave home and just want to find a place to temporarily relax and escape. Most of the time, people have to find these places themselves as being social is seen more in a positive light compared to being alone. This is why we created soloSD. As a user, I can use soloSD to find places to explore and be alone by picking large open areas such as parks and cemeteries. This allows me to find places easily instead of having to rely on where I have been to already.

The design for soloSD came about when our group decided on what applications we would want to use. Most of us on the team are introverts and thus we get socially exhausted at a faster rate than other people. By imagining ourselves as users, we created the design for soloSD. San Diego is a huge city and there has to be locations where we could avoid society and relax while still enjoying the wonderful city. From here, we made an assumption that places such as parks were an ideal location to relax and be by ourselves. However, we did still want to feel safe, which the idea of marking the closest police station and health clinics came in mind. We also wanted to make sure there were other places nearby we could go to if we wanted to. Lastly, we wanted to compare different locations in order to help make a decision on where to go. By combining all these ideas together, soloSD was designed.

So prototypes for soloSD first began as wireframes and paper prototypes. These were used to establish an accepted layout of how we would want to display the information that we acquired and make sure that everything, like the map, were being displayed properly. From the low-fidelity prototypes, we went to high-fidelity in order to check the flow of the application and to better understand how the layout would look. From here, we were able to change the design repeatedly to get the desired features and design, which resulted in what we have today as soloSD.

Some feedback we gotten from the prototypes has helped us tremendously from changing our design. Originally, our design looked very sandwiched. From this, we changed the sidebars into tabs than can be minimized. This helped allow more of the map to be shown and helped the items look less clustered. Another suggestion was how we displayed the data. This is where the comparison with the bar charts came up and why we displayed numbers for the places. From the different evaluations for our prototypes, we were able to continue to improve soloSD.

The most important feature for our application is the markers for locations to go to and the nearby places for that marker. This feature allows our users to find a place to go to and be alone while still having conveniences they would need to enjoy themselves. By allowing our user find these markers, it allows them to conveniently choose a place based on their location and explore the area safely.

In the future, we would want our project to continue to cater to those users who want to find a place to be alone and enjoy themselves. This is why some of the features we would want to add would be population density ratings as well as traffic in real time. By providing this information, users would get a better understanding of how crowded a place is and choose to go

there or not based on the information. We would also want to allow the user to write a journal entry about the location so they know they visited the place and can choose whether to go again based on their experience. Once these are implemented, we would want to continue to find ways and new features we can implement to continue to appeal the our target audience.

1. Introduction

With San Diego being such a huge city to explore and with continuous flow of people coming in out of of San Diego, it is a huge place to explore. With the application, soloSD, the goal is to help people who may want to explore places in San Diego without being suffocated by the huge population.

In section 2, we will discuss the motivation to use our application and why our application is more efficient than similar applications. We will also discuss the problem that our application solve and explain why there isn't a sufficient solution to this problem like soloSD.

In section 3, we will discuss the design of our application. We will go into how our design has changed over time and how the feedback we received has influenced many of our design of soloSD.

In section 4, we will discuss the system development of our application. In this section, we will go into the architecture of our application and what technologies were used for our application such as mapbox and DELPHI databases. We will also go into the features of our application that utilized these technologies.

In section 5, we will discuss the Human-computer interaction (HCI) principles that we implemented on our application, and discuss any test conducted and the feedback returned. We will also discuss the how the user reacted to our idea and the motivation we described. For each feature, we will discuss why the principle we chose was applied to this feature.

In section 6, we will discuss the contribution of each of our members and the division of labor for our project.

In section 7, we will summarize our project and discuss any future ideas that we plan to implement and changes that still need to be made.

2. Motivation and Background

So with the large population of San Diego, being the 8th largest city in the United States and 2nd in California, it is difficult to find a place to explore without there being a vast amount of people. Since there are prestigious colleges like UCSD and CSUSD, there is a constant flow of people coming in and out, meaning that there are always new people coming that may not want to interact with such a huge population, but want to explore San Diego. Although our application can't point out places that are truly isolated, it suggests places that would allow large open area in which the users can explore without having to interact with people.

The problem that our application solves is that it helps people find places in San Diego where they can be alone without interacting with people. This is why we suggested places like

parks that have large open area for people to still explore and enjoy the San Diego area. With the large open area, we hope that our users would be able to find a secure place to relax and enjoy their surroundings without the worry of others. They can take all the time they want to explore the area while feeling safe. The feeling of safety is accomplished by allowing our users to be able to see the nearest police station. We took into consideration that the closer a police station is to an area, the less likely a crime is going to happen. If something does happen, the closer the police station, the faster the response will be as well. In case of injury, we also put the closest health clinic where the user can get help if they aren't feeling well. This also means, faster response time in case of emergencies as well. By including this information, the user can feel safe while they explore, motivating users to use soloSD even more.

So why hasn't there been a solution to this problem? It is because many places encourages people to go out together, and not by themselves. Many places offer group discounts, but nothing for people by themselves. Of course more people means more profit, but that also means that they encourage more people to come together. However, there times when people want to go out by themselves and explore. This is where our application comes into play. Our app, soloSD, actually encourages people to go exploring by themselves and find comfort in doing so.

Some people out there may just want to use Google Maps to find a place or whatever map application they prefer. However, you would have to look up the place, then look for the police station and health clinics around that place to see if it is safe. Our application skips this and does both at the same time. By looking at the markers, you can find places to explore and see safe spots around the area.

3. Design

As stated in section 2: Motivation and Background, initially we had set ourselves in mental health services where we sought to aid researchers in the psychiatric field by providing answers to the question: 'How might we communicate the hardships of others to therapists, psychiatrists, and other researchers in an empathetic way' through the transformations of our data visualizations. The key motivating factor in arriving at our service is to humanize statistics in order for policymakers and all in the psychiatric field to best handle afflicting trends in vulnerable populations around their local areas. However, this idea remained divisive between finding real user needs and finding purpose for the data we already had. Our initial design sprint will showcase how we arrive into our current design.

We organize our calendar with a gantt chart. Beginning with a 24 hour design sprint, we each diverged across many different interests we had searching for potential needs to iterate upon and develop services for. We also used the databases immediately available to us to drive ideas toward certain directions.
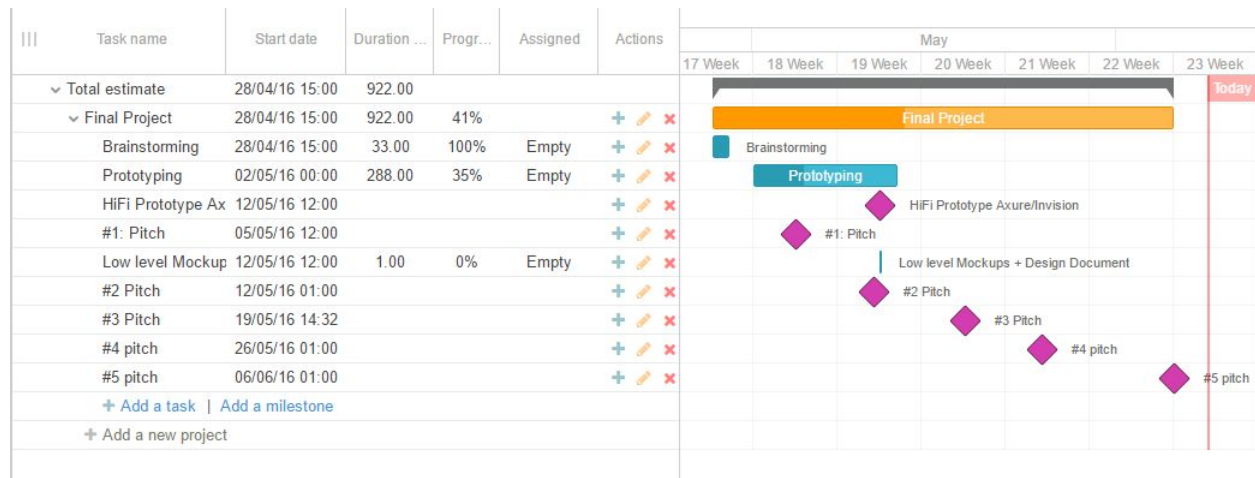
We looked at:

- Potential living spaces
- Mental Health
- Neighborhood Public Policy

- Physiological Health

Constricting our brainstorming to 24 hours forces us to critically enumerate on potential topics without getting caught up on perfecting an idea. From choosing to launch with developing upon the problem of: "do certain demographics display more of a trend towards certain mental issues than others?," we began a 72 hour prototyping session where we focus on our core tenets derived user needs we researched.

Our current idea, soloSD, was established after being unable to develop a unique niche around the problem: As stated in the introduction, initially we had set ourselves in mental health services where we sought to aid researchers in the psychiatric field by providing answers to the question: 'How might we communicate the hardships of others to therapists, psychiatrists, and other researchers in an empathetic way' through the transformations of our data visualizations. The key motivating factor in arriving at our service is to humanize statistics in order for policymakers and all in the psychiatric field to best handle afflicting trends in vulnerable populations around their local areas. However, this idea remained divisive between finding real user needs and finding purpose for the data we already had. Our initial design sprint will showcase how we arrive into our current design.

We organize our calendar with a gantt chart:

Task name	Start date	Duration ...	Progr...	Assigned	Actions
⌄ Total estimate	28/04/16 15:00	922.00			
⌄ Final Project	28/04/16 15:00	922.00	41%		+ ✎ ✗
Brainstorming	28/04/16 15:00	33.00	100%	Empty	+ ✎ ✗
Prototyping	02/05/16 00:00	288.00	35%	Empty	+ ✎ ✗
HiFi Prototype Ax	12/05/16 12:00				+ ✎ ✗
#1: Pitch	05/05/16 12:00				+ ✎ ✗
Low level Mockup	12/05/16 12:00	1.00	0%	Empty	+ ✎ ✗
#2 Pitch	12/05/16 01:00				+ ✎ ✗
#3 Pitch	19/05/16 14:32				+ ✎ ✗
#4 pitch	26/05/16 01:00				+ ✎ ✗
#5 pitch	06/06/16 01:00				+ ✎ ✗
+ Add a task	Add a milestone				
+ Add a new project					

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We looked at:

- Potential living spaces
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upon the problem of: "do certain demographics   display more of a trend towards certain mental issues than others?," we began a 72 hour prototyping session where we focus on our core tenets derived user needs we researched.

Our current idea, soloSD, was established after being unable to find a unique niche when tackling the problem of:

> *What trends can we find for mental health in relation to factors such as age, sex, race, and income to attach digestible visualizations that are manipulatable by layers of demographics available to us through the delphi dataset, and develop user stories enabling research to be more than just an overview of who is afflicted with what.*

Thus we pivoted toward the issue of social exhaustion in public spaces is close and familiar with many members of our group, and we believed the idea to be unique and interesting enough to pursue as a project.

We felt that there was a lot of potential for an app that emphasized both getting out of the house and being comfortable by yourself. By working on soloSD, we hope to provide the more socially withdrawn side of San Diego with a helpful tool that encourages getting out of the house and enjoying life without having to worry about the busy world around you.
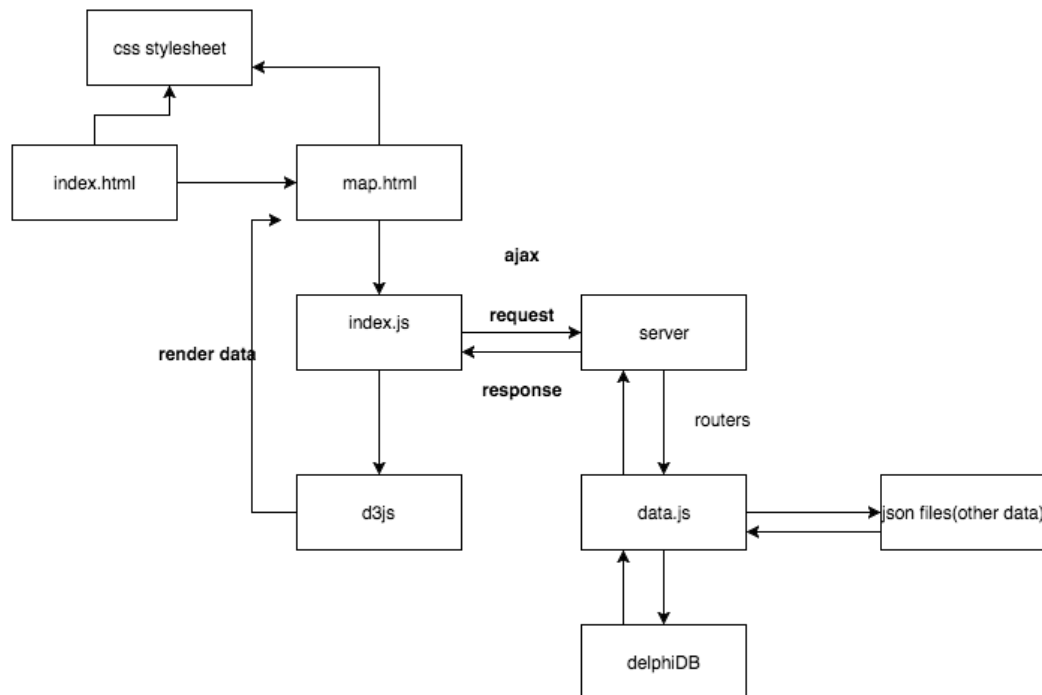
4. SYSTEM DEVELOPMENT

4.1. Architecture

Fg1.Architecture design UML

4.1.1 General architecture design
　　　　This system is development with Nodejs,a light but powerful open source web application framework.Considering our application's frequent data transporting requirement,we implemented Ajax in the system to enable async data communication.In this way,we are able to do data visualization in a dynamic way without complicated and slow html rerendering,since we can only update a part of the page and keep other parts static.

4.1.2 Client side architecture design
　　　　Our application has two html pages,one for the landing page and one for the main page.
　　　　On landing page,we provide a brief guide for users to explore what they can do with our application and what's our goal.After user getting the idea of how to use this app,they can enter the main page.
　　　　The main page consists of two views,one for the interactive map,on which users can select the type of places they want to explore and the nearby police,clinic info will be displayed alongside. Also users can explore the nearby shops to see how possible the place will be by selecting the checkbox.The other view is the *Saved Place* view.When user save the places they like,they can click the button to jump to this view and make comparison of data .
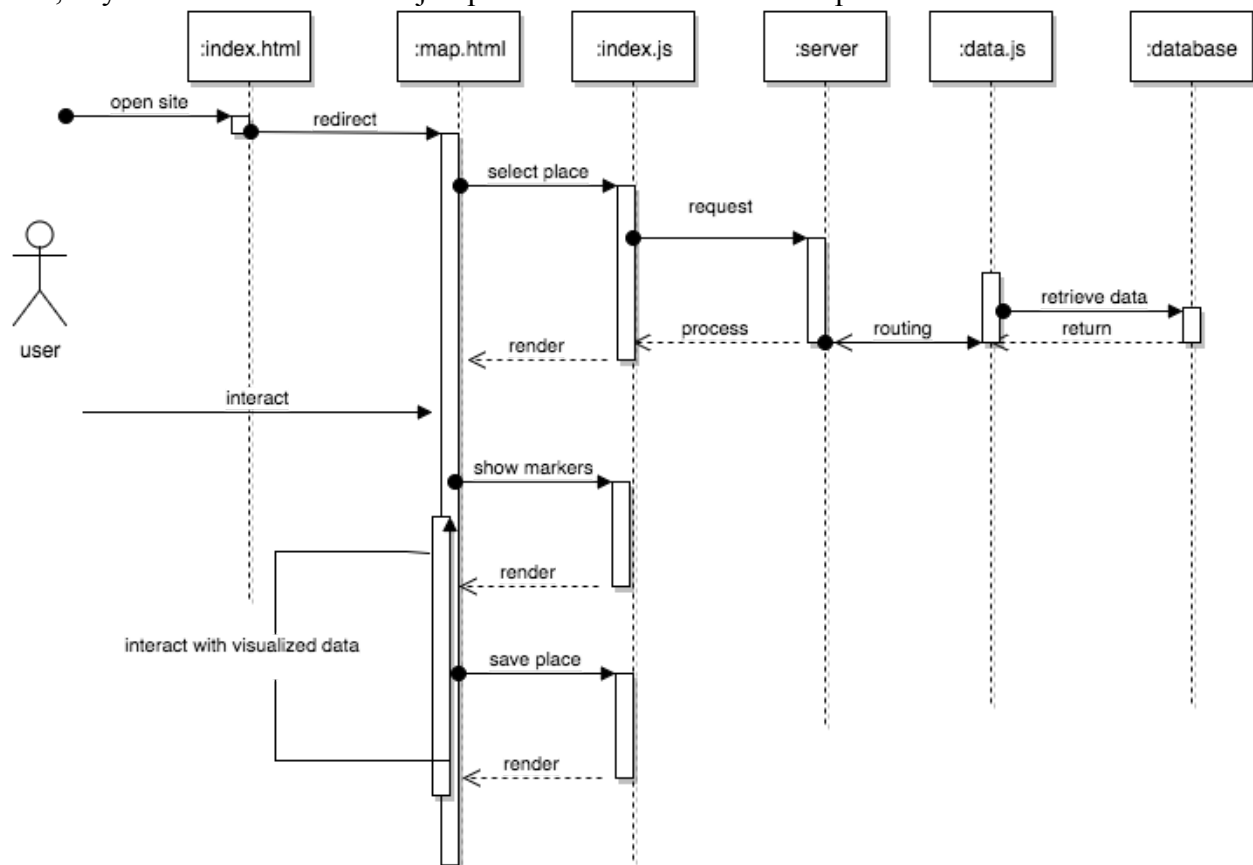
Fg.2.Workflow Sequence Diagram

4.1.3 Server side architecture design
　　　　Implement the decoupling principle,we created a route and a data endpoint for every request.Database connection and data retrieving are done in data.js .

For every database query process,we design complicated aggregate algorithms to retrieve expected type of data.The main algorithm we used are :

a.Find nearest place by calculating distance with squared difference of x and y coordinates and get the one with smallest distance

b.Get average distance from the place user selected to all the police and clinic

c.Find nearby food,drink and grocery shops with 0.02 square mile

4.1.4 Inputs and outputs

Inputs in our system can be

a. type of place
b. Selected info to display
c. Control event:save location,delete location

And the outputs will be

a. Makers displayed on map
b. Information of the place shown on sidebar
c. Corresponding immediate responses for the save/delete action
d. Text information of saved location
e. Bar chart for shops data visualization

4.2. Technology Used

4.2.1 Mapbox

We implemented Mapbox in order to provide users with better user experience .Mapbox is customizable and provides lots of helpful interfaces ,so we were able to create a map that can serve our purpose best.

What have done to customize map are

a. Customize makers
b. Marker cluster ,which prevents user from being overwhelmed by too many markers showing at the same time.
c. Set map boundary ,which can prevent inappropriate zooming
d. Add geolocation function ,use can locate themselves with a click which helps them make decisions and comparison.

4.2.2 D3/C3 js

We implement D3 as our main method to do data visualization.Although D3 is powerful ,we still found some inadequate so we decided to implement C3js,which is an open source project based on D3js.This library enables us to make more interactive charts,with less coding and easier to make dynamic changes.

4.2.3 Ajax

For better performance ,we implement Ajax which made it possible to update the data visualization without re-rendering the whole html page.This definitely improved the response speed and helped with reducing coding pressure.For user friendly design,response time is a very essential factor that developers have to take into consideration.Using Ajax technique can ensure the speed of our application,which makes sure that user won't be frustrated by long waiting time and consequently,they will be more willing to continue use our application.

4.2.4 Json query

Although Delphi database contains most of the data we need, we still need other data from the json files which contains the data we collected from the internet.Hence,in order to do
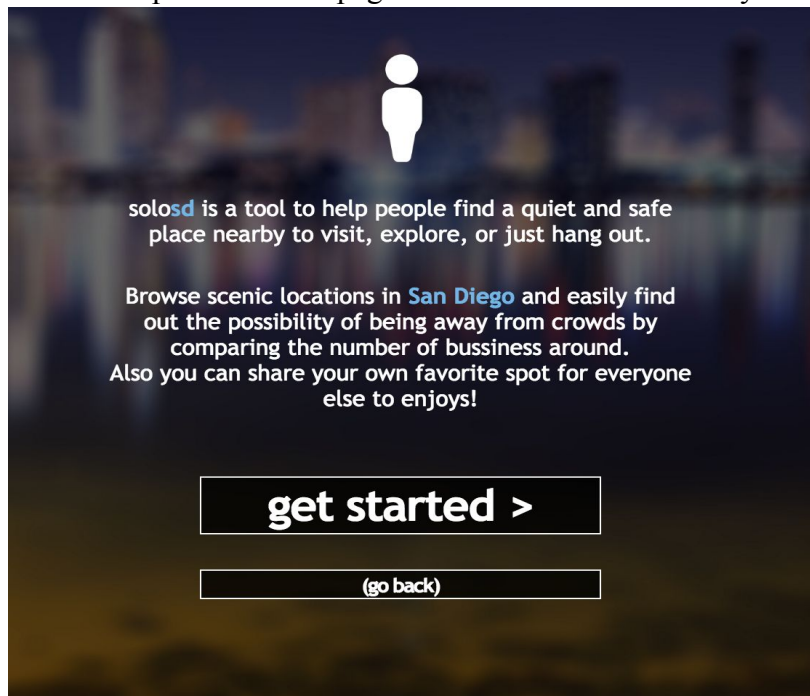
efficient query on these json files ,we implement *json-query* to do queries in the way like doing queries with sql database,which greatly improved the query performance.

4.3. Features
4.3.1 Landing Page

We provide about page to let users know what they can do with our application.

Out of the consideration that new users might feel confused once enter the landing page,we make an About button to show a brief introduction of our application in order to give them a guideline in how to use it and what results they can expect to get.

4.3.2 Select type of place

There are totally three types of places that users can select .We made the choices checkbox out of the consideration that users might want to explore more than one type of places at one time .This feature helps users to categorize the places which is helpful for them to explore in a more organized way.
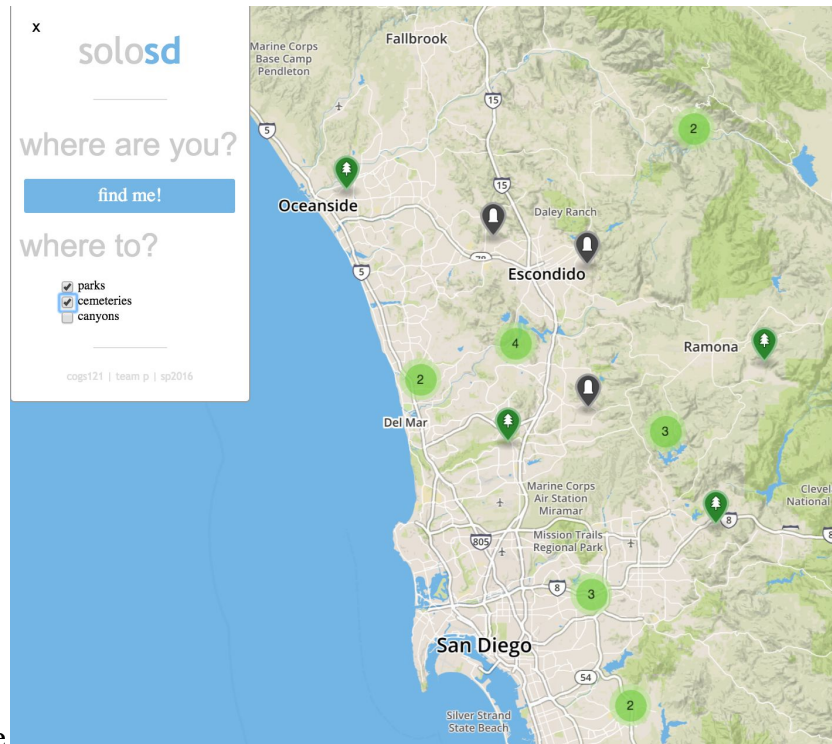
4.3.3 Geolocation -Find Me
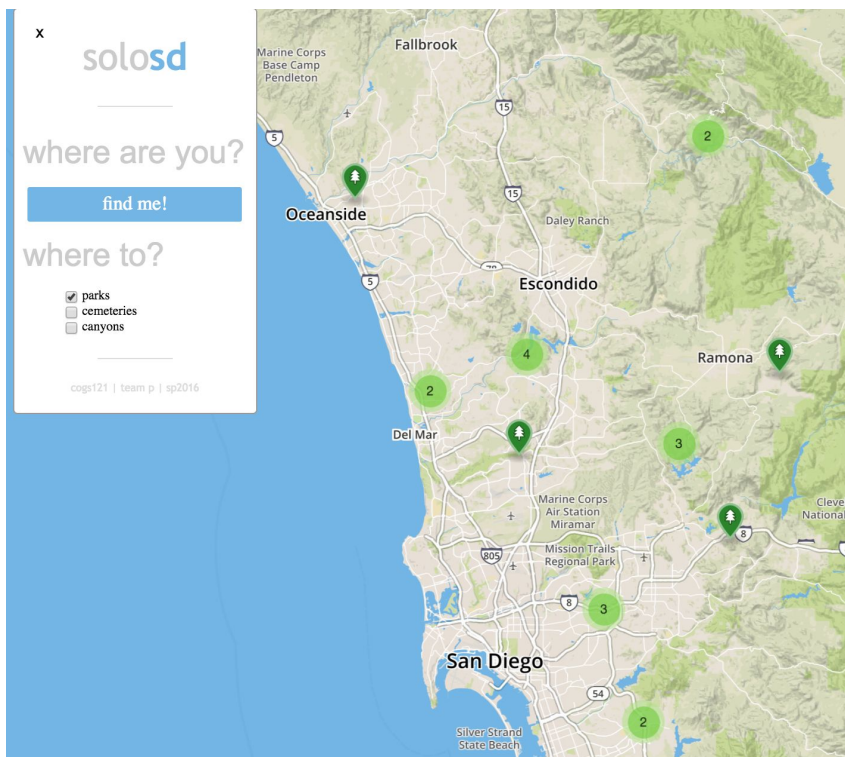
Users can click the button [Find Me] to locate themselves.This was achieved by implementing the Geolocation API offer by Mapbox.
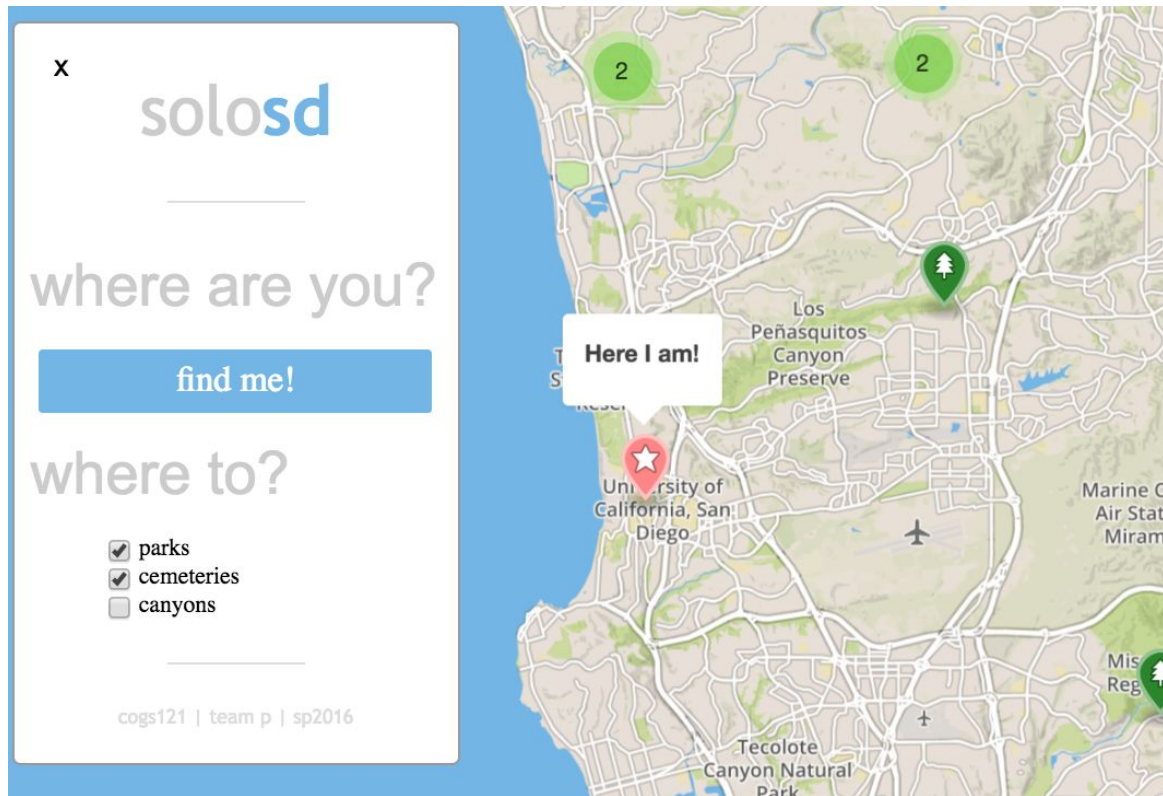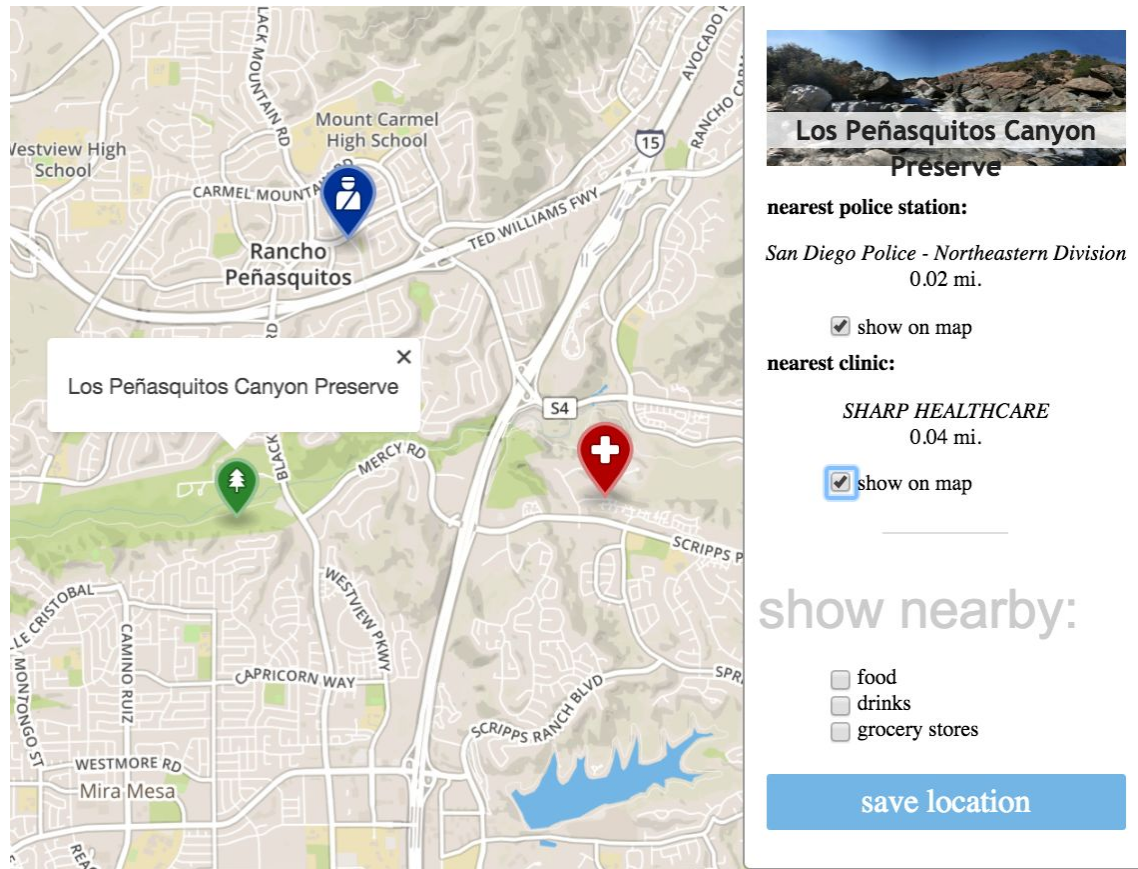
4.3.4 Selected place info

When users click a marker of a place,the related information will be displayed on the right sidebar. Information includes name of the place,an image and the nearest police station ,clinic 's name as well as the distance.

We display these information in order to give users a brief idea of is this place safe enough for me to go alone? More specific, is this place near to a police station that I can get help immediately when something bad happens,or is this place near to a clinic that I can get quick aid when I get hurt?

We calculated the distance from this place to all of the police and clinic and select the ones with smallest distance.

Los Peñasquitos Canyon Preserve

nearest police station:

San Diego Police - Northeastern Division
0.02 mi.

☑ show on map

nearest clinic:

SHARP HEALTHCARE
0.04 mi.

☑ show on map

show nearby:

☐ food
☐ drinks
☐ grocery stores

save location

       Another kind of data we offer is about the nearby business .We have two purpose to display this data.First of all,the number of shops can be a determining factor of the possibility that this place will be crowded or not.For example,if there are more than 100 shops around within 0,02 square mils,it is possible that there will be crowded ,even maybe a commercial center.So we suggest users to avoid the place with too many shops.

       In another aspect, users might want to grab some food or drinks during their time alone. So we provide the shop information that they can take into consideration as a oritentation for
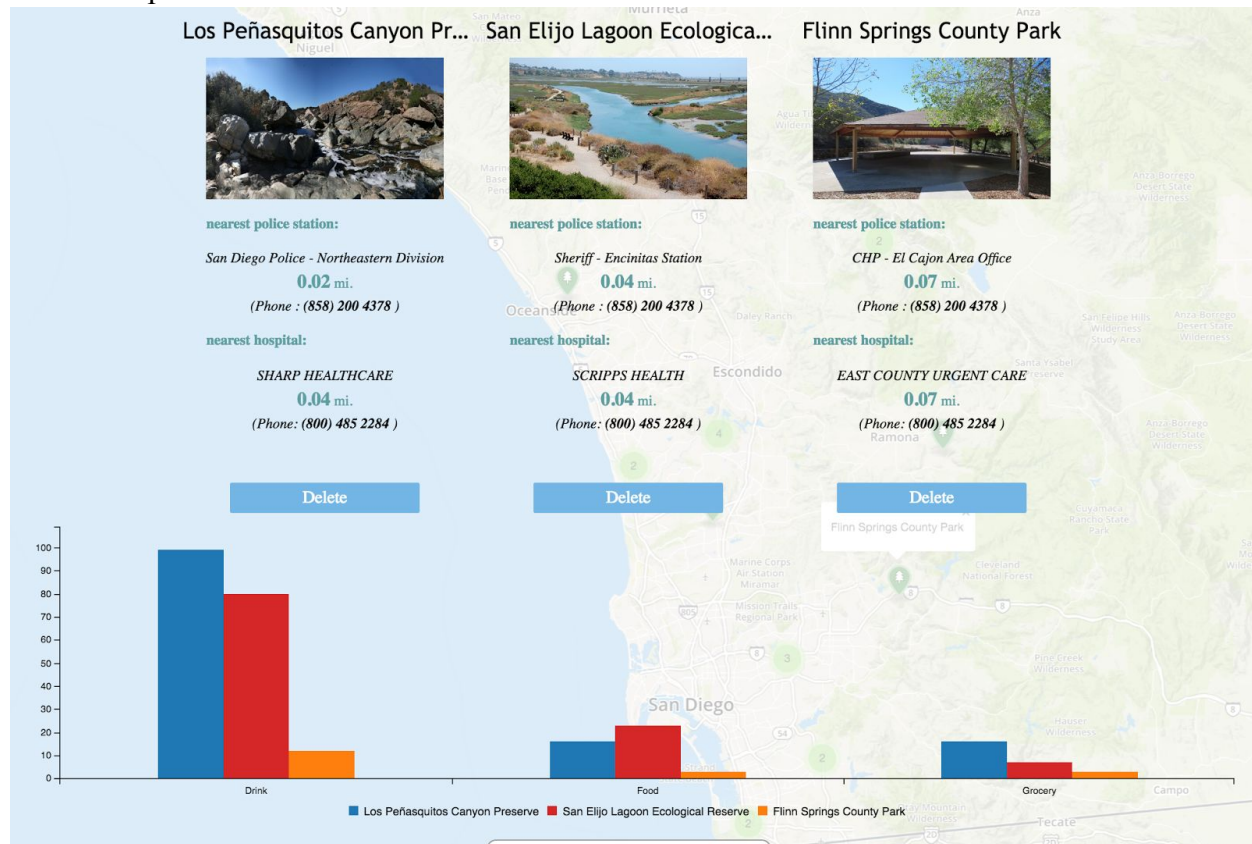
where to find food or drinks nearby.
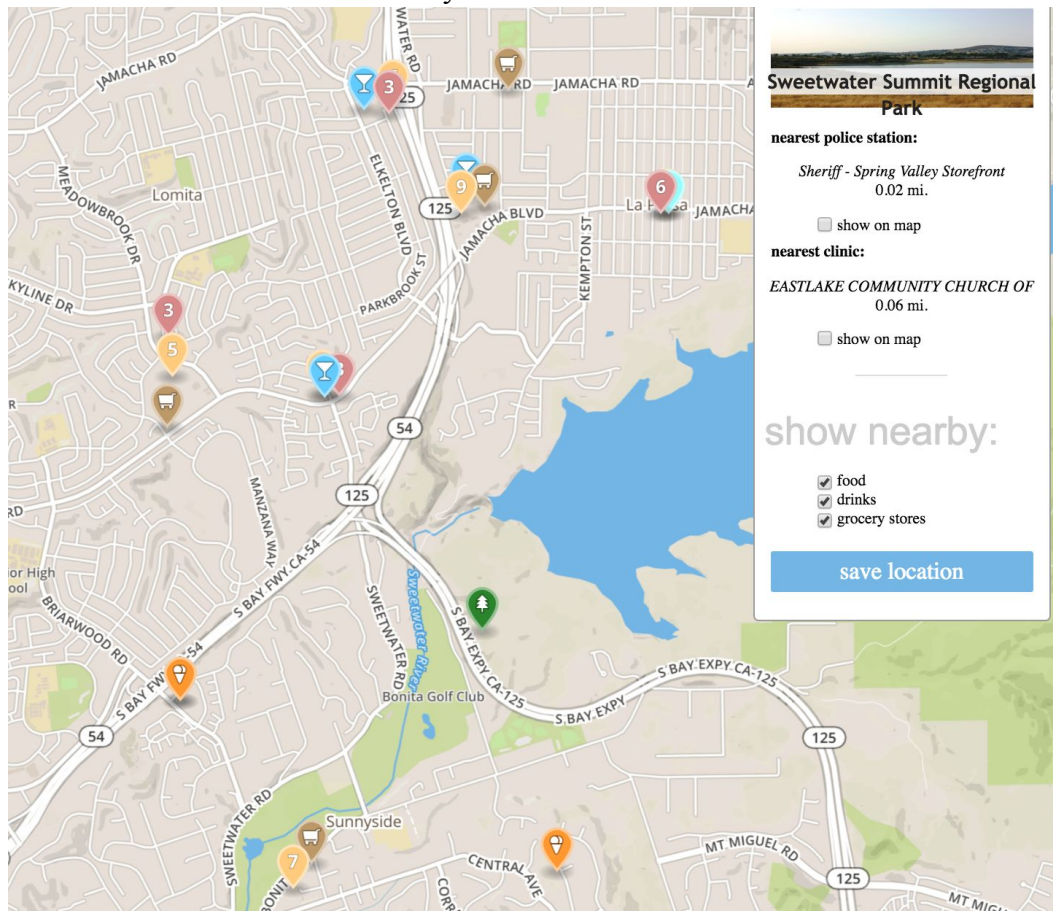
What beneath this is the database aggregating query operations in backend. We select the shops within 0.03 square miles from three database:

Sandag_foodgrocery_business_prj
Sandag_foodbeverage_business_prj
and sandag_food_business_prj

4.3.5 Save place

This is our highlight feature,that users can save the places they explore and make comparison on the statistic data of those places.

As shown above,we have information of every places the same as displayed on right sidebar. There are several sub-features

a) Phone number for police and clinic

In every block for every place,we not only provided the distance of the nearest police and clinic but also the phone number of each police and clinic.The purpose is that when something really urgent happens ,they can access the police or clinic resources as soon as possible with the aid from our app.

b) Interactive Bar chart

We display the number of different kinds of commercial shops by category .And the bar chart is interactive ,when users hover mouse over the chart,the detailed data will show in floating window.This provides users a more intuitive way to compare the statistic of every places.For example in the chart below, we can see Otay Lakes County Park has the least number of drink stores,so it is reasonable to believe that it will be less crowded around there than these two other places.
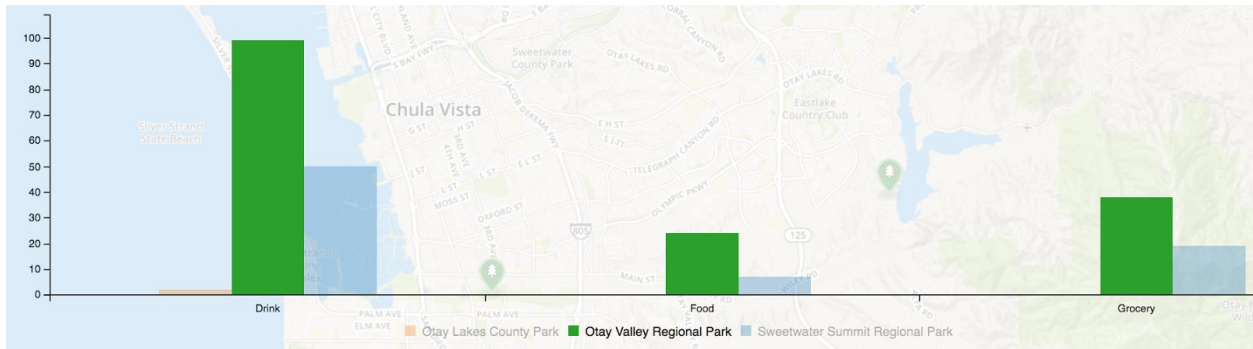
When users click the object's name under the chart, this object's data will be highlighted and other data will fade. This enable users to concentrate on one place's data while comparing.

We used C3js to create this interactive bar chart, and customized the x-axis labels. Every time adding a new place, we load a new data object on this chart without re-rendering the whole chart.
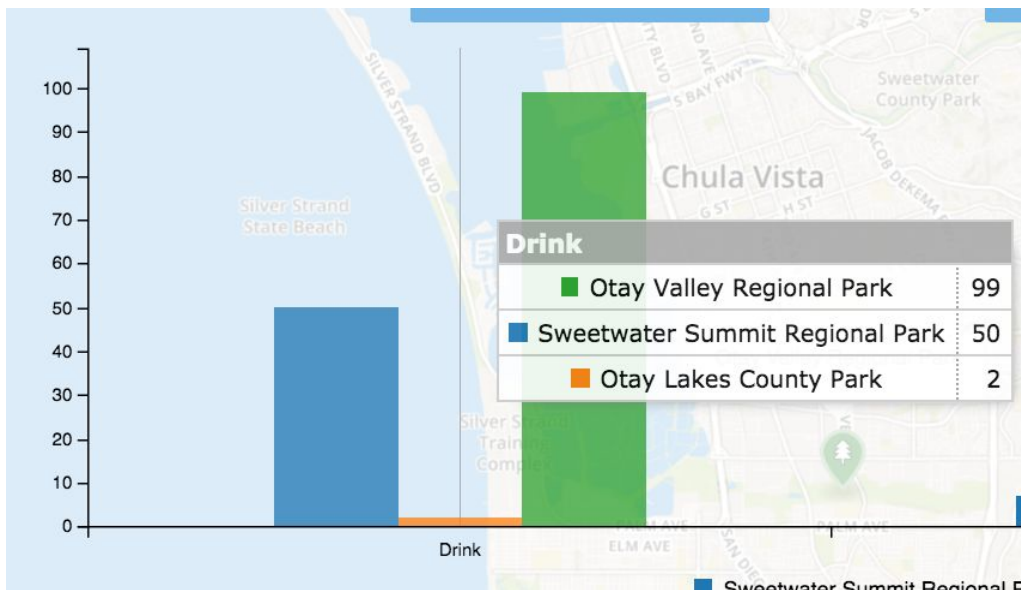
c) Delete places

We provide the possibility of deleting places that users don't want to save any more. This feature gives users a more completed control.

5. HCI Principles, Testing and Evaluation (1-2 pages)

In our user testing we found that users "Love how the modules can move and the overall feel of the app." A hit with providing user control with the menus itself allowing for intuitive dragging as if manipulating objects in real life. We followed Schneiderman's Guidelines Principles and Guidelines. "Flexibility for user control of data display. Users should be able to get the information from the display in the form most convenient for the task on which they are

working. (Schneiderman 59)" Allowing users to manipulate objects on our app as if they were dragging them across a desk in reality allowed for intuitive grounded connections to be made based on experience.

However, other features of our app still required further research as one other user states "Not sure what the blue mail icons are supposed to represent or how they represent a place... Also not sure what the scale of most park vs this park is supposed to show either." we now are critical of Schneiderman's guideline of "Efficient information assimilation by the user" where the format should be familiar to the operator and should be related to the tasks required to be performed with the data. (Schneiderman 59)" We had originally thought our abstract icons were able bridge connections with concrete terminologies such as police stations, cemeteries, and parks. Thus, we reformatted our icons to be more relatable based on current practices researched through competitive analysis.

In terms of data visualization another user commented, by adding tool tips on the map or graph to make users understand better about your data visualization. Right now, color schemes are very clear and user-friendly, I think it will be better if you add some clearer way to render your information onto map." Throughout the project we have always wrestled with ideas about where may our data be displayed to be best served for users to find cool places to explore, and where might safe facilities such as police stations and clinics be located near selected areas. We looked back on the guideline of "Compatibility of data display and data entry" where "the format of displayed information should be linked clearly to the format of the data entry. Where possible and appropriate, the output fields should also act as editable input fields." Thus, we opted for a sidebar design with pull-up menu through a clickable button located at the bottom as
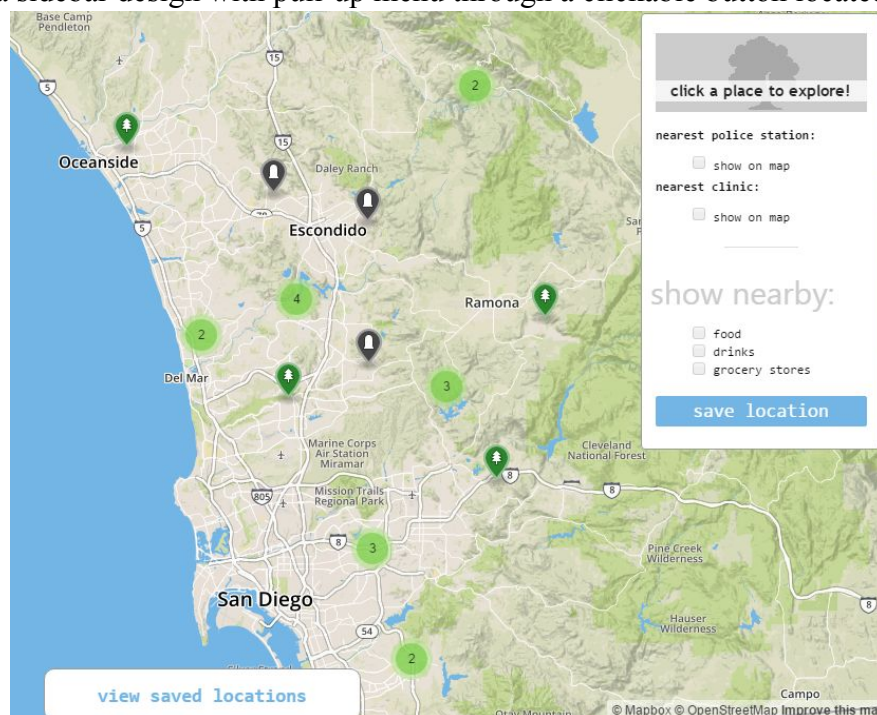

seen here:

This allows the user to control what is being displayed, and when they would like to view what they saved. Looking closer, we created map clusters where if locations are within a certain distance from each other, they would be clumped in a bubble highlighting the perimeter surrounding every location within the cluster. This allows for our visual display to convey

numerous amounts of information without visual overload due to clutter. :
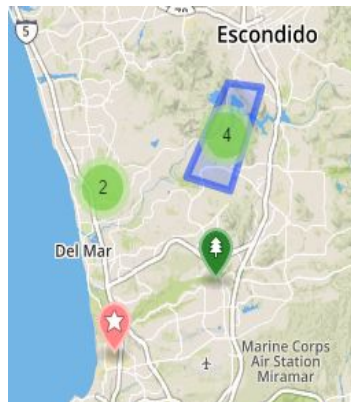
In terms of enabling users to save locations in as seen here:
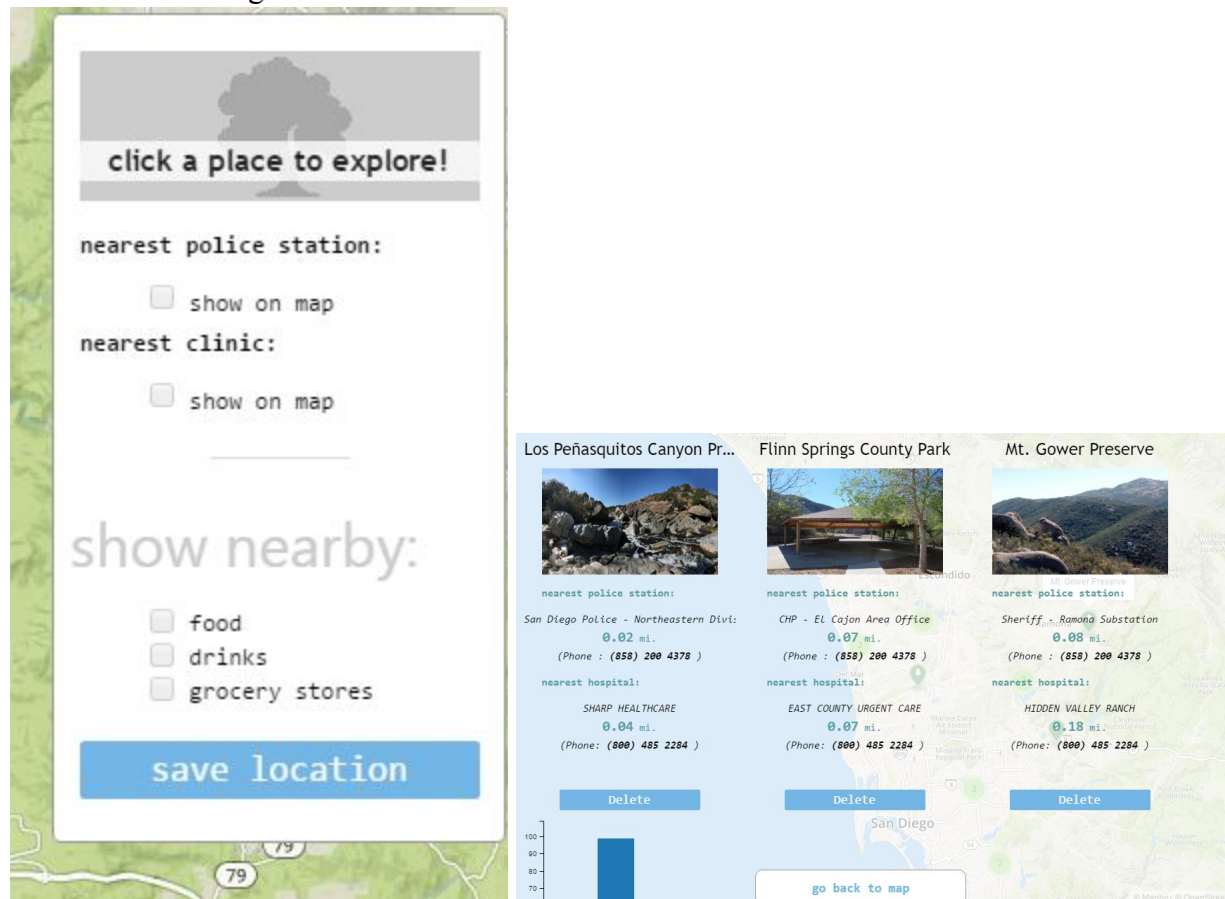
We wish to allow for memory offloading in order for users to focus where they would like to go rather than having them just remembering what they selected. As discussed in our future work, we wish to take this concept further in not just allowing for comparative data, but historical as

well where users can save where they have been and document their experiences. In tackling the aspects of remembering, we found such new design features to work with.

In designing for safety, we originally thought users would be sufficient with knowing information about the nearest facilities of aid such as hospitals and police stations leading us to develop only showing the average distances of all facilities. But through testing, users wished for contact information more rather than distance, so that if something were to happen they could be put in touch directly rather than still going through the general emergency lines first. Thus, we designed the sidebar to display such information like so:

User control principles are a large proponent in our app design in order to enable users freedom as to what they want to display.

6. Collaboration

Our team is structured around having each member focus within the field they are experts in, and through that allow for each phase done modularly in order to best get work done efficiently in a timely manner. Through each experts, we allow pair sessions to not only divide the work, but enhance a member's mastery in weaker areas.
In each area of expertise we have:
- **Veronica**: System architecture, backend coding
- **Gabriel**: backend coding
- **Michelle**: frontend coding/designing
- **Alicia**:UX/UI, prototyping
- **Allan**:feedback implementation, documentation

For each role within the project, All team members provided their efforts at every stage of design, but those with proficient knowledge will aid the team through collaboration consisting

of paired programming, and design methodologies such as affinity diagrams to cohesively unite the design.

- Veronica handled working with the team to set up the backend necessary for the application. She will work with others using D3js for visualizations.
- Gabriel also pairing up with the team in structuring the backend, and linking data to the frontend for data visualization.
- Michelle worked with frontend design, prototype mockups utilizing Balsamiq and other technologies. She will also coordinate structuring the visual design of the website.
- Alicia handled visual prototypes, both paper and digital, utilizing Axure and photoshop. She is also willing to work with any other technologies if needed.
- Allan also paired with the team working with frontend design, backend functions, creating prototypes, and kept all the materials created.

7. Conclusion and Future Work

With SoloSD, we have been working on the solution to helping people find a way to explore places in San Diego without worry. They would not have to worry about interacting with people and they are able to feel safe and secure while enjoying their zip code. Even if you are not alone, you can still explore with friends. The work we have provided though is to allow people who don't want to socially interact with others to explore different places as much as people who want to go in a group.

For future development, we have a vast amount of ideas we want to implement to further bring out the solo part of soloSD. One feature we would want in the future is to implement a population density heat map for the user. In this way, the user can tell how populated an area is before heading there. This will help eliminate the problem that even though a place, like a park, should be large open area, if the population density is high, there is a chance there would be many people there. By allowing our user see the population density, they can choose whether or not to go to that area based on whether they feel it would be too densed for them or not.

Another feature we would like to add is to add the different routes and traffic that occurs. This can also contribute to to whether a person wants to go out or not. If there is a lot of traffic. It is less likely that the person will go to an area since lot of traffic can often mean large amount of people. This is something that one of our users would like to avoid.

For our users' convenience, we also want to implement a journal aspect of our application. When a person visits a place, they can write into a journal about that location or mark it down as visited. Depending on what the user wants to do, they can mark it down as visited so they know they have been there before and should try to explore a new area. Another use is that they could mark it down as a place they would want to visit again and choose to go to that same place. This place can act as the solitude location that they would want when they want to relax and avoid social responsibilities.

As a bonus fun idea for our application, we also wanted to change it into a sort of Stage Selection. This would be similar to how many fighting games have marks on a map and each mark acts as a stage that the player can choose to have a match. So this could be used as a way to meet up with people to have some sort of match between them. Possibly have like a volleyball match or flag football match. However, this is more of a look change to make it look more gamified for users to enjoy. It wouldn't add any new features.

Although there are still many features that we would want to implement, we feel that soloSD can help in finding places to enjoy and be alone. We feel that our application solves the problem of social exhaustion as people will use our app and enjoy the solo time that they need and to recover.

References

Economic Development. (2011, March 1). Retrieved June 08, 2016, from https://www.sandiego.gov/economic-development/sandiego/population

Shneiderman, S. B., & Plaisant, C. (2005). Designing the user interface 4 th edition. *ed: Pearson Addison Wesley, USA*.