“Ideas are meaningless until they are created. They are neither good nor bad, strong nor weak. They are simply empty because no one can know the full extent of what we mean or intend, nor understand our skill and vision based solely on what could be.”

Anwar Bey-Taylor
Character Designer
Mind Traveler Design

# WeatherMe

A Mobile Application Concept to
Help San Franciscans
Find More Sunshine

by Jeffrey Bergier

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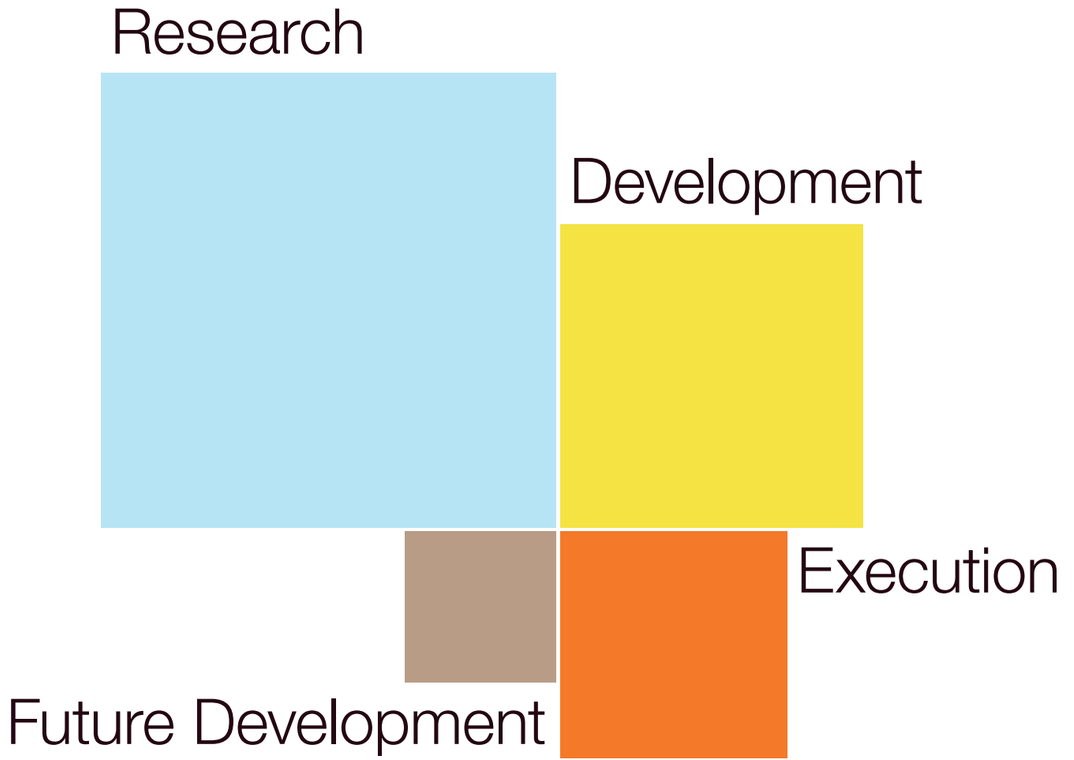


# Research

twitter

Login Join Twitter!

Why is the weather info on my iPhone always wrong in San Francisco? #FirstWorldProblems

half a minute ago via Twitterrific for Mac

jeffburg
Jeffrey Bergier

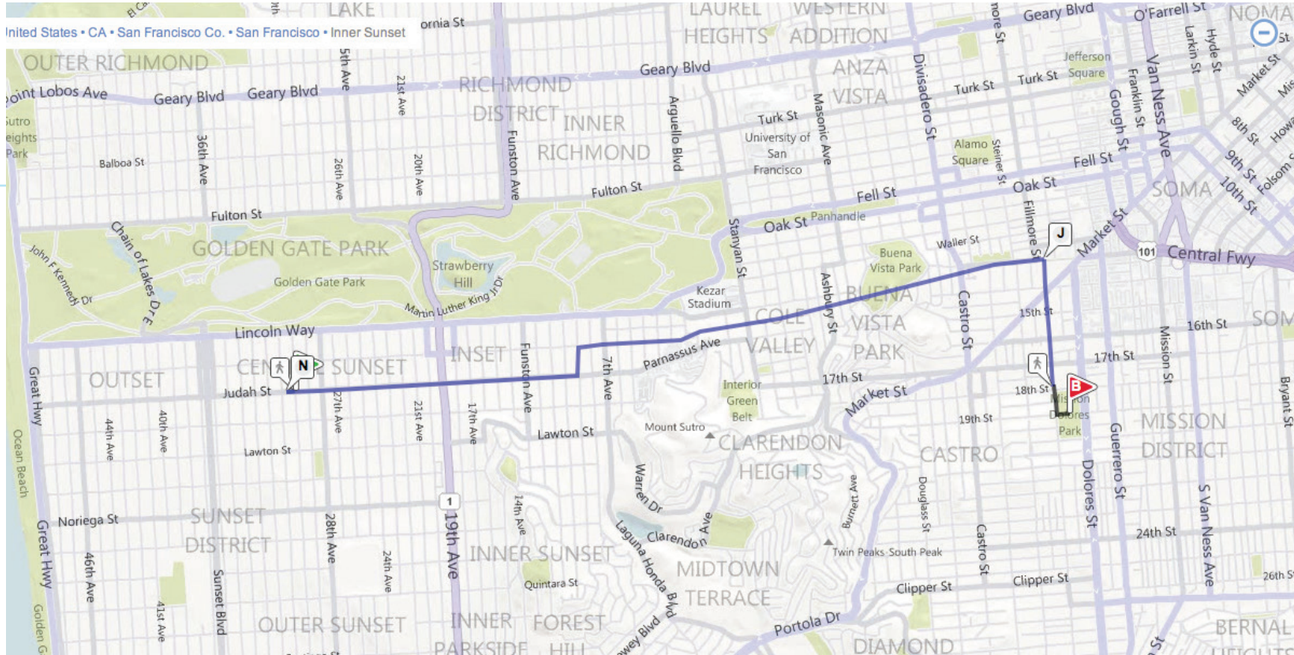
# An Anecdote

## Your Day Off

Its a Sunday in August and its your day off. You live at the intersection of Judah Street and 30th Avenue. Its overcast and cold at your house and you want to enjoy your day off by staying warm and catching some sun. So you walk outside to wait for the N Judah street car. About 25 minutes later you're walking onto the grass of the park where everyone says its always sunny, Dolores Park. But alas today, the myth of it always being sunny in Dolores Park is wrong and you're out of luck. So you think to yourself, "Well, if it isn't sunny in the only place in the city where its always sunny then it must not be sunny anywhere."

## Missed Opportunity

So you decide to head home. About an hour after you left your house you're now back at your house. That hour of your day off was wasted. Your free time is very valuable to you and you feel like you've lost something. Not only that, but later that day some friends post an absolutely gorgeous picture that they took near the Ferry Building on Facebook. You think to yourself, "If only I had known that it was sunny on the Embarcadero I would have gone there instead of wasting my time with Dolores Park."



## Problem Statement

There is no way for a San Franciscan to find where the sun is shining in the different districts of The City of San Francisco.

## Purpose Statement

The purpose of this study was to research how weather information is currently collected in San Francisco and to discover alternative methods of collecting weather information within the different districts of the city.

# “hit and miss”

## Zip Codes

Getting weather information in San Francisco can be hit and miss. By “hit and miss” I don’t mean that the information is rarely there. What I mean is that San Francisco is one data point for most weather systems. This means that no matter if you type in the zip code for the Mission or for the Sunset districts of San Francisco, you’re going to get the same temperature and the same forecast. This seems fine, but every San Franciscan knows that in The Sunset it can be cold and overcast while in The Mission everyone is at the park tanning. Some weather systems do more to address this problem than others, but the user is left guessing zip codes for different districts and then just hoping that the system they are checking has accurate weather information for that district.

## Leisure Time

San Franciscans are busy people. We work hard to pay the high living costs associated with the city. Because we work hard, the small amount of free time that we do have is extremely valuable and it is a shame when it is wasted. While studying in London for nine months I learned the value of sunshine and sun exposure. Enjoying the sun in some parts of the city can be nearly impossible for much of the year. The current array of weather information products does not allow for someone to reliably find where the sun is shining in the city.

# Scope of Project





## Target Location

In order to control the scope of this project and to make it manageable the location for this weather problem has been reduced to cover only The City of San Francisco. There are several reasons behind this decision. First off, the problem is relatively specific to San Francisco. The weather can vary from district to district quite a bit, but once outside the city, the weather normalizes and there is little variability from place to place. On top of this, San Francisco has a high number of people that fit within the "target demographic" of this problem and solution. Lastly, the people that live in San Francisco are more active and spend more time outdoors than people outside the city. This means that this problem and the resulting solution have a larger effect on the people that live in San Francisco.

## Target User

The target user is between 18 and 34 years old. Key demographics for the users include students, entrepreneurs, tech industry workers and gadget nerds. These people love information. They love knowing what's going on. They love feeling like they are a part of a network of other, similar people. They like to be involved. These people are tech savvy and have advanced mobile devices like smartphones

## Deliverables

The deliverables for this project include this comprehensive design document. This design document shows all research and all design thinking and design decisions that went into solving this problem. On top of the design document will be a comprehensive set of digital assets that can be used by a software engineering team to create a usable product. Lastly, a short Flash simulation video will show the animated details that can't be illustrated with static images.

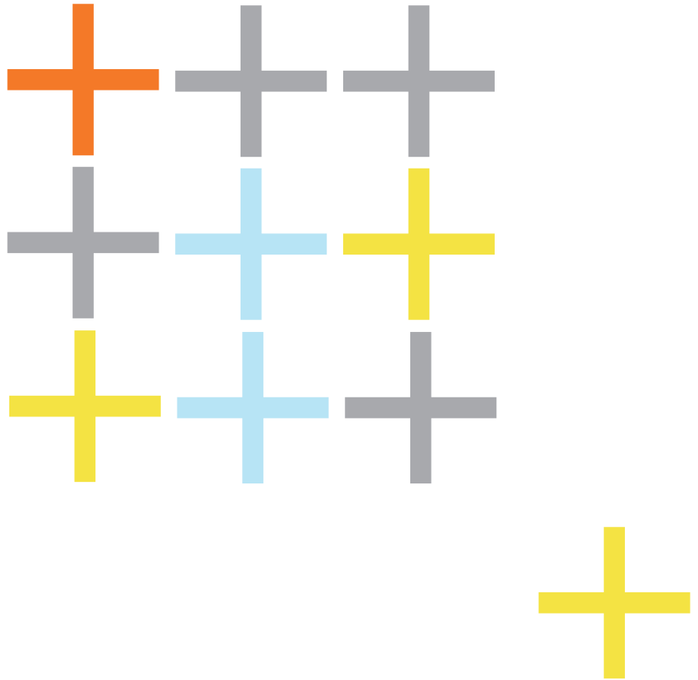
# Research Methodology

## Data Collection

The solution to this problem relies on two separate issues. There is a need for data collection and interpretation and then there needs to be a solution for data formatting and display. The research methodology for data collection involves talking with experts. I need to know whether the data that already exists is enough to get the kind of detailed weather information required. If this data doesn't exist I will have to speak to experts about how I might be able to collect data from alternative sources.

## Data Display

The other half of the project involves displaying the data in a readable and dynamic fashion to the user. Since the weather changes so much from hour to hour I know this display will have to be very dynamic and active in order to be successful. Research is needed on how other weather systems display their data. But I know limiting myself to current weather display systems could limit my final solution. To avoid this research will be broadened to more than just weather displays systems.



# Impact



## First World Problems

I'd like to address the idea of first world problems. I think that a lot of people would look at this problem and decide that its not worth pursuing. I mean how can I focus on the elite in San Francisco when there are so many hungry people in the world? I'm not going to try and say that there aren't bigger problems in the world. But I do believe that there is room for innovation in this space and I do believe that a solution to this problem will make many people's lives better. So, on the right I have presented some ways in which this product would impact our community in a positive way.

### Social

Get people more interested in weather

More socializing outside

More recreation time

### Health

More Vitamin D from Healthy Sun Exposure

More human contact

More recreation time

### Environmental

Food trucks drive less, use less fuel

People interested in climate

### Economic

Reduce sales of emergency hoodies

Food trucks find more customers

MTA changes meter rates based on sun

# Need Assessment



## Needs vs Wants

While the discussion of establishing the “needs” of a product started with the definition of the word “need” versus the word “want.” In the context of this study, I have defined the word “need” to mean the features and capabilities of the solution that are required in order to make the solution useful to its target user and successful in its marketplace.

## Frequent Updates

In order for the solution to be successful it needs to be updated regularly. That means that whichever source of weather information is being used to display data on the map needs to be updated often. In most cases this means that many users will need to be using the application to not only look at the weather but to report it as well.

## Dynamic Map

The map of San Francisco needs to be the centerpiece of this solution. The map needs to be dynamic and constantly updated. It needs to show the weather reports in a clear and concise format. This format needs to show where the report came from. It needs to show what weather was reported. It also *should* show how many people reported similar weather from a similar location.

## Accurate to One Square Block

Whatever system is used to track the location of the weather reports, it needs to be at least accurate enough to show the closest street intersection. For example, if a user reports the weather while shopping at Whole Foods in the Haight, then the solution would need to know and report that they were at Haight St and Stanyan St.

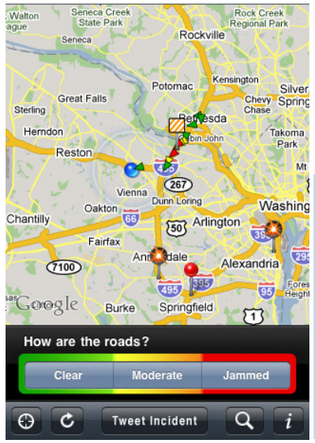
## Quick Reporting

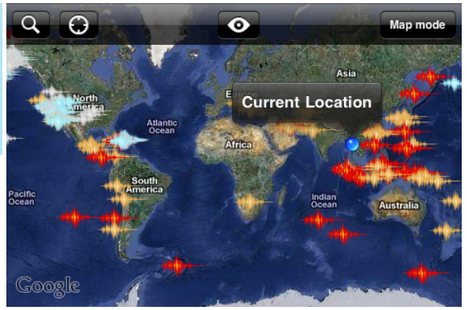
At this point it is still unknown as to how the weather information will be collected throughout the city. But however it is, it needs to be updated quickly and often. If the updating process burdens the user, they will not engage with the solution and the product will fail.

## User Profiles

Because the target user is interested in feeling part of a larger group and interacting with others, the solution needs to include some sort of profile system. In this profile system, basic information is shared. Information could include photo, current location, a description, what they were doing when they reported the weather and where the user lives. Of course, all the information could be filled in to the user’s comfort level, or be left completely blank.

# Product Comparison




## TrafficTweet

Traffic Tweet is significant because it uses a social network to report how bad or how good the traffic is. It works in a very simple way. Many users report how bad the traffic is around them. Then when other users open the application, they can see the traffic reports submitted. This way they can better plan for their commute home.

## I'm Not in a Vacuum

There are a lot of solutions to a lot of problems out there. In order for my solution to my problem to be as deep and as meaningful as possible it important for me to look at what others had done in this arena and see what others had done in other arenas. With this information I was better able to innovate and create something truly new and different. The following few pages are summaries of the most important comparisons.

## iEarthquakes

The data presented in this application is all historical data. But this application shows information spread across a map. It uses colors to show severity. The display is very simple but its hard to tell exactly where the earthquakes took place because they are so big over the map. However, with earthquakes, the area affected is quite large, so this display gets the job done.

# Product Comparison



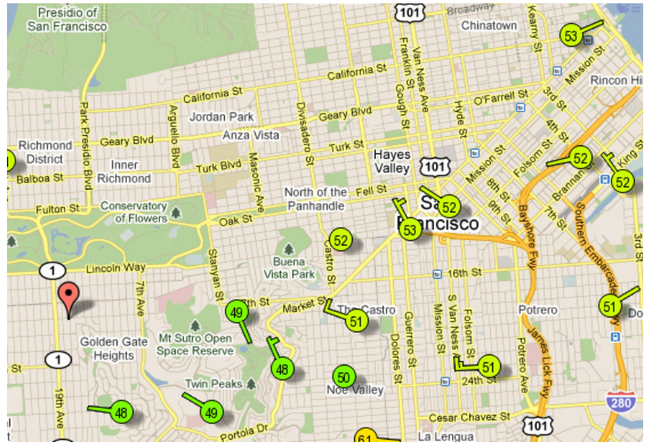
## Weather by HTC Sense

In order to differentiate its phones from the competition, HTC includes a graphical layer called Sense. This layer features a current weather icon on the main screen. The icon is extremely polished and features different animations for different weather conditions. This is an example of “glanceable” information. No “app” needs to be loaded. Simply looking at the device gives the user the information needed.

## Human Weather

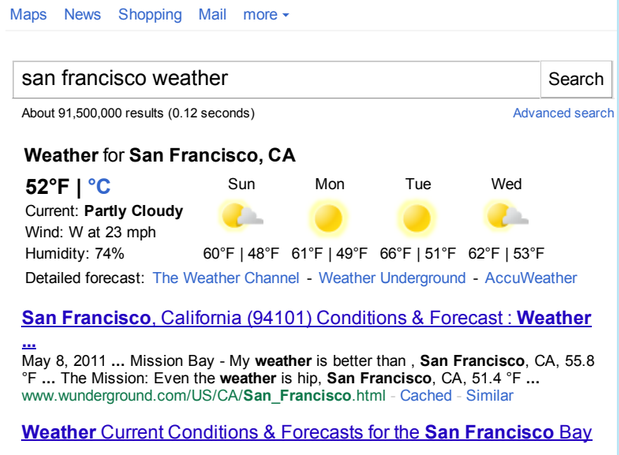
This application reads Tweets and their location data to help tell users what to wear. The beauty of this concept is that no users need to use the application for it to be useful to other users. Because its reading data from the thousands of Twitter users, the application is always populated with data.

# Product Comparison




## Weather Underground

At first glance, Weather Underground looks like it solves the problem. It collects weather data from non-standard sources and displays the data with pinpoint accuracy. Here we can see different temperatures throughout the city. These temperatures are gathered from automated weather stations. This data is displayed on a standard Google map. It is important to notice that some areas of the city are completely unrepresented.




## Google Weather

Google weather is extremely easy to use because Google attempts to understand plain-englishs search queries and guess that your search for San Francisco weather means you would like to know the current weather. Instead of making you go to a weather site, the data is presented at the top of the search results. This design is effective because it reduces the number of sites a Google user must click through to get the information that has been searched for. This design isn't deep enough as there is no map or any other indicator of where in San Francisco this weather data is being recorded from.

# Experts

## Panel

In order to facilitate efficient research, I compiled a panel of experts. These experts were chosen based on their credibility in their respective fields. I would like to thank them all for their time. Needless to say, their input was invaluable.

Meteorology

Social Media

Air Traffic

# Meteorology

## Oswaldo Garcia

"I have been serving as chair of the Department of Geosciences for the last seven years. This position has helped me get a broader perspective on the issues that are being faced in geoscience education across the country. With the many challenges facing society today, from coping with natural disasters such as the 2011 Japan quake and tsunami and their aftermath, to the need to adapt to global climate change, it is important that our students get the best possible education so they can contribute to the solution of these problems."

SFSU Department of Meteorology Web Site
http://tornado.sfsu.edu/Faculty/regfaculty.html

### Professor of Meteorology

B.S. Applied Geophysics,
Columbia University
M.S. and Ph.D., Atmospheric Science,
State University of New York at Albany

"In recent years I have had the opportunity to visit Cuba, my native country, and have been able to establish collegial working relationships with meteorologists in that country. I am working with American colleagues to extend to Cuba the network of ground based GPS receiving stations (known as "COCONet") that can detect in real time the amount of water vapor present in the atmosphere. Since water vapor is the "fuel" of hurricanes, the COCONet network should help in improving hurricane forecasting in the Caribbean basin. With the help of two of our students, I am also looking at the practical uses of soundings of the atmosphere obtained by the COSMIC satellite network that use GPS technology to obtain data that was previously only available through weather balloons."

SFSU Department of Meteorology Web Site
http://tornado.sfsu.edu/Faculty/regfaculty.html

## Raffi Krikorian

"At Twitter, @raffi leads the Applications Services group, the custodians of Twitter's core logic - his teams manage, amongst other things, the business logic, scalable delivery, APIs, and authentication of Twitter's application. Previously, he was the lead of the public APIs as well as being the one of those behind Twitter's Geospatial APIs."

Quote Sourced from http://about.me/raffi.krikorian

Image Sourced from http://twitter.com/raffi

Lead of Application Services at Twitter

B.S. Computer Science,
M.S. Computer Science,
Massachusetts Institute of Technology

"Before Twitter he used to create technologies to help people frame their personal energy consumption against global energy production (Wattzon - Business Week's "Best Idea" 2008), and also ran a consulting company building off-the-wall projects. At one point, he used to teach at NYU's ITP (created the class Every Bit You Make) and spent way too much time as a student at MIT and the MIT Media Lab (Internet 0 - Scientific American September 2004)."

http://about.me/raffi.krikorian

# Air Traffic

## Ricky Brown

Ricky has been involved in aviation since his youth and has accumulated extensive knowledge in the field via formal/informal training, as well as professional experience. He holds a multi-engine commercial pilot certificate with instrument rating and is currently an air traffic controller in Fort Myers, Florida. As a pilot, acute familiarity with the fundamentals of weather are imperative to planning a safe and efficient route of flight, as well as being able to recognize changes while in the air. Air traffic controllers need this same knowledge in order to disseminate information to pilots and to pre-plan traffic flow changes due to weather to avoid congestion.

Air Traffic Control Specialist
B.S. Aeronautical Science
Embry-Riddle Aeronautical University

"One summer I was driving back to school from California to Florida while Hurricane Fay was passing through at the time. I didn't want to have to wait it out and start my semester late, but I was concerned that I'd either have to drive North around it or possibly take my chances and drive through it. After studying surface analysis charts, upper level wind charts, and many hurricane forecast models, I correctly predicted that I'd drive straight through it. However, I knew that once it got over land, its energy source would be cut off and its strength would begin to diminish rapidly. This is indeed what happened, and although technically it was rated a tropical storm when I passed through, it was still an interesting experience."

# Phone Interview



## Twitter

Twitter is a web startup company based in San Francisco that created the concept of “microblogging.” Before Twitter, select people blogged about what was important to them. A blog consisted of paragraph or longer posts created one or more times per day. However Twitter allowed people to microblog. By limiting the number of characters allowed per post to 140, Twitter lowered the barrier of entry for normal people to start sharing their ideas on the internet. The 140 character limit and more relaxed posting style eliminated the apprehension many experience when thinking about starting a blog. Recently, Twitter added the ability for posts to be marked with the GPS coordinates of where the user was when the post was “tweeted.”

## Objective of Interview

Krikorian is a very busy person, therefore I designed a list of questions that were aimed at answering the main question I was after. “Could tweets from Twitter’s users be used to collect weather information?” Because tweets *can* store geolocation information and people *can* tweet about the weather it is plausible that these tweets could be plotted on a map. My phone interview with Raffi really answered a lot of questions for me.

## Geolocation System is Accurate

Krikorian confirmed for me that the geolocation system built into Twitter is very accurate. When a device locates itself, it uses GPS to find exact coordinates and then also gives a range of error. Usually the range of error is less than 20 yards in diameter. This easily gives enough detail to find the nearest street information and make the data useful to my target users.

## Weather Tweets

Raffi Krikorian lead me through a couple of basic searches on the Twitter web site that showed how many people actually talk about the weather. We searched for key words such as “sunny,” “windy,” “cloudy,” “cold” and “hot.” In each case hundreds of results came up from tweets that were less than 24 hours old.

# Phone Interview



## Geolocation Underused

Raffi Krikorian's primary concern with using Twitter as part of the solution is that the adoption of the geolocation system was not as high as his team had hoped for. Krikorian explained that Twitter had not yet found a good reason to give its users in order for them to "give up" their location when tweeting. Krikorian thought, for that reason, people would rather not share their location because they may be posting from their home or another private address.

## Advanced Search

I learned how to use Twitter's advanced search capabilities to narrow the results down to just San Francisco. After searching for key weather terms it appeared that there simply was not enough tweets that spoke of the weather *and* had geolocation information attached. So while it would have been ideal to use Twitter to collect weather information, it seems like not enough Twitter users are adding location data to their tweets to make it feasible. Clearly, another way of collecting data needed to be found.

# Interview





## Passion

I just wanted to take a minute and reflect a little bit on passion. I have always felt that passion is something that is extremely rare. I also have always thought that passion is very important to the outcome of any project. I have never met anyone in my life that was so incredibly passionate about the weather. Every time I met with him, he gave me the energy I needed to go home and spend a many more hours on this project. Working with Oswaldo definitely kept me energized and passionate enough to really deliver on the quality and sophistication that this problem deserves.

## Weather is an Icebreaker

Professor Garcia and I discussed how the weather is something that affects us all. As a community, we all have to endure or get to enjoy the weather together. For this reason, weather is a common icebreaker when meeting new people or meeting up with friends. Weather is important to our lives. Oswaldo and I discussed the importance of the social dynamics of weather. We discussed how communities have been built around areas of interest. This was an extremely important concept to think about because the weather is an area of interest for everyone. If a community could be built around weather, it would be of interest to everyone.

## Data Sources

Basically all weather information in the United States can be traced back to data collected by the National Weather Service. The National Weather Service has a lot of information on its web site. However, most of the information is designed to be read and interpreted by specialists and is not friendly to the target user of this project.

## Automated Stations

Weather Underground and Weather Bug and several other services have automated weather stations stashed around the city in different areas. These automated systems collect information like temperature and wind speed (although with limited accuracy) but can't collect information such as cloud cover at all. This means these stations are not useful for my solution because finding the sun is the most important part of this problem and solution. And because the amount of sun shining is inversely proportional to cloud cover, if you can't detect one, you can't detect the other.

# Oswaldo Garcia



## Questions

As a scientist, Professor Garcia was very concerned with people that are not trained in meteorology answering questions about the weather. He explained that it would be impossible to ask someone the temperature because they won't have a thermometer. But Oswaldo was even concerned about using terms like "Warm" because they are so subjective. The professor recommended that asking what kind of clothes the user is wearing may be a more reliable indicator than "Is it warm out?" But, and this is a big but, if the questions asked were designed well and really allowed for accurate weather reporting, Oswaldo was extremely interested to see the data and incorporate it into the vast amount of data he already parses from the National Weather Service.

## Possible Data Source

As a next step, Professor Garcia instructed me to look at San Francisco webcams. They're all over the city and, if they show the outside, could be very useful in collecting weather information.

# Research Conclusions



## Nothing Solves the Problem

The problem statement states that San Franciscan's do not have a way to find the sun in the different districts of San Francisco. No current solution allows them to do this. Weather information for San Francisco is a single data point for the National Weather Service. This means that no matter which zip code or district you look up, the weather results are the same. Some services such as Weather Underground and Weatherbug attempt to alleviate this by using small, automated, weather stations placed around the city. However, these stations are not spread throughout all of the city. Also, they can't measure cloud cover because cloud cover is measured by meteorologists at National Weather Service stations. Cloud cover is the most important factor in determining how sunny it is outside. If cloud cover can't be determined, the data is not useful in solving this problem.

## Focus on Purpose

The purpose of this study was to research how weather information is currently collected in San Francisco and to discover alternative methods of collecting weather information within the different districts of the city. So now that I have learned that weather information collected in the city is inadequate, its clear that weather information will have to be collected from alternative sources.

## Twitter Won't Work

Twitter data collection would have been a dream come true. In a perfect world, users would not even know that they are reporting the weather. Instead, the solution would look at Twitter and see a tweet like "Wow, its so nice and sunny outside." then look at its GPS coordinates and plot it on a map of some kind. However, after speaking with Raffi Krikorian it became clear that the number of Twitter users that were taking advantage of the automatic geolocation system built into Twitter was not enough to create a useful map of data.

## Webcams Won't Work

I searched for a San Francisco city-wide network of webcams and I was definitely surprised to find that there was no such thing. There are a few webcams around the city. However, they are not centrally managed. Different webcams have different tools to view them. Most of the cameras were very low quality and most of them only worked intermittently. It quickly became clear that there were not enough cameras that could be counted on to collect data from around the city.

## Social Network

Collecting data from users and then displaying it to other users is the basis for all social networks. Normally a social network is driven off of people's want to share what they're doing with an audience bigger than their in-person friends and acquaintances. However, a social network based around weather would be a completely different paradigm. The reason to contribute to the network would no longer be to share personal stories but instead to share weather information. This would be an untested and unproven move in the social networking space.

# Design Drivers



## Developers

### Development

Screen engineering firms to get highest quality application

6 month development time

$15,000 preliminary engineering budget

### Form

Mobile device application

Initially released on iOS and “App Store”

### Standards

Conform to Apple Human Interface Guidelines

*Push the limits of Apple Human Interface Guidelines

### Service Life

6 month development

30 day bug fix cycle

6 month feature update cycle

## Users

### Performance

Collects weather information in San Francisco

Displays weather information on mobile device display

Allows for quick access to weather information

Allows for quick reporting of weather information

### Accuracy

GPS Tracking accurate to 1 square block

Weather accuracy is on a “human” scale. i.e. “Warm, cold and hot” not 70ºF, 50ºF, 90ºF.”

Display must support 60 second update intervals

### Market Price

Free to users

Inventive Advertising Scheme

### Lifespan

Product release 5/2012

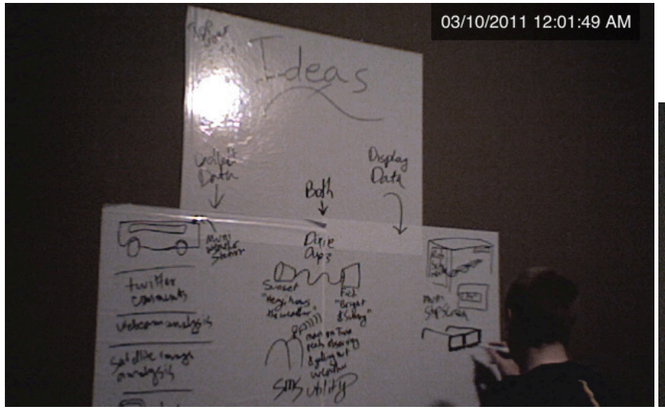
Bug fix releases every 30 days

Feature updates every 6 months

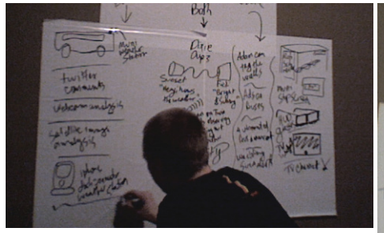
# Development

# Ideation











## Collect and Display

Thinking in a clear and linear fashion is not something I do well. However, that doesn't mean that I have to be hopelessly disorganized. Thanks to modern technology, I was able to acquire static cling dry erase sheets that essentially make my wall into a giant white board. I put up these dry erase sheets. Throughout the week, when an idea popped into my head I would throw it up on the white boards. On top of that, I had some hardcore sessions of ideation that lasted hours and prompted the creation of mass ideas. I organized my ideas into three different categories: collect, display and ideas that collect and display. For instance, tracking hot and cold drink sales at Starbucks is an example of an idea that collects weather data. Whereas warbling siren alerts is an example of an idea that displays weather information to users. Lastly, weather jackets that collect and display information are an example of an idea that do both.

# Runner Up Ideas

## Man on Twin Peaks

While the most impractical solution, for some reason the man on Twin Peaks is one of my favorite solutions. I like it because a person on Twin Peaks can instantly see where the sun is shining in the city and where it is not. That information could then be relayed to an online server and then viewed by anyone on their mobile devices. However, the man on Twin Peaks lacks the ability to feel temperature or wind in specific parts of the city. Also, employing people to stand on top of a hill all day, every day is pretty impractical. Never the less, this solution would be an effective way of collecting enough data to solve the problem of San Franciscans not being able to find more sunshine.

### Pros

The human element in this idea was extremely powerful to me. I really liked the idea of having a human look at and analyze the weather for the entire city at once. This holistic approach could have been very powerful.

### Cons

This was obviously an impractical solution. Paying to have one or more people observe the weather all the time would be innefficient. Also, the person on twin peaks would not be able to feel wind in different districts within the city. He would only be able to feel the wind omn top of Twin Peaks.

## Social Network

A social network for weather was an extremely appealing idea. This would be the simplest way to collect and display weather information. Users would simply post about the weather in the area they were in and then other users could view a map that shows what others have posted. This network could have been designed for the web browser and desktop or notebook experience. Or it could be oriented for use in the mobile space with smartphones and tablets.

### Pros

This was the most practical solution. This could literally be implemented in a matter of months with existing technology.

### Cons

This solution features the social network chicken and egg problem. To get usable data on the network people need to post information. To get people to post information there needs to be usable data. This is a problem that would need to at least be addressed. Also this solution features the problem of untrained people reporting on the weather.

## Lighter than Air Flight

My thinking here was that one or more low altitude blimps would fly around the city. They would record where its sunny and where its cloudy. Using infrared temperature sensor technology they would also record the temperature at ground level. On top of that, if they had displays on the sides of them, they would display weather information. For example, the display on the blimp could say “Its sunny at the Ferry Building” while the blimp is flying over the sunset district.

## Pros

These blimps would be unmanned and hopefully fully automated. While the initial investment costs in this solution would be high, the running costs could be lower than than a person on twin peaks full time.

## Cons

Even though San Francisco is a small city, a blimp would still be unreadable from more than a 1/4 mile away. That would mean that a lot of blimps would be needed to cover 49 square miles of San Francisco. Also, the city is known for its wind and air currents and those can be quite problematic for blimps.

# “Supertech”

## Biomimicry

The UC Berkeley Robotics and Intelligent Machines Lab is working on small flying robots. They call this biomimicry and the robots are designed to have similar flying mechanics to natural flying insects. They openly describe these machines as spy machines as there seems to be no other use for them. However, that could all change. If these flying machines had an image makeover that changed them from flying spy machines to weather data collection machines then they might be welcomed by the San Francisco public. These small machines would monitor weather data such as temperature, wind, cloud cover, etc and report back to a central online server that then can distribute the data to users on mobile devices.

## Pros

These flying insects would fly around the city and collect data. There would be many of them and that would provide lots of data points. This would also change the image of flying robots from spying machines to data machines and would increase their acceptance by society.

## Cons

The technology is still in development. Also, these machines are being developed under military contracts so information can be sparse. While it is in the best interest of this technology to use these machines for non military purposes, the military is looking to fund military research, not civilian research.

## Private Feedback

After making my presentation on the flying bugs idea I spoke with my colleagues for a private feedback session. The first thing said was “So Jeff, you’re going supertech, huh?” I was so put off by this. I had thought my insect idea was very innovative and would put a technology that we currently fear into a positive light. I thought that making flying robots friendly and useful would bring more interest and more money into their research and eventually lead to a faster growing technology. However, my colleague was right. When I started this project I had no intention of “going supertech.” All I wanted to do was collect weather information and display it in a way that would allow a normal San Franciscan to find the sun. I had no idea that the data didn’t exist in the first place and that finding a way to get it would be so difficult.

## Now or Later

In design there is always a need to innovate for the future, there is also always room for innovating now. While it would have been very educational for me to work with researchers from Berkeley to turn this into a feasible concept that might be implemented five or ten years in the future, there had to be a simpler way that could get the job done in a matter of months with technologies that are currently available.

# Social Networking



## Collaboration

A fellow student reminded me that the magic of the internet was collaboration. After thinking about that I realized that Facebook and many other incredibly successful ventures were based around social networking and collaborating online. Based on the dead ends I was hitting, it seemed that an online collaboration was going to be the simplest way to collect the weather data that I needed in order to solve the problem at hand.

## The Solution

Based on all the experts I had spoken to and all the research I had done, it seemed that the only clear solution was to base my data collection around a social network that centered itself around weather in San Francisco. Because the target market I was after were tech savvy individuals with advanced mobile devices I thought it best to make a mobile application. A mobile application is not limited to a desktop computer and can be quickly accessed at home or on the go.

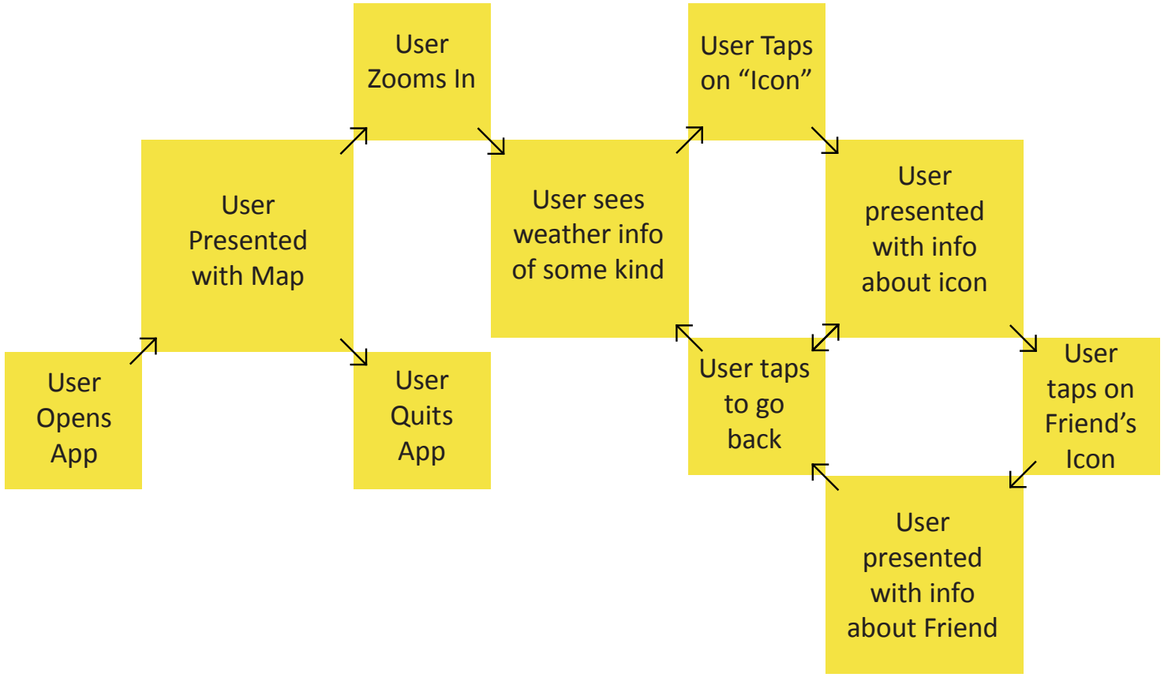
## Participation

Companies like Facebook, MySpace, Digg and Twitter have proven that people will participate in your product simply to feel socially involved. This is how weather information would get uploaded for this solution. If people get to talk about where they are and what they are doing when they report the weather, they will come back and do it again. This effect will be enhanced if they get to see what others were doing and where they were when they reported the weather. I knew this could be the key to defeating the chicken and egg problem of social networking. Defeating this that problem would be required to get the weather data that this solution needed.

# Function Diagram

## Finding the Sun

The standard use case on most mobile applications starts with the user opening the application and being presented with an interface that shows the most relevant information for that user. This is how I imagined my solution would work. The user opens the application and is presented with a way to easily find the sun. On the right is a simplified version of the flow diagram that shows how the user would interact with the application to find the district that had ideal weather.



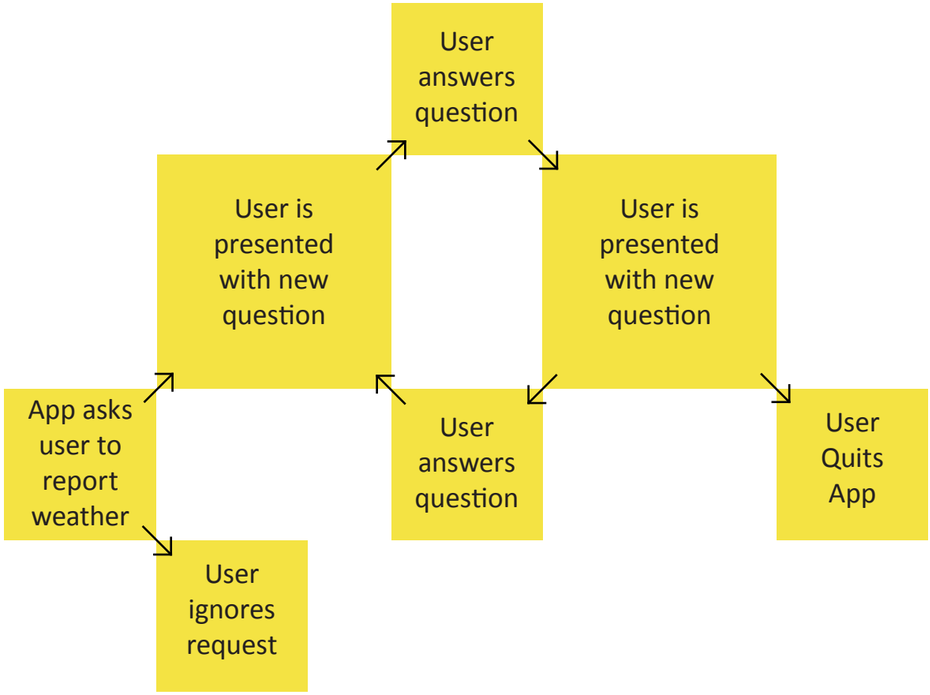
# Function Diagram

## Reporting the Weather

The simplest way to have the user report the weather would be to add a button around the map that allows the user to do so. However, I thought that if the application were smarter than that and could “ask” the user to report the weather then they would be more likely to do so. So my idea was to have the application discover when the user has moved from one district to another whilst it was closed and ask the user if they would like to report the weather in their new location.

## Continuous Questions

Some users have more time to spend on social networks than others. I thought that a great way to take advantage of this was to have a continuous stream of questions ready when the user decided they wanted to report the weather. That way, users with no time would answer only one question and then quit. Whereas users with lots of time could continue to answer questions for as long as they wanted. This would encourage the most usage while still getting a large amount of data.

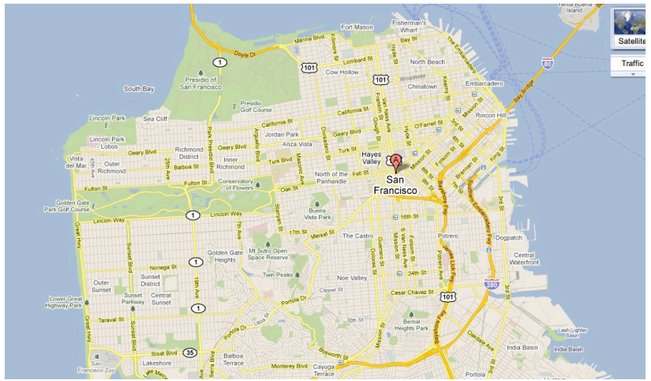


# Current Mapping Tools



## Mobile Conventions

The technology user in me wanted to use “standards” when creating the map of San Francisco that users will get their weather information from. However, the designer in me said that the maps that are currently out there may not provide the best solution for this new use. Obviously, thorough analysis of the current conventions in mobile mapping would have to be completed in order to determine what the next best step would be.

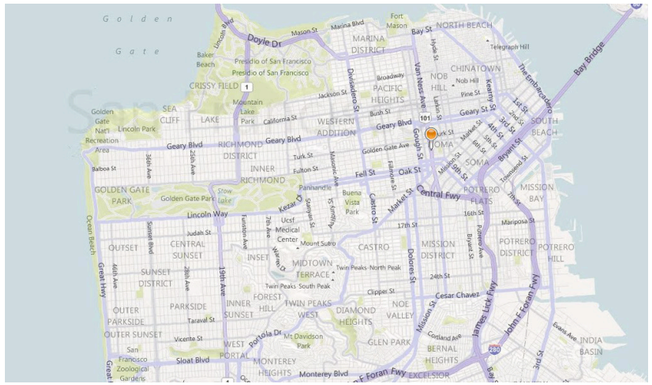



## Google Maps

Google is the undisputed 800 pound gorilla in the room when it comes to mapping tools. Their maps are synonymous with accuracy and abundance of information. However, the color scheme is very utilitarian and not that pleasing to the eye. The way the district labels work is not effective because the district boundaries are not shown. Google maps “pins” were designed for pinpoint accuracy. They were designed to show an exact address. Weather, by its nature is spread out. If I used mapping tools that are less accurate I would be able to show weather information in a more effective way.

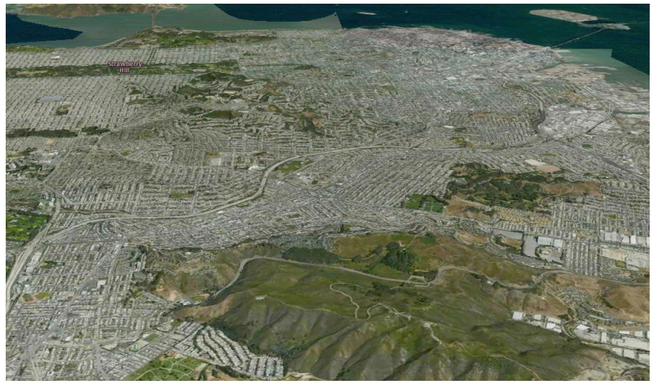
# Current Mapping Tools






## Bing Maps

Bing Maps is Microsoft's competition for Google Maps. While this mapping system has a slightly more muted, and more pleasing color scheme, it is pretty much the same as Google Maps. It has the same abundance of information which is great for getting directions and finding addresses but it is too much information for showing weather data.



## Ovi Maps

Ovi Maps was just released by Nokia. It is a new, advanced, mapping system that features a really attractive 3D view. While the 3D view is particularly appealing for displaying weather information. The weather information would have to be the standard, scientifc, information for cloud cover and other things to be shown in 3D. Displaying information reported by untrained users would be quite difficult in a 3D view. This is primarily because the GPS coordinates presented by a mobile device are 2D and would not show any vertical data.

# Accuracy

## Pinpoint Accuracy

When users are reporting the weather it would be very simple to find their GPS location and put a pin on a map and tell what they reported but that would lead to a lot of data points on a map that users would have to sift through. That didn't seem like a good user experience to me. Since the weather reports would be based on many user's input from close, but not exactly the same locations I knew I would have to think of a different way to display data than simple GPS coordinates and a pin on the map.

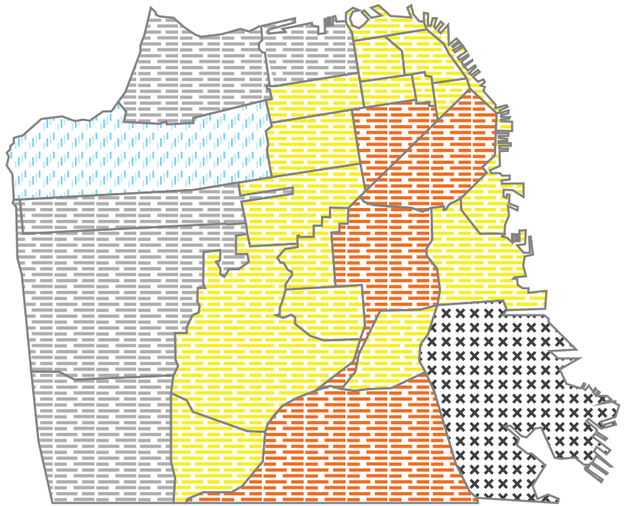
## Privacy

Privacy has become a really hot topic with social networking and other online activities. I would need to take my user's privacy very seriously. Raffi Krikorian told me that privacy was most likely the reason why Twitter's geolocation service remains underused. Luckily for me I knew that if I wasn't going to put a pin on the map with the exact location (like Twitter and other services do) I would pretty much solve the biggest privacy issue which is showing someone's home or other private street address. I would also solve the pinpoint accuracy issue at the same time.

## The Weather Bar

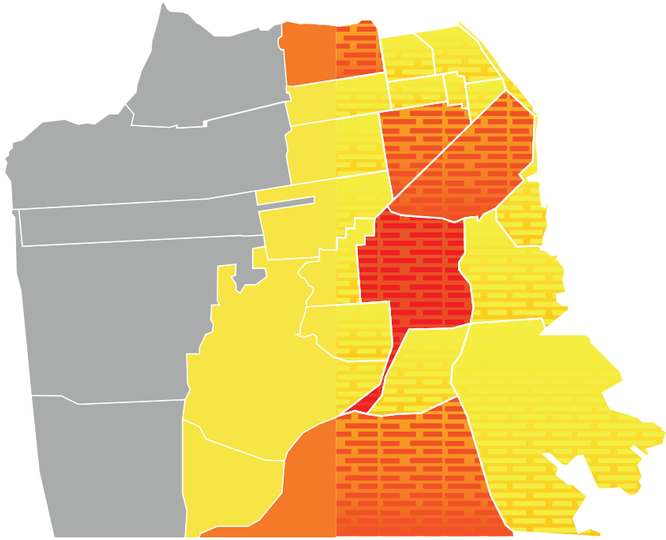
Taking into account concerns about privacy and the need to not bombard the user with data points on a map, I thought a lot about what the display might look like. I came up with the concept of a weather bar. A weather bar is a horizontal bar on the map with text in it. The text in the weather bar indicates the reported weather and how many people reported it. As more people report the same weather from the same general area the bar gets longer. If someone reports different weather from the same area a new weather bar pops up with those reports. The earlier reports remain, they just move to accommodate the new reports. This weather bar concept allows a user to easily view the different weather reports from the different parts of the city without being overwhelmed with an overwhelming number of pins on a map.

# Map Iteration



## The Original Map

This is the first map that I developed. It was traced from a map of the city, piers and all. This was also my first attempt at drawing weather bars. There were a lot of problems with this original map. First off the piers and docks brought too much detail to the map and really detracted from the information at hand. The weather bars were color coded and then placed over a white background. This had the effect of overpowering the eye. The contrast was simply too much.



## Iteration 2 and 3

This map is half my second iteration and half my third iteration. The simple colors on the left is the solution I came up with to reduce the amount of contrast between the colored weather bars and the white background. The plan was to have the map open and feature solid colors and then as the user zooms in the weather bars start to appear. However, the map was too plain and the idea was trashed. On the right side I experimented with gradients. Ultimately I removed them but the experiment ended up being worthwhile because it really showed me that I needed to research the colors I was using.

# Color Selection

## Using the Wrong Colors

When I showed my initial map to colleagues and friends, the normal response was that the colors were wrong. I thought this was strange because they seemed pretty standard to me. The blue colors were cold, yellow was warm and orange was hot. Most people agreed with that general assumption but there was something about the specific shades of each of the above mentioned colors that wasn't working for people.

## Perception of Warmth

I knew that in order to use the correct colors in my map I would have to better understand how people perceive hot and cold in terms of color. This was a job for resources that designers use far too rarely, peer edited scientific journals and articles. I started browsing and searching the article database and after some trial and error I found a very promising article.



**Abstract**

The Neural Basis of the CIE Perceptual Hue Angles, Warm and Cool Appearance of Colors, and Chroma in the Primate Visual Cortex

by

Christopher Lee Kavanau

Adviser: Ehud Kaplan

**Some colors appear "warm", others "cool". This distinction is universal across cultures and languages, but its neural basis is unknown. Recent work demonstrated the existence of systematic hue maps in the primate visual cortex, in which peaks of regions activated by perceptually similar hues tend to be near each other. Here I show that the spatial activation patterns elicited in the primate striate cortex (area V1) by warm and cool hues differ. Stimuli associated with them also have opposite (L-M) cone contrasts: warm hues positive, cool hues negative. My results suggest that the hue maps in area V1 play an important role in color perception, and contribute to the perceptual distinction between warm and cool colors.**

## Universal

The article I found was "The Neural Basis of the CIE Perceptual Hue Angles, Warm and Cool Appearance of Colors, and Chroma in the Primate Visual Cortex" by Christopher Lee Kavanau. The article is extremely scientific and almost everything in it was far above my level of comprehension. However, the basic assumption of the article is that the appearance of warm and cool colors is "universal across cultures and languages." Learning this, I knew I would just have to track down the ideal colors, once I had those, I knew I had a scientific article that shows that these colors are universally recognized as warm and cool.



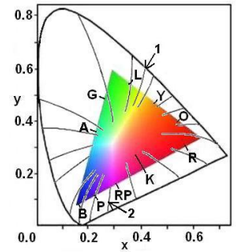


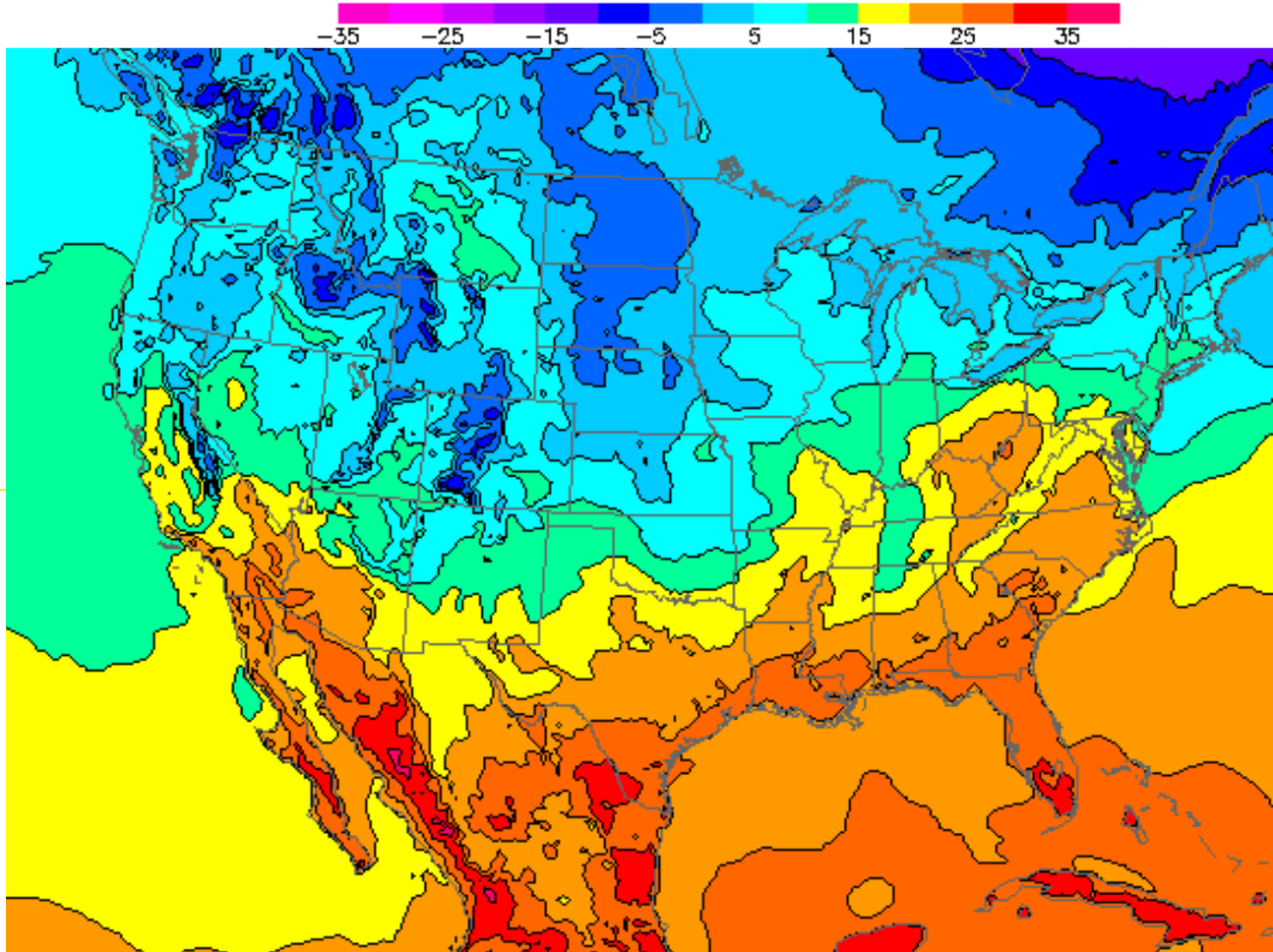

Figure 3.13: **The Abney effect on the warm/cool division between lime and yellow.** CIE 1931-xy coordinates of the stimulus colors. R, red; O, orange; Y, yellow; L, lime; G, green; A, aqua; B, blue; P, purple; RP, reddish-purple; K, pink. The triangular region shows the range of possible colors that the cathode ray tube stimulator could produce (at the luminance used); The curved gray lines show sample lines of constant hue. The number-1 labeled arrow points to one of the lines of constant hue that corresponds to 560 nm. This is the line of demarcation that separates the warm from the cool spectral hues. This curved line bisects lime (L) and yellow (Y) on the triangular color gamut and hence lime is cool and

# Air Traffic and Color

## Ricky Brown

Nailing the right colors actually turned out to be easier than I thought it would be. I don't know very many people that always get their weather information straight from the National Weather Service web site. There just aren't that many people that can read and interpret that raw data. Ricky is one of these people. I asked him to show me what colors the National Weather Service uses to represent warm and cool colors on its maps. Ricky sent me a link to the most concrete example I could have imagined. It clearly laid out all the temperature ranges and their associated colors. From there I simply sampled and copied their RGB values verbatim to my weather bars.

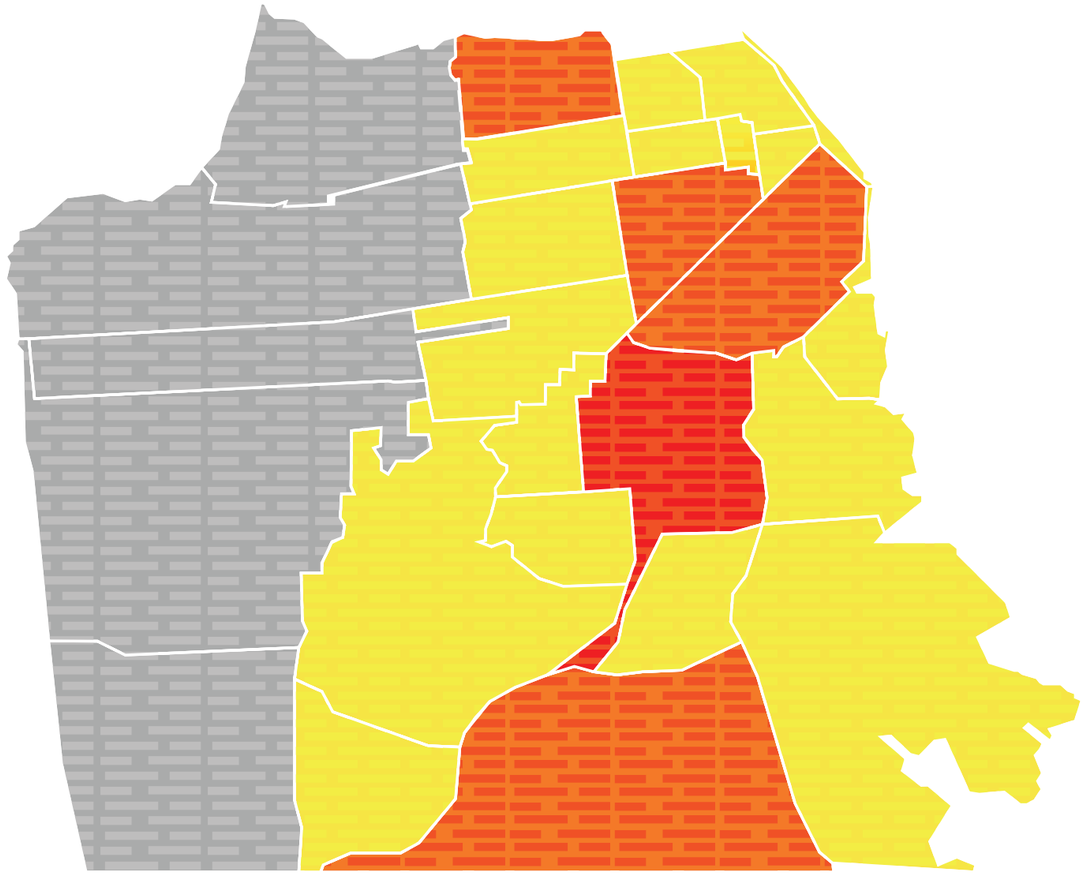
Air Traffic Control Specialist
B.S. Aeronautical Science
Embry-Riddle Aeronautical University



# Map Iteration

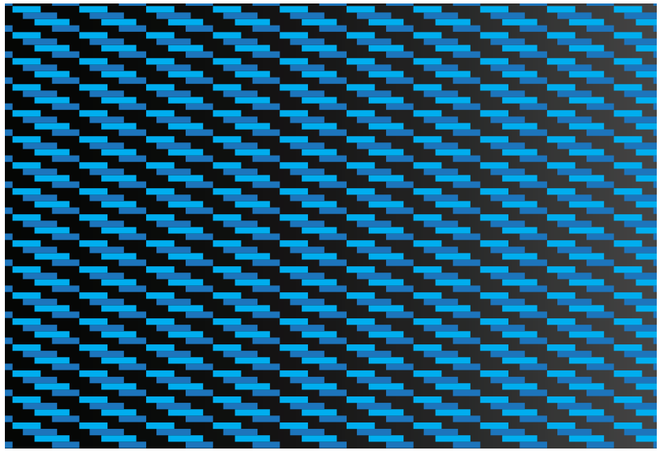
## The Final Map

This is the final map design. The piers and docks had all been lost in the search for simplicity. The colors were now based on the National Weather Service standard. I reduced the contrast between the weather bars and the background map by coloring behind the weather with a slightly different shade or tint of the same hue. I also finalized on white borders that separate the districts as the grey was not visually appealing and could get lost among the grey colors that were meant to represent overcast weather conditions.



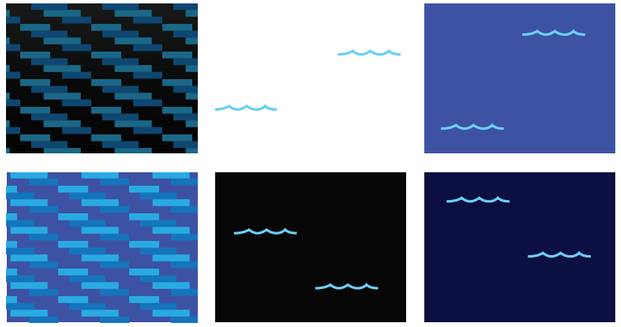
# Water Iteration





## Yikes

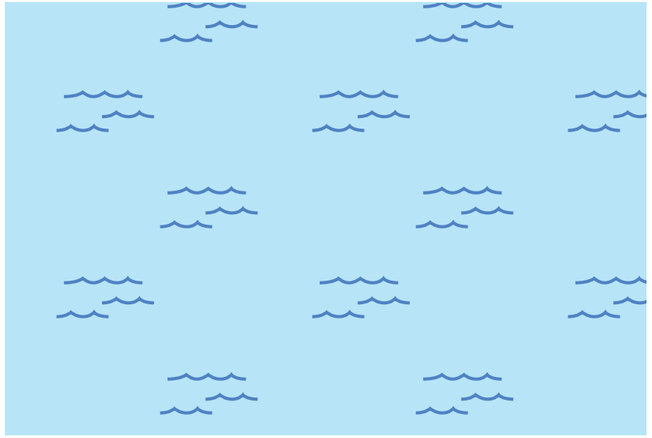
My original aesthetic for the water that would be laying underneath the map was created to highlight the concept of the weather bar. However, in practice, the intense colors and tightly knit pattern were far too overpowering. They completely dominated the map and all other visual aspects on the screen. Clearly I was going to need to prototype different possibilities.



## Bars to Waves

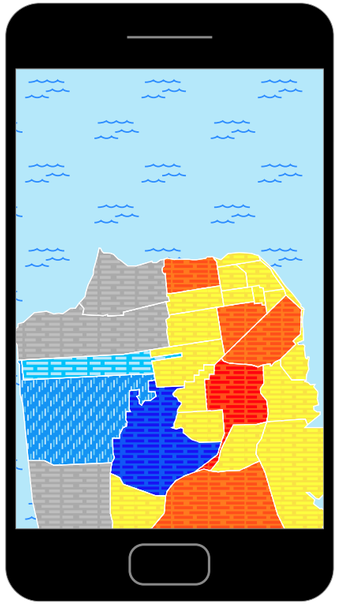
These are a series of experiments with colors and forms. It became necessary very early to drop the bars from the water as they just were not representative of the idea of water. The waves were then developed to be a more obvious representation and to reduce visual clutter. The background colors were experiments in how dominating the water would be compared to the map. White was quite nice but it blended with too many other elements. The dark colors were too dark.

# Water Iteration



## A Perfect Background

The light blue color was easier to comprehend and didn't conflict with other elements unlike the white. Initially the waves were a solid black but that started to compete with some of the text so a dark blue was chosen. This color choice makes a perfect background for the map to rest on.



## *Actual Size

It was apparent very early on that the key to understanding and evaluating the design elements on the application was to see the graphics and image prototypes on the device itself. So while I can't recreate the vibrant RGB LCD screen from the device in this design document, I can show all of my work at actual size.

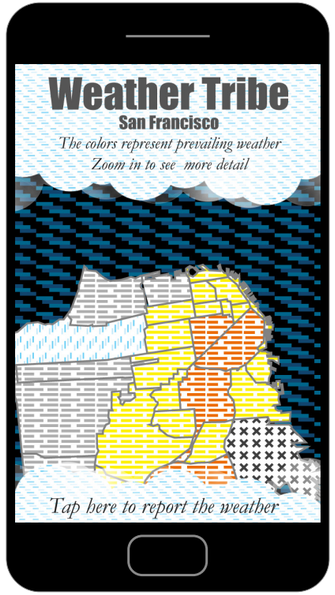
Execution

## Brand Identity

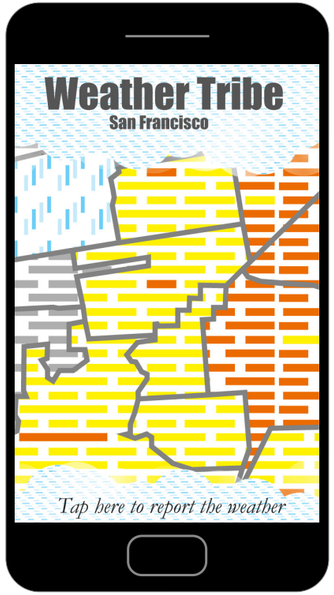
In my initial concepts, the brand identity was placed very high on the visual hierarchy. This is obvious as my typeface choice was Impact and it was quite large. I also tried to maintain the large type through as much as the application as I could. Overall though, this original concept was too busy. There were way too many lines and textures in all the visual elements of the display. The map was basically hidden and the visual elements completely overpowered your eyes. This was particularly evident when viewed on the display of a mobile device. After this experience I learned the importance of always designing a visual element on the large computer screen and then testing it on the small screen on a mobile device. They are completely different mediums and can completely alter the look and feel of the prototype.

## Weather Bars

In all of these prototypes, the weather bars can be seen. While zoomed out, the intention was that these weather bars would be a specific color depending on the prevailing weather reports in that are. But then as the user zoomed in, details would start to emerge. The execution of this concept can be seen in the prototype on the right. The word represents the average report and the number represents how many people reported that bit of weather. They are placed around the map based on the approximate grouping of the reports that they show. When a user taps on a weather bar more info is shown. That view will be detailed later.




"Busy" is the most polite word that can be used to describe these early prototypes. In my defense, some of these prototypes looked stunning on the computer screen on a project. But on the mobile device they fell apart and were nigh unreadable.




In this prototype there is a key concept I was trying to illustrate. As the user zooms in, more details in the weather bars begin to emerge. So in this concept, most people were reporting it warm in The Haight but two people in the middle reported it hot.


This prototype is the key to understanding weather bars. Now that the user is zoomed in enough, labels beging to emerge. The user can see where and how many people reported certain types of weather. They can also tap on a weather bar to get more details.

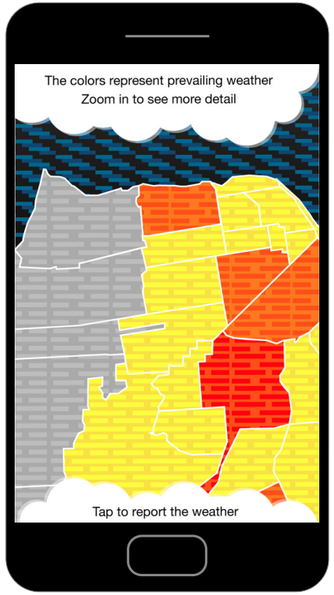
## Change of Focus

One of the most important things that I changed on this iteration of the primary map view was to make the map the most dominating feature. On iteration one, the map competed with the top and bottom clouds. In all honesty, it didn't compete with them, it lost to them. My original intention was to make a strong visual symbol with the top cloud and the name of the application. But, after feedback, I realized that the map had to dominate the view as it was the most important asset in the application.

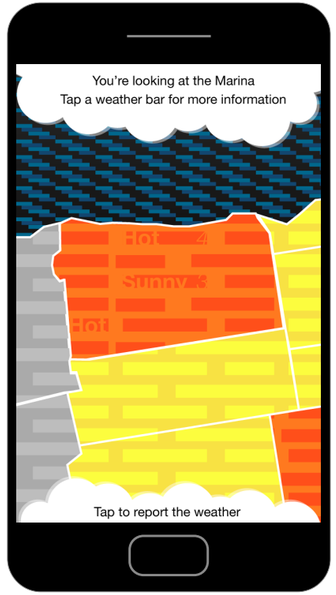
## New, New and Old

This iteration featured the new map and the new, more refined, clouds. The clouds were reduced in size and the typeface choices were changed. Helvetica Neue Medium replaced Garamond Italic. Garamond was completely visually dominating before. Helvetica has no problems taking a visual hierarchy back seat to the map, which now dominated. Except I still hadn't solved the water issue. The water still overpowered everything.


Gone was the dominating application name. It has been replaced with simple instructions on how to use the application. The map was now cleaned up and simplified and much easier on the eyes. The individual districts would change color as they experience different weather conditions.



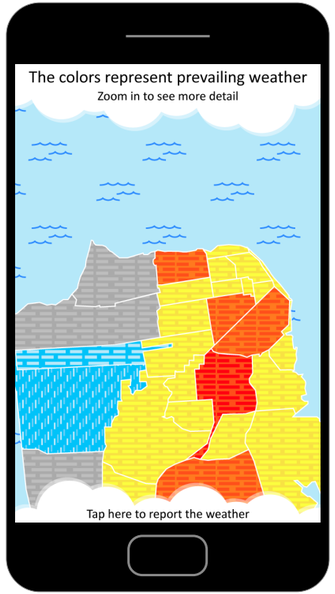

Not present in this zoomed view is the weather bars with different colors that were seen on the previous page. This concept would have to be prototyped with live data to see what works and what doesn't. I decided to keep things uniform for these examples and leave them out.



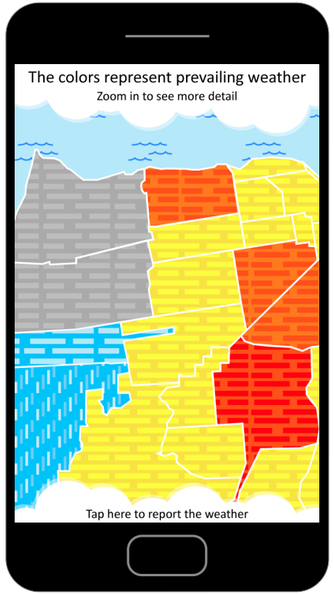

The biggest difference I made in the second iteration of the zoomed in view was making the white borders that surround the districts the same size despite zoom view. Take a quick second and look at the previous page. See how the borders got thicker as the user zoomed? Here they stay the same thickness. This felt far more refined.

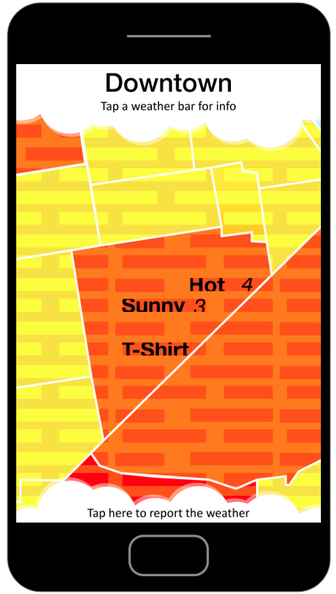
## Font Choice

Somehow the choice of Helvetica Neue wasn't working in the upper and lower clouds. Its hard to imagine a place where Helvetica doesn't work, but I found one. I think it had to do with Helvetica's hard edges not fitting in with the soft and rounded clouds. So, after some experimentation I decided on Calibri to be the instructional typeface choice in the clouds. However, to create a visual hierarchy I decided to use Helvetica Neue for bigger text in clouds. An example of that can be seen on the right in the word "Downtown." In the case of this larger type, the hard solid edges of Helvetica really made the title stand out.




The dark blue waves on light blue background really work. They are a much more obvious representation of water and they do not dominate like the old, dark bar pattern.



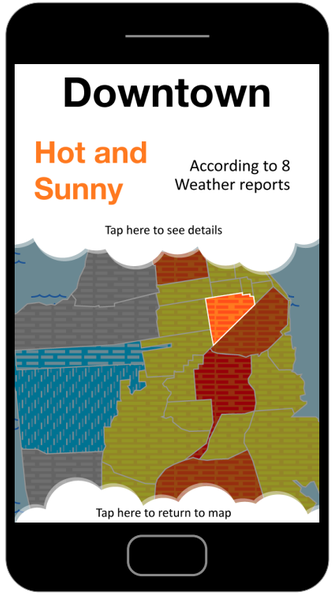

There are two things worth noting in this prototype. First the hierarchy of information changed in the upper cloud. Instead of a sentence stating where the user is, there is a single large word that describes the location that the user is over. Second the information in the weather bar changed to black. This change was made for readability reasons.

## A Common Question

A common question I got while I was showing these concepts was “Will it zoom in if I just tap on a district?” The answer inside my head was “No. It would zoom in if you double tapped a district.” As that is a standard map zooming convention on mobile devices. However, I did have to do something if a user single tapped on a district.

## The Summary View

I found out that I could solve a lot of common problems with a single tap. For instance, I would no longer need a key for the map. If a user did not understand a color or symbol they could just tap. I could eliminate the need to zoom in if someone just wants to see an overview of the weather information for a specific district, not each weather bar.




The way I decided to handle the single tap feature of the map was to have the top cloud slide down and show the average weather information for that district. Also, the other districts would fade to dark so that only the selected district was highlighted. Overall, its a very clear and simple way to give the user quick information with a single tap.

# Social Network



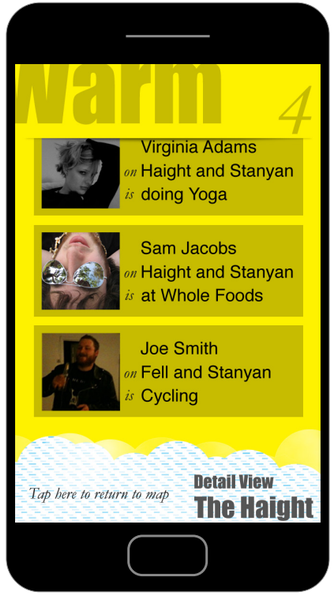


## Utmost Importance

These were my first attempts at the social networking aspects of the application. The social aspect would be incredibly important to the success of the application. Without users reporting the weather there would be no way to show where in the city it was sunny.

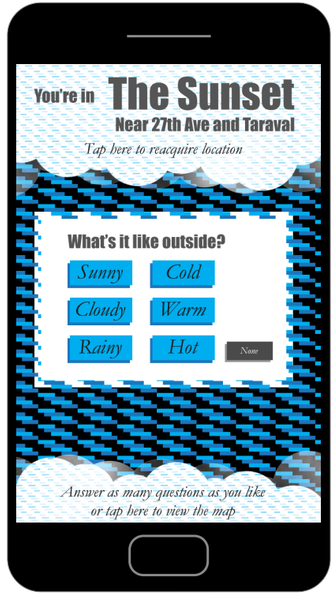
## Mixed Metaphors

These first iterations of the social aspect of the application were filled with all kinds of mixed metaphors. They somehow appealed to my eclectic tastes but, overall, the aesthetic did not work. The tiles in the water and clouds were too distracting. On top of that, the myriad font and typeface choices were really inconsistent and distracted the user from the “task at hand.” The task was to answer a simple question, but users were incredibly distracted by the visuals on the screen.




This was designed to be the initial view a user would receive after tapping on a weather bar. It showed all the weather reports that made up that weather bar and who made them.

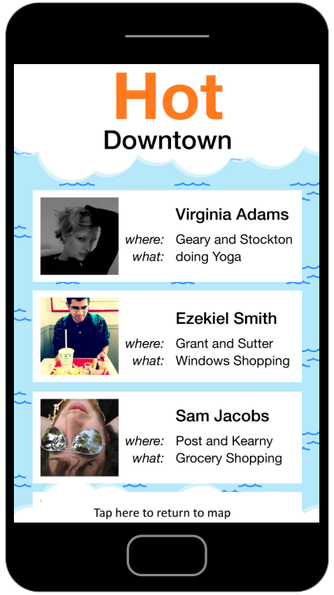

After a user tapped on a specific user from the detail view on the left, the user would be presented with a view showing all of the reports from that specific person in the profile view.




This view was developed to show how the users would report the weather. It does not feature the continuous questions concept that I considered to be so important to the success of the concept.

## Cleaning Up

These later iterations have a cleaner, brighter feel to them. They also incorporate the final water and cloud designs.




This view shows who posted that it was hot in the downtown district of San Francisco. This is the social networking aspect of the app.


Tapping on one of the weather reports reveals this view. From this view the user can see a historical view of this user's weather updates.

## Continuous Questions

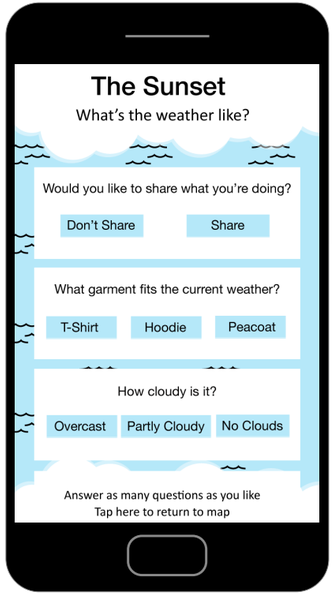
Obviously, this new interface is using the refined elements that I iterated during the development portion of the project. But more important in this prototype is the concept of continuous questions.

The user can see a list of questions. The user can answer any question they want. They can answer as many or as few questions as they want. This system allows a user to answer questions they feel most comfortable answering. It also allows the user to answer questions for as long as they want or to answer a single question and then quit the application. This will allow for users to post information quickly without feeling bogged down and it will allow a user to report a lot of data if they have the time to do so.

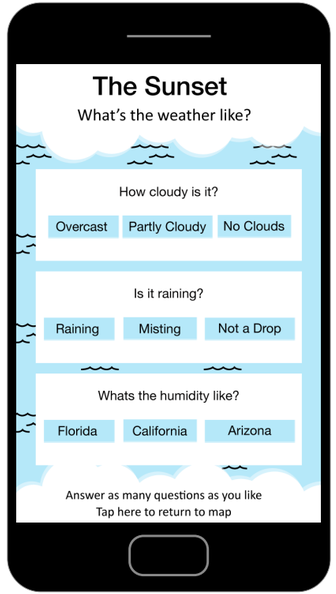
## Location Aware

I always imagined there would be a simple way to report the weather from within the application. However, in order to get people to report the weather more often it would be necessary for the device to automatically detect when the user has moved from one district to another and then ask the user if they would like to report the weather. Of course, security concerns would have to be considered, but it could be a great feature to increase the amount of weather data available to the application and its users.


The location aware dialog is simple and matches the user interface of the host device, an iPhone in this case, and asks the user to report the weather in the new area they are in.




Social networking is about being engaged in the community. I knew it would be important to know what users are doing when they report the weather. For this reason, the first question asks "What are you doing?"



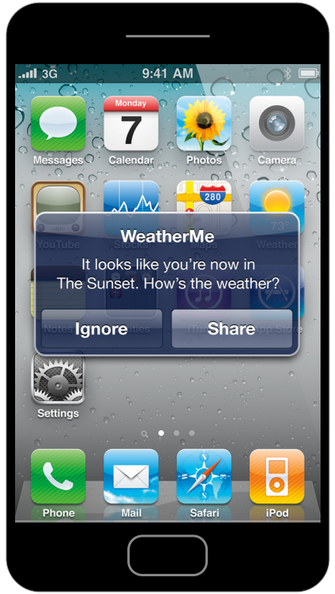

The concept of continuous questions was clearly established in this view. The user could answer any question they want. When they answer a question, that question fades away and the rest slide up to fill its space.

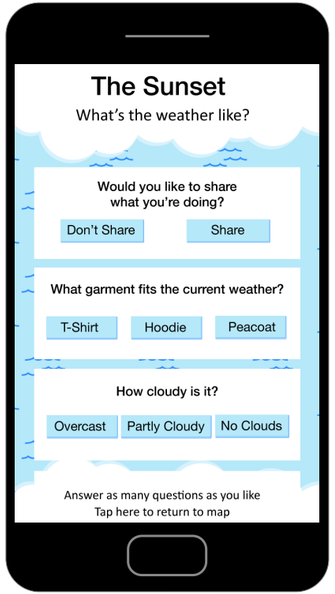
## Changed Name

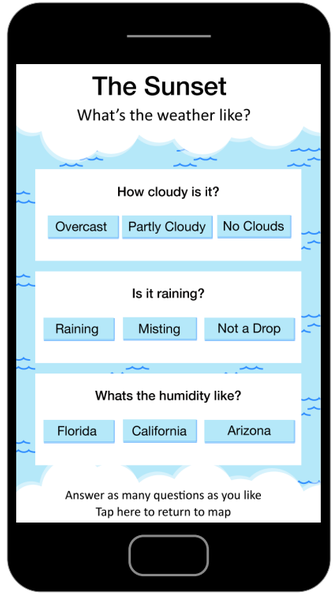
On the previous page, the name of the application was “Weather Tribe.” This was a very fitting name. People reporting the weather could be compared to a tribe. However, the word tribe has other associations that I did not want to bring into the design. For example, when I hear tribe I think of tribes in Africa and their related artifacts that are featured in popculture films such as Indiana Jones or games such as Crash Bandicoot. To avoid these connections I decided on the name WeatherMe. It still has to do with weather and it still has to do with social networking, but it no longer has stereotypical pop culture associations.

## Small Refinements

These screens on the right show small but important refinements. Namely, there was some depth added to the buttons so that the user knows that they are actually buttons. Also, the wave color was changed from black to dark blue. The black competed with the typography on the screen in a negative way. With the dark blue there was no confusion between type and water.

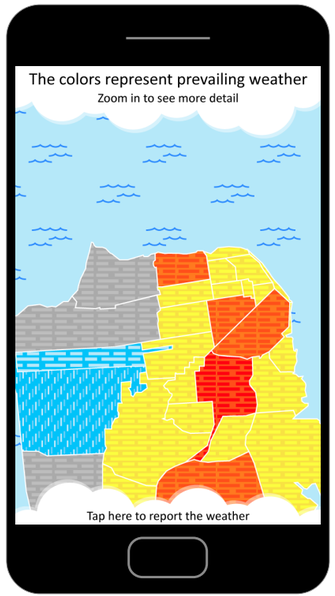


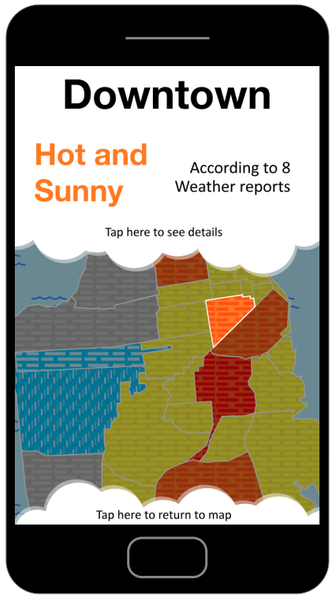



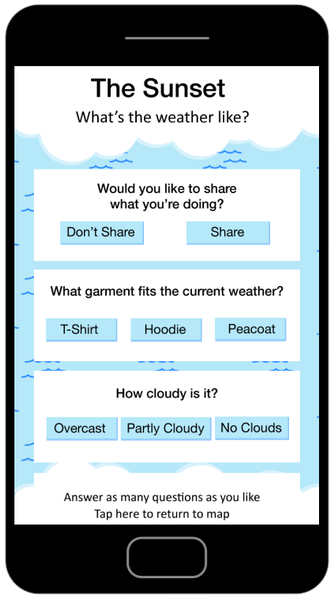



# Execution Summary






## Problem Solved

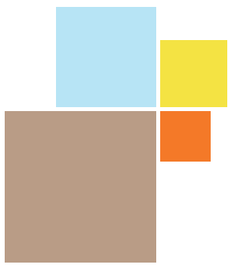
Well, mostly. The current solution requires that users actively report weather information. Only then can other users read the weather information presented by the application. The best case scenario would have made the weather information gathering automatic. Specifically, Twitter would have been great for this. Twitter users would post weather information and then this application would secretly analyze the information and show it on the map. Alas, not enough Twitter users use the geolocation feature. So while this social network adds a dynamics feature to the application, it is truly a means to an end.

## Pros

The pros of the solution involve an innovative way to plot weather on a map. The weather bar is better than pins on a map. Weather is more spread out than a specific address, which is what the pins were designed for. The weather bar also allows easier combining of similar information into one graphical asset to then present to the user. This simplifies the display for the user. The color system used is easy to understand because its used by the standard of standards in weather, the National Weather Service. The solution also allows users to get deep into the application to report as much information as they want or to read as much information as they want. It also allows users to get information quickly and to report information quickly.

## Cons

The social networking aspect of the solution, as said before is a means to an end. Finding another way to collect weather information within the city would be ideal. The social network aspect presents issues such as the chicken and egg problem. It also requires that users are interested enough in the weather on a regular basis to report the weather often.



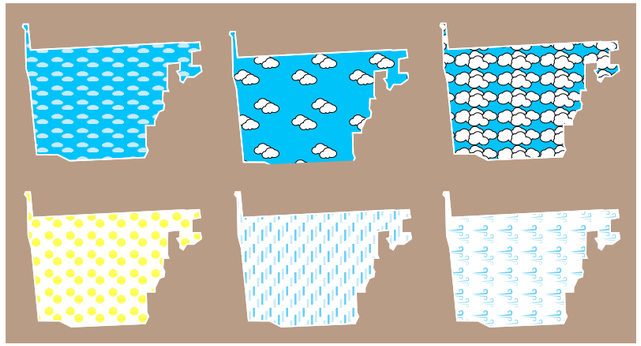
# Future Development

# More Weather



## Problem Statement

The problem statement for this project very specifically had to do with helping San Franciscans find the sunshine. However, sunshine isn't the only type of weather. I experimented with how to show other types of weather phenomena. Specifically I wanted to show wind, clouds and rain. In most of the prototypes shown in the "Execution" section of this book include rain but they totally lack wind and clouds.

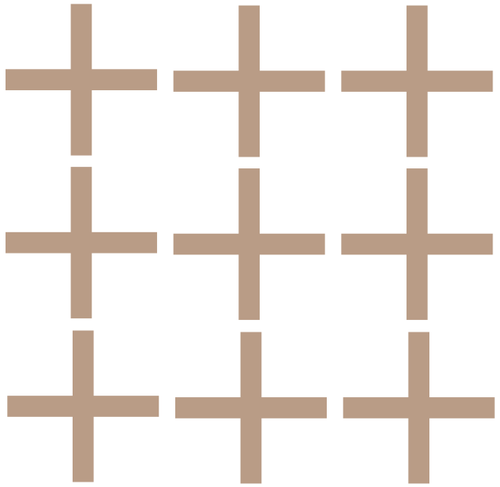


## Animation

Through experimentation, it seemed the best way to show wind and rain was through animation. The wind animation would simply show the weather bars moving from one side to another. The direction would indicate the wind direction and the speed of the bars would indicate the relative speed of the wind. Rain was a simpler animation where the colors of the rain would swap back and forth. Both of these animations would need more work before they could be implemented.

## Experiments

These are some experiments for displaying different kinds of weather conditions. I don't necessarily have individual comments on any of these. I purposefully left them out of the final deliverable because they aren't ready. The problem statement involved finding where its sunny and the current system does this with no issues. These other weather conditions are important and thats why they are now classified as an item for future development.



## Data Sources

The current solution collects weather information from users of its own social network. This is great as long as many people are reporting the weather. Ideally this application would pool together weather information from many sources. Other sources include, but are not limited to, Twitter, webcams and automated weather stations. My research indicated that these systems, by themselves, did not collect enough information to solve the problem, but adding them to an already complete pool of data would mean even more information to present to users.

## Getting it Running

The most obvious, and the most challenging, next step is to get this application concept out of the concept stage. A huge future step in its development is to research people and firms that can turn an application concept into an actual mobile application that can be downloaded and used. Moving onto this step would involve convincing others that this concept will cause a measurable financial gain for those involved.

## Advertising Idea

For this application to be a success it would need to be free. Paying to social network has only worked in one arena and that is dating. It has never worked for any other type of social network. However, advertising in an old fashioned way with ads that pop up in the application would be extremely annoying. Instead, since this application is location aware, presenting useful ads to people that are for businesses near where the user is might be far more effective. Obviously this concept would need to be research, but its an idea.