

An Interface for Apartment Search

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Introduction and Motivations

We conducted a survey to find out what people look for when searching for apartments. As expected most respondents stated price as the number #1 factor that influenced their apartment hunting. A close second was the location of the apartment.

With respect to location, 49 of 55 respondents said that distance to their points of interest (POI) like work, school etc. was somewhat or very important. These people also said it that it was important to them that these POI be somewhat equidistant from the apartment.

This paper will discuss a new interface for apartment search that we designed for this course, SIMS 247: Information Visualization, and for our master's project. Although much work overlaps between the writeup for this course and the writeup for SIMS 247, this writeup will focus on user interface design to support apartment search.

Problems with Existing Search Interfaces

There are several search interfaces currently that explore different ways for searching for apartments.

Most of the existing interfaces offer searching by price. In terms of location, they assume the user knows which city they want to look for apartments in.

a) Craigslist

Problem with this kind of interface is that it is purely text-based. When viewing the search results, user has no idea which geographic area these results are in.

The screenshot shows a Craigslist search interface. At the top, it displays the breadcrumb path: [craigslist](#) > [east bay area](#) > [apartments for rent](#). There are links for [help](#) and [post](#). Below this, there are location filters: [s.f. bayarea](#) | [san francisco](#) | [south bay](#) | [east bay](#) | [peninsula](#) | [north bay](#). A search bar contains the text "apartments for rent" and a "Search" button. Below the search bar, there are filters for "rent: min max", "0+ BR", and "alameda". There are also checkboxes for "cats" and "dogs". A summary bar indicates "Found: 144 Displaying: 1 - 50" with a "Next >>" link and pagination links [1] [2] [3]. The search results list several apartment listings, each with a date, price, and description, such as "Nov-22 \$1900 / 2br - Charming house on Tree Lined Street (alameda)".

b) Apartments.com.

Apartments.com, like Craigslist, assumes that the user knows the names of the city or cities that the user wants to search in. An improvement this interface offers is that it shows the areas on a map when giving the user options to select from them.

apartments.com™ [search for rentals](#) [manager center](#) [moving center](#)

More sources = more listings: apartments from Newspaper Classifieds, Private Landlords & Managed Communities!

Moving Resources

- [Find a Roommate](#)
- [Moving Quotes](#)
- [Renters Insurance](#)
- [Apartment Locators](#)
- [Rent a Truck](#)
- [You Pack, We Move](#)
- [Connect Your DSL](#)
- [Connect Local Phone](#)
- [Rent Furniture](#)
- [Community Info](#)
- [Storage Facilities](#)
- [Auto Insurance Quotes](#)

Credit Resources

- [Free Credit Reports](#)
- [Free Checking](#)

Search options

- [Start a new search](#)
- [View favorites](#)
- [Get email alerts](#)

Search Criteria :

State : California
Region(s) : San Francisco & Bay Area
Area(s) :
Community(ies) : All
Price : Any
Bedrooms: All
Type Of Housing: Any

Choose an Area to Search


You are searching for San Francisco & Bay Area apartments in California. To narrow down your search for an apartment in San Francisco & Bay Area, select an area or areas within the San Francisco & Bay Area region.

Choose an Area to search:

- 1 East Bay
- 2 Marin & Sonoma Counties
- 3 San Benito County
- 4 San Francisco
- 5 San Jose/Silicon Valley
- 6 San Mateo County
- 7 Santa Cruz/N. Monterey Bay
- 8 Solano & Napa Counties

[continue](#)

[See a Detailed Community List](#)



Choose a Community to Search

You are searching for San Jose/Silicon Valley apartments in San Francisco & Bay Area. To narrow down your search for an apartment in San Jose/Silicon Valley, select an community or communities within the San Jose/Silicon Valley region.

- 1 Campbell
- 2 Cupertino
- 3 Gilroy
- 4 Los Altos
- 5 Los Gatos
- 6 Milpitas
- 7 Morgan Hill/San Martin
- 8 Mountain View
- 9 Palo Alto
- 10 San Jose
- 11 Santa Clara
- 12 Saratoga
- 13 Sunnyvale




[? Click Here For A Detailed Neighborhood List](#)



continue

In this case also, the search results are just text, albeit dotted with some pictures. They still give no indication of where on a map they appear. The user needs to click on another link, for each result to see the location of each item. This process can be rather tedious. Moreover, it does not allow the user to envision the locations of all apartments together.

Save to favorites | [View favorites](#) Sort by clicking a column header below: Subscribe to get results via [RSS](#)

Photo	Name	City	Price	Tour	Special	Source
<input type="checkbox"/>	 <p>Macara Gardens Apartments 955 Escalon Ave. Welcome to Macara Gardens Apartments where convenience and comfort come together. more >></p> <p>Call (866)-205-3931</p>	Sunnyvale, CA 94086	\$1250 - \$1525			Managed
<input type="checkbox"/>	 <p>Oak Pointe Apartments 450 N. Mathilda Ave. Welcome to Oak Pointe Apartment Community! more >></p> <p>Call (866)-391-3777</p>	Sunnyvale, CA 94086	\$850 - \$1350			Managed
<input type="checkbox"/>	 <p>Oakwood Mountain View 555 W. Middlefield Rd. Oakwood Mountain View apartments is located in the heart of Silicon Valley just minutes away from several major technology companies and office parks. more >></p> <p>Call (866)-787-4586</p>	Mountain View, CA 94043	\$1200 - \$2175			Managed

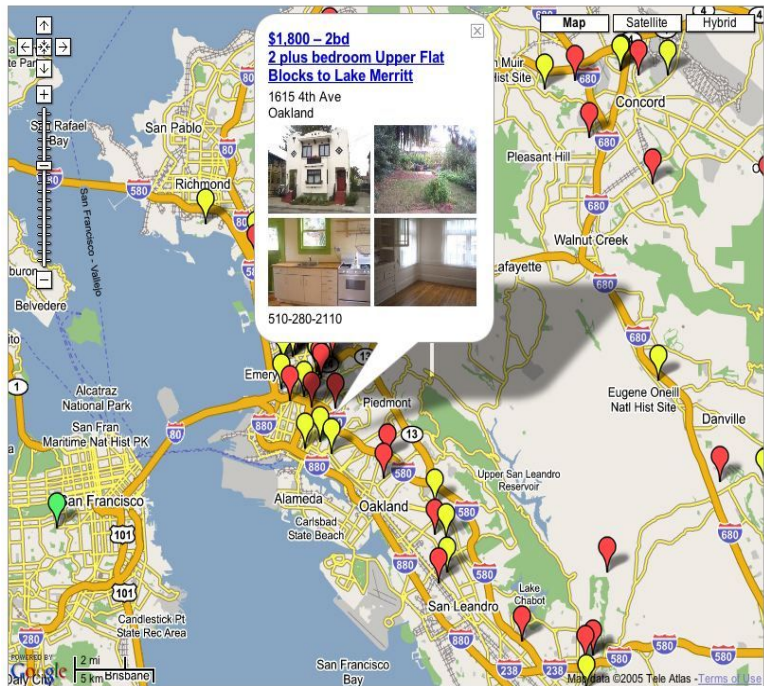
c) HousingMaps.com

Housing maps solve some of the problems mentioned above. In addition to a list, it provides a geographic mapping of all apartment search results in a given area. However it still has limited searching capabilities, since it does not let a person input places they want to search ‘around’.

For Rent For Sale Rooms Sublets Powered by [craigslist](#) and [Google Maps](#)
(this site is in no way affiliated with craigslist or Google) [About / Feedback](#)

City: Price: [Hide Filters](#) [Refresh](#) [Link](#)

Keywords: Rooms: Pictures Dogs Cats



price	bd	description	city	date
\$1800	2bd	Gorgeous Apartment Complex Completely Remodeled!	Oakland	11/22
\$1900		Magnificent Open-Plan LAV/Loft Pic. Link. Open House Tues. 2-2:30	Emeryville	11/22
\$1750	3bd	Gorgeous Martinez Townhouse	Martinez	11/22
\$1500	2bd	2BA/2BA Big Condo near Piedmont Ave. Free garage prkg. Transport!	Oakland	11/22
\$1599	2bd	Great 2 BR -- newer building! 415-637-8917	Oakland	11/22
\$1500	4bd	Newly-remodeled Spacious Single Family Home in Concord. Showing today!	Concord	11/22
\$1525	3bd	Fremont House- 3BR/2Bth/2Car	Fremont	11/22
\$1750	2bd	2 bed 2 bath hardwood floor new kitchen	Berkeley	11/22
\$1850	2bd	Great 2 Bedroom/2 Bathroom in North Berkeley's Hillside Village!	Berkeley	11/21
\$1600	2bd	Norcal Realty Inc. 2 bedroom 1 bath house	Castro Valle	11/21
\$1750	3bd	3 + 2,1,500 square-foot home in Livermore	Livermore	11/21
\$1500	2bd	2 BR/Apt 5 blocks from Uc. "Walk To Campus"	Berkeley	11/21
\$1500	1bd	New Condo in Chinatown	Oakland	11/21
\$1750	2bd	Charming flat, Craftsman details, nr Ashby/Bart	Berkeley	11/21
\$2000	2bd	Furnished modern flat in charming Victorian house	Berkeley	11/21
\$1850	2bd	2br/1bath lower unit in Craftsman duplex close to campus	Berkeley	11/21
\$1600	3bd	3Bedroom/2bathroom House in Concord	Concord	11/21
\$1750	3bd	One Year Option To Buy	Concord	11/21
\$1550	1bd	Very Large ca be 2 Bed Close to Rockridge	Oakland	11/21
\$1575	2bd	Albany Condo w/ Panoramic View & Amenities	Albany	11/21
\$1600	3bd	Large Immaculate Duplex near Trader Joes	Walnut Cree	11/21
\$1700	2bd	Unique and Spacious 2 Full Baths	Hayward	11/21

Solution Overview

For our apartment search interface, we wanted to support the following:

- not assume that the apartment searcher knew the area well
- help user find apartments convenient to one or more points of interest, such as the work place, school, and public transit
- give some focus on the returned results, not just a listing of all results
- help the searcher easily filter the results or alter the query

In order to accomplish those goals, our search interface incorporates the following:

- Shows results in a graphical way
- Allows user to enter multiple points of interest, not just a city or a geographic location
- Calculates a "Suggested Area", based on proximity to the points of interest
- Allows user to change this suggested area, using Dynamic, Visual Queries

We had to decide how to present the apartment results that best match the apartment hunter's search criteria. The first idea was to develop a ranking algorithm and order results in a list based on rank. However, gathering enough information about the apartment searcher to develop a meaningful ranked list would be difficult; it would be hard to say that one apartment was better than another for that particular user. A second idea was to cluster the apartments in some way. These clusters would first be constrained by geography. Then, clusters could be formed by grouping apartments close to public transit, shops, or based on price (which is usually closely linked to location). However, without proper labels, the apartment searcher may not understand the meaning of such clusters. An alternate idea to clusters would be to create meaningful categories and categorize apartment based on these categories. Such categories could include proximity to points of interest and groupings by price ranges. A final idea was to find one cluster of apartments, constrained by geography, that best matched the apartment hunter's search criteria.

In our first prototype, we decided to test two designs for presenting apartment listings:

- one relevant cluster of apartments as a "Suggested Area"
- listings organized in meaningful categories, by proximity to points of interest

Personas and Scenarios

Persona 1:

Ernie has a graduate degree in Computer Science & Engineering from Carnegie Mellon University in Pittsburg. Due to the focus of his education, he spends a lot of time with computers and is very technology savvy. His favorite store is Fry's Electronics and he usually hangs out there. He can perform tasks on a computer with just a keyboard when most other people would need a mouse to do the same thing.

In his spare time he enjoys a game of tennis or hiking, especially with a group of friends. Working late long hours at the computer lab has given him a taste for appreciating night life. He recently got a great position at Cisco as Product Manager and since his girlfriend recently got accepted to the SIMS program at Berkeley, he decided to move to the west coast to be near her. Originally from Gardner, Montana, he stayed in a campus dorm for most of his time at CMU and is a bit apprehensive about moving to a bustling metropolitan area. Living in a safe locality is very important to him. An avid skier, he usually buys the season pass to the nearest Ski resort he can find.

He had been hoping to buy a house soon after he graduated but after hearing about the real estate prices in the Bay Area, he figures it might be better to rent an apartment for a while and decide if he can really get used to the absence of snow.

Persona 2:

Greg just recently moved to the Bay area from Southern California, after getting married to his long time girlfriend Ashley. Ashley, who is a financial consultant, has been living in the Walnut Creek area, close to her current job. Prior to moving up, Greg, who is an accountant, landed a job at a small accounting firm in Fremont. He is currently living with Ashley in her Walnut Creek apartment. However, the long commute is taking a toll on him, and both he and Ashley decided to try to find a new apartment closer to Fremont while they save up money to buy a house.

Greg met Ashley while he was getting his undergraduate degree in business economics from UCLA. Greg has lived in Southern California all his life, and as a result, he's not very used to taking public transportation but is very comfortable driving. He is a car enthusiast and takes great care of his Suburu WRX. He also loves hiking and is looking forward to exploring the many regional parks in the Bay area.

Scenario 1:

Its already the second week of May and Ernie is graduating in a few days. He recently accepted a job offer with Cisco and his start date is in 3 weeks. He has had no time to look for apartments in the San Francisco Bay Area. He had been planning to fly out and visit his girlfriend in Berkeley during spring break, but it somehow never happened.

Now with less than a month left to clear out his apartment and ship his stuff to California, Ernie wants to find a in the Bay Area, as fast as he can. Unfortunately, he isnt very familiar with the apartments in the Silicon Valley.

He isn'treally sure how hell go about finding an apartment in such a short amount of time. His Cisco recruiter pointed him to a couple of online newspaper advertisements and local online listing sites but he quickly gets exhausted since he has to repeat the same steps over and over for each listing he looks at. He has to get the apartments address, go to a site that can give him driving directions and then compute the distance from the apartment to his office in order to gauge which of these sites is closest to the places he is interested in.

He decides to room with another of his classmates, Jack, who is also moving to the Bay Area and will be working at Citibank in San Francisco. After talking to Jack, he makes a list of what is important to the both of them. They decide that with their hefty signing bonuses they could shell out upto \$1800 per month for a 2 bed 2 bath apartment. Jack's only conditions are that a) the apartment they select be equal commute from each of their respective work places. And b) there should be grocery stores nearby. Ernie adds his condition of living in a safe community to this list.

Having heard about the Blobbit project from his girlfriend, he decides to give it a try. He enters the information regarding preferences like price range, number of bedrooms etc and also enters his work address and Jack's work address as his 2 points of interest. The results he gets suggest a shaded area or blob right around a city called Hayward. He then decides to find the grocery stores near by and is happy to see that the area has many grocery stores. He then looks for crime statistics in the area. He is dismayed to find that the cheapest apartments are also in areas where crimes have been listed. He decides to move the blob a bit to see surrounding areas. He finds fewer instances of crime as he moves the blob towards Milpitas.

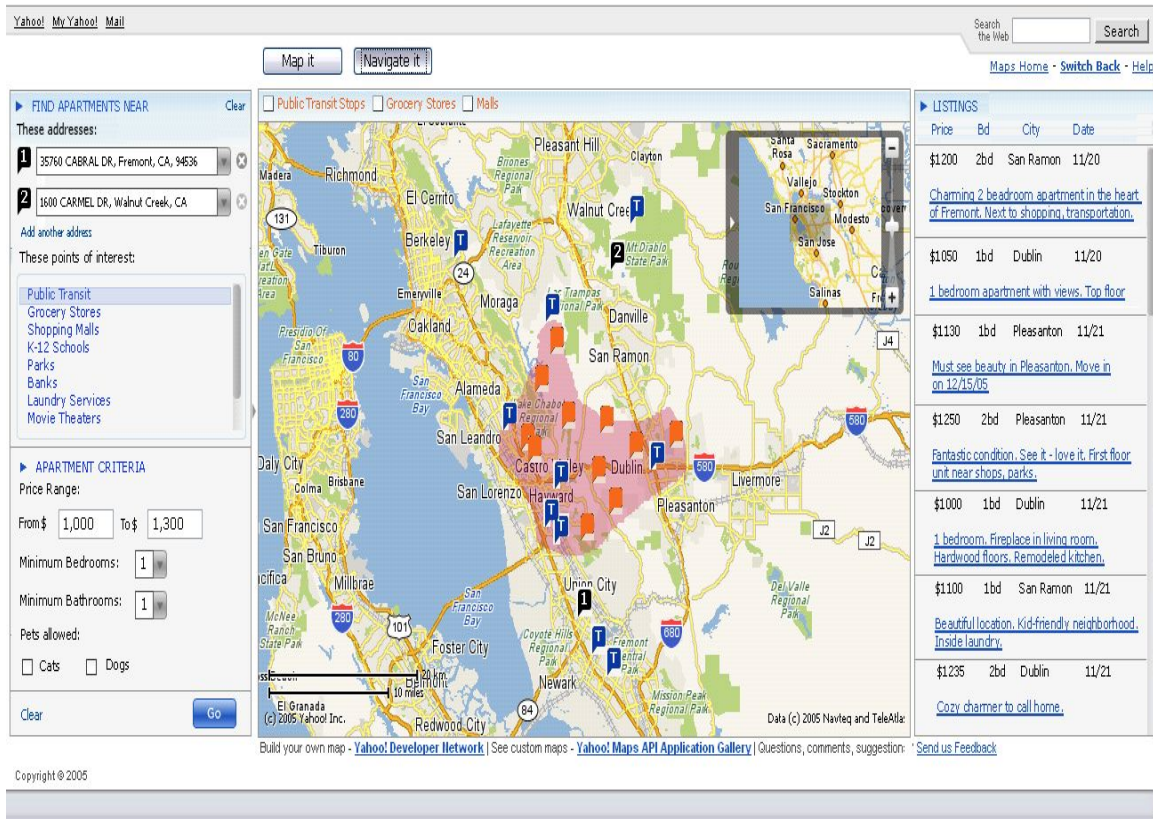
A few minutes later, Jack walks in and says he will not be able to take his car as his company refused to pay for the transport. Ernie now needs to look for an apartment so that Jack can get to work. He selects mass transit stops as a point of interest also. The recalculated blob shows him VTA and Bart stations in the vicinity and Ernie decides that the Fremont area would work out the best since it meets all their criteria. He proceeds to look at the apartment listing that came up in the search results and soon finalized an apartment.

Scenario 2:

Greg just moved to Walnut Creek two months ago to live with his wife. He has been commuting to Fremont everyday, making the long commute from Walnut Creek. His daily commute is over 2 hours total, and Ashley and Greg decided that they need to find a place closer to Greg's workplace without creating a long commute for Ashley. Currently, they live a block away from Ashley's work place, which is also a block away from the Walnut Creek station. Unfortunately, both Greg and Ashley are only familiar with Walnut Creek and San Francisco. They are very unfamiliar with all other cities in the East Bay.

Greg decides to use the Blobbit project to try to find an apartment for him and Ashley. He initially enters in his Fremont work address as well as Ashley's Walnut Creek work address. This pulls up several apartments in the Dublin and San Ramone area. However, Ashley and Greg were discussing the possibility of Ashley taking the BART to work, since her workplace is within walking distance to the BART station. Greg alters his query so that the apartments returned would be closer to the Fremont/Richmond BART line. Greg now has a listing of apartments midway between Fremont and Walnut Creek while being close to BART stations.

First Prototype Design Description



To start a search, the apartment search would enter on the left panel:

- 2 points of interest search fields, which is expandable to allow more
- additional common interests points, such as public transit and grocery stores
- any other criteria for filtering apartments, such as min and max price and number of bedrooms

Once those fields are entered, apartment listing results would be displayed. We developed three designs that would help the apartment hunter evaluate the apartment listing results.

Design 1: "Blob" with Direct Manipulation (above)

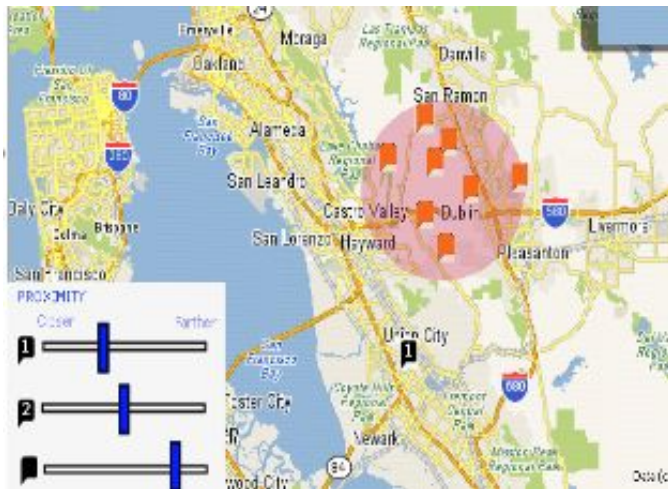
Once the search criteria is entered, the map would populate with the points of interested specified and apartments that best meet the search criteria. A pink "blob" surrounds the apartments in order to draw focus to the suggested area area as a suggested area. This "blob" also represents a query area that can be manipulated to alter the query. Titles of the apartment listings are shown to the right of the map.

In order to alter the search results, the apartment hunter would be able to drag the "blob" in order to get results from new areas. For example, if apartment hunters entered 2 addresses as points of interest initially but then decided that they would like to see

apartments closer to the freeway, they could drag the "blob" closer to the freeway to see the available apartments in that area.

In order to be able to alter the "blob," the user must be in the "Map It" mode. Otherwise, in the "Navigate It" mode, the user would be panning and zooming through the map.

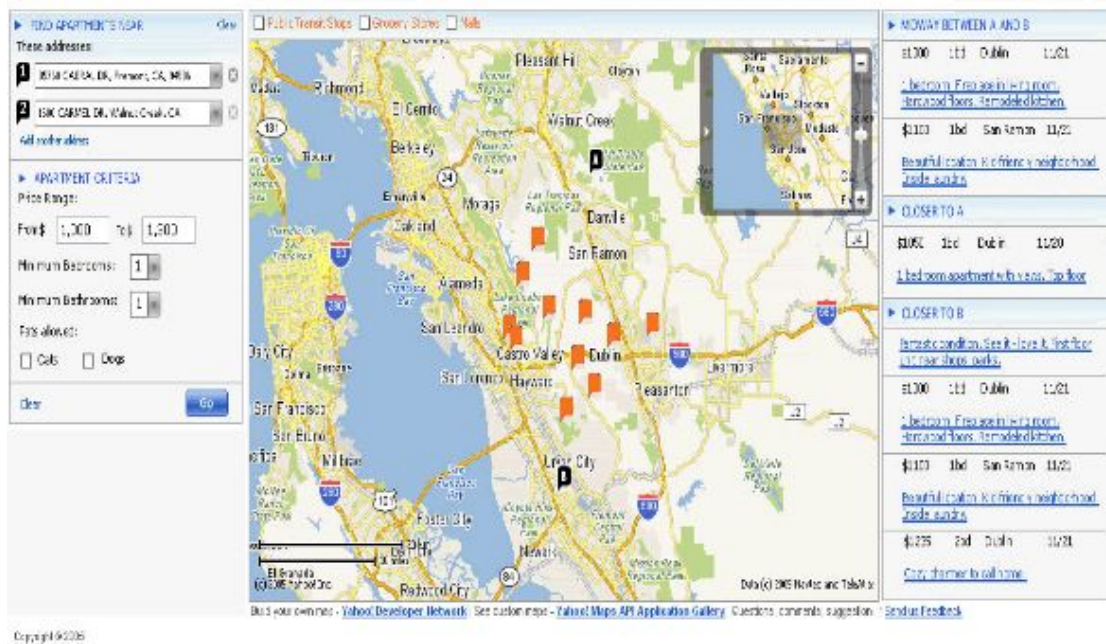
Design 2: "Blob" with Direct Manipulation via Sliders



The second design idea is very similar to design 1, except that instead of directly pulling and re-shaping the "blob," sliders are used to move and manipulate the blob, in relation to entered points of interest. For example, if two points of interest were entered and the users decide they need to live closer to point 1, the users would move the slider "Closer to 1." If they decide they are less interested in the apartments close to point 2, they would move the slider "Farther from 2." This design is similar to the design outlined by Christopher Williamson and Ben Shneiderman in their Dynamic HomeFinder paper (2002).

In this design as well as the third design, there would only be one mode for panning and zooming on the map. It would not be necessary to have a mode for "blob" manipulation, since that is all done by the sliders.

Design 3: Meaningful Categories



The 3rd design differs from design 1 and design 2, because it doesn't use a "blob" as a query. Instead, the apartment results are categorized by proximity to points of interest. Categories would include "Midway between A and B", "Closer to A", and "Closer to B", if two points of interest were entered. When one category is selected, the apartment hunter could drill down even further with categories such as "Closer to Public Transit" and "Closer to Shops." A second idea, not explored in this design, is to drill down by price categories as the secondary set of categories.

Usability study results

Number of participants: 5

Participant profiles:

Participants were recruited from among SIMS Masters students as well as outside acquaintances that best matched the target demographic for our application. The target user is between 20-40 years of age, either student or working professional with at least a basic level of computer proficiency.

Responses of participants to the interface:

This section contains a general summary and analysis of participant responses. After analyzing the responses of 5 participants we were able to discern some general trends. However, their reactions to some parts of the interface were very diverse and even contradictory with each other. We will need to conduct more tests in the future to get a clearer picture of user preferences for these parts.

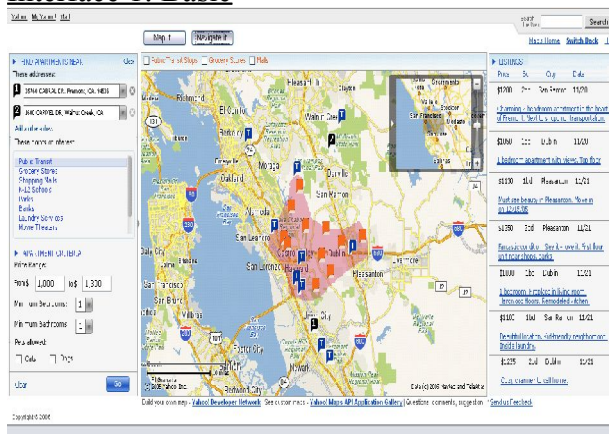
Search interface variations:

We tested 3 different interfaces. It is important to note that while basic interface remained the same in terms of layout, we tested some variations in the display and interaction with the search results – these include both results displayed on the map as well as text results of their search. We wanted to know how easily users were able to filter results or alter their query. For this reason, difficulties with common features such as the search/query input panel on the left, the checkboxes at the top of the map, as well as getting details about apartments are described here but can be assumed to be applicable to all versions of the interface.

In addition to search results we also tested the usefulness and user reaction to getting additional location specific information, like driving distance from points of interest to the currently active (selected) location in the search results.

Results from each interface as described below

Interface 1: Basic



4 out of 5 participants found Interface 1 moderately difficult to use. 1 participant found it to be difficult.

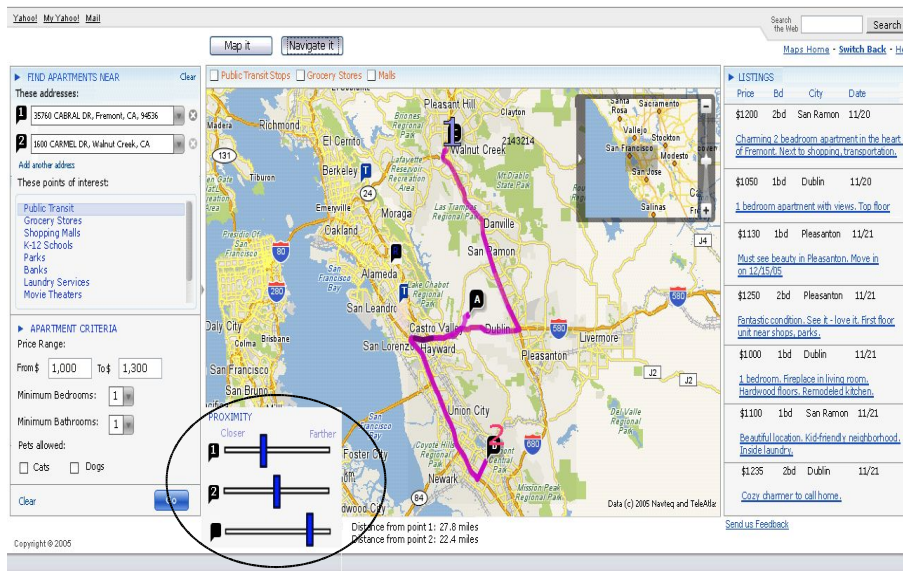
All of the participants were confused about the difference between the list of points of interest in the left panel and the checkboxes at the top of the map. Therefore they were not able to display additional information like grocery stores, malls etc. on the map. 2 participants also noted that the public transportation category is too general. It is not clear what types of transportation are covered.

2 participants noted that there was little to connect the results on the right with the markers on the map. This probably needs to be reinforced by perhaps numbering the listings on the right and having the numbers displayed on the markers.

All participants initially struggled with the “suggested area” idea. 2 participants believed that it represented city boundaries. However, as the tests progressed, all said that they see it as potentially useful. Participants 4 and 5 noted that the confusion might be due in part to the non-interactive nature of the prototype. Participant 1 mentioned that even with its shortcomings, having the “suggested area” would be an improvement over current alternatives.

All five participants felt that the “Map It/Navigate It” labels did not convey useful information and gave no clue about the functionality they represented. Participant 5 said that they left him in “complete confusion.” All participants were lukewarm at best at the idea of being able to click and drag the suggested area.

Interface 2: Sliders and driving distance information:



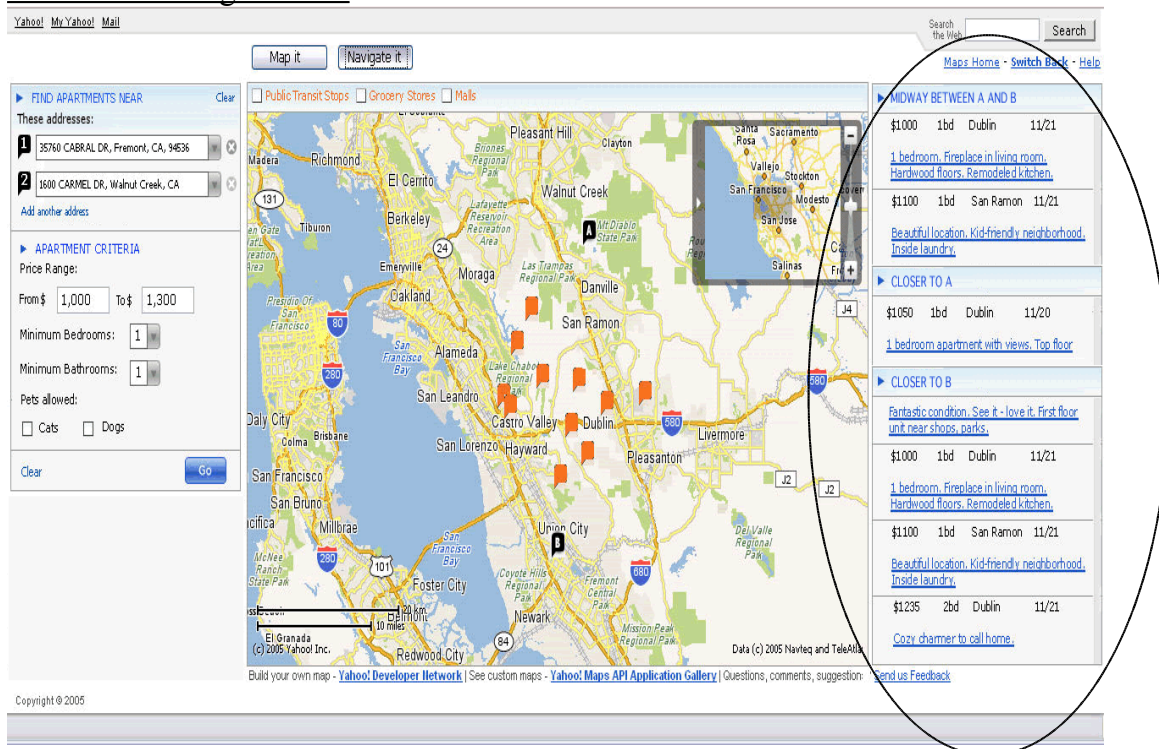
4 out of 5 participants found the slider interface easy to use. 1 participant judged it to be moderate because he felt better labels were needed to designate it as ‘easy’

2 participants were not sure if the sliders were independent of each other. Both believed that they should be.

The availability of additional location specific information was, in general, well received by the participants. All participants like the routing functionality. However, 2 participants mentioned that they would not have known to hover over a market to bring up the routes because the interface provides no clue to the availability of the option. One participant also pointed out that the sliders should be removed from view since they have no connection to distance information.

Participant 5 pointed out that representing different routes with one color is confusing and suggested that different colors are used for routes to different points of interest. All participants liked the numerical distance values.

Interface 3: Categorization



Interface 3 proved to be the most controversial of the three. While all 5 participants found it easy to understand, 2 of the participants found the categories “extremely” useful, 3 others found it completely useless. There was absolutely no middle ground.

Those that found the categories view useful thought it conveyed more information than “suggested area” and was easier to understand. One participant suggested that there should be more categories, perhaps even some that sorts results by price.

Those that found the view useless felt it provided no information that wasn't already conveyed by the “suggested area” view and unlike the “suggested area” view provided no

context for where the boundary for the listings was on the map. Participant 4 also pointed out that the term "Closer" is too subjective to be used for categorizing listings.

General observations, comments and suggestions:

Participants 2 and 3 suggested adding the ability to sort listings by price, number of bedrooms, etc.

Participant 5 suggested that it might be useful to be able to see one route at a time as opposed to all routes being displayed together.

Participant 1 suggested that it would be helpful to be able to click on the name of a city on the map and have that city included in the "suggested area"

Participant 5 thought that apartments at a preset distance outside the "suggested area" should also be displayed. The same participant commented that he really liked the layout of the interface. He felt that barring the lack of adequate labeling, it was very clean and had "the right things in the right places." However, he voiced concern that there might be no room to add any other features should we decide to do so.

On the other hand, Participant 3 pointed out that the right side area of most websites has been surrendered to advertisements, and so he has conditioned himself not to pay attention to that area of the screen. This made it difficult for him to even notice the apartment listings. He suggests placing the listings along the bottom of the interface, under the map.

Plans for Second Prototype

Based on the results of our first usability test, it is too early to say which design we would like to implement for our first interactive prototype. Instead, we need to perform additional tests on these initial designs with more participants to get a better sense of what is or isn't working. However, there are a few things in our prototype that we would like to change or vary for the next round of testing.

For design 1 ("blob" with direct manipulation), we would like to get rid of the modes completely, as our participants found them to be unintuitive. Instead, we would keep a navigation control window for panning and zooming common in most online maps. However, clicking on the map itself would not cause a panning/zooming effect. When a user hovers over the "blob," more cues would be used to indicate that this area could be manipulated, such as a change in color and a change in icon (such as a hand, to indicate that the blob could be dragged). We believe that the main reason why people felt that the sliders were easier to use is simply because there weren't enough cues to indicate that the blob could be changed.

For the design with categories, we would like to test different types of categories when drilling down, such as price ranges.

We also want to be more careful about the way we word things. In order to help the apartment searchers know how to best start the task, we need to draw more attention to the initial form, so the apartment hunter knows right away how to begin finding apartments. Currently, some users of the system may want to begin playing around with the map by clicking on cities, versus entering in points of interest in the form. This doesn't help support the task of finding apartments equidistant to points of interest. One way to get around this is to have a start page, much like Yahoo's driving directions page. Here, we would give them a simple form to get started, helping them enter in points of interest. Once the users are on the main page, then they can enter in more search criteria and alter their query.

Finally, we want to offer the users a way to sort through the apartment listings, by price, location, and number of bedrooms.

Appendix A: Basic demographics of participants

Participant 1:

Undergraduate degree in Computer Science
29 years old, male, single
occupation: software engineer
highly proficient in computers

Participant 2:

Undergrad degree in Microbiology
occupation: financial consultant
highly proficient in computers
28 yr old female, single

Participant 3:

Undergrad degree in Business
29 yr old male, single
occupation: marketing consultant
highly proficient in computers.

Participant 4:

Undergraduate degree in Computer Science and Engineering
Occupation: Advanced degree student
Computer Proficient
25 years old, male

Participant 5:

Undergraduate degree in Psychology
Occupation: Sales representative
Computer proficient
23 years old, male

Appendix B: Description of the tasks given to users

We had a high fidelity, non interactive prototype. We created the following general task list for the participants. Because the tests were purely qualitative in nature, we used the questions as guidelines but allowed the participants to ask questions and do as much exploration as the prototype would allow. We also took particular care to distance ourselves from the interface as much as possible in the eyes of the participant and to encourage them to speak their mind.

Interface 1

1. Enter specifications left hand panel,
2. Enter points of interest.
3. What does the blob convey to you?
4. You do not have a car so how might you want to modify the results you got to accommodate that?
5. How will you find the grocery stores without modifying the suggested area?
6. Modify your search area to be closer to the malls/shops (*already highlighted on map*) but you don't want the computer to do it for you so how would you do it manually?
7. Did you find this task easy/moderate/hard?

Interface 2:

The interface was presented with the search results displayed on the right hand side.

1. What do think the sliders are for?
2. You want to move your search area to point-of-interest A, how would you do that.
3. Did you find this task easy/moderate/hard

Interface 3:

1. Do you find the categories helpful?
2. What do you like about them/ dislike about them.
3. Did you find this task easy/moderate/hard

General/Overall

Suggestions?

What did you like the most?

Dislike the most?