Find Your Dream House

IS 520 FINAL PROJECT

Qinyi Zhao | April 12, 2016

Table of Contents

Executive Summary

Finding your dream house is a stressful and time consuming process. Usually, we brainstorm first. Then start reading websites, newspapers and magazines that have real estate listings, and make comparison. After that, calculate the mortgage payment and make a decision.

The purpose of my project is to simplify this process and save hours of time for users. They can just use an excel file to find their dream house.

Implementation

There are three steps in my projects.

Search Real Estate and Make Decesion

   Step 1: Search Online and Get Housing Information

    Step 2: Calculate the Mortgage Payment

    Step 3: Decision Making: Monte Carlo Stimulation

I created ribbons for each of them and below I will describe and explain it separately.

Step 1: Search Online and Get Housing Information

The first worksheet in the excel file helps users search the real estate information from http://www.realtor.com.
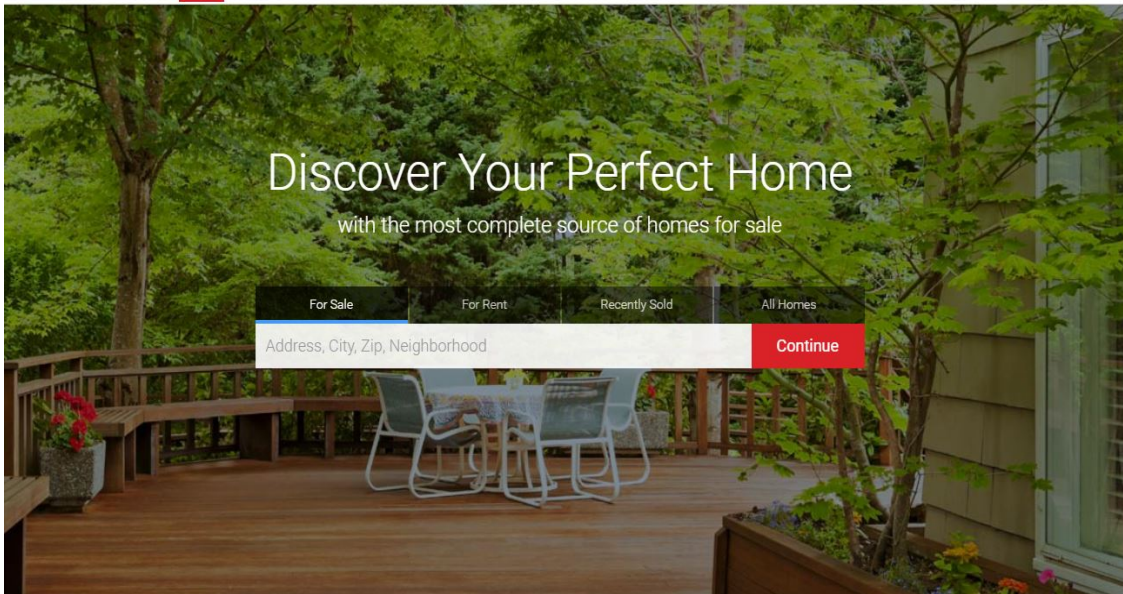
They can enter either the zip code or the name of city when searching housing information. A user form will be popped up, asking the zip code, if they don't know, they could click "I don't know the ZIP", and another user form will be shown to ask the name of city and state.

There is another worksheet called "Cities". In this worksheet, all cities in the United States are listed, about 40,000 in total. The code will validate the city name and the state name that users entered, if the name is wrong, then the procedure will stop. Other than that, it will automatically list all real estates in that area, including the price, address, how many bedrooms and bathrooms, space, lot size, property type and a link to get more information. This process is achieved by automating internet explorer.

Real Estate and Homes for Sale						

Please enter the zip code of the city you want to search:
*If you don't know the zip code, Please enter the name of the city: Provo
and the abbreviate of the state name: UT

Comparison Criteria   Clear

Price		Bedroom	Bathroom	Square Footage	Property Type	

Price	Address	Bedroom	Bathroom	Square Footage	Lot Size	Property Type	More Information
$189,900	933 N University Ave Apt 6, Provo, UT, 84604	3	2	1100	436 sq ft lot	Condo/Townhome/Row Home	http://www.realtor.com/reale
$220,000	952 W 1200 S, Provo, UT, 84601	5	3	2178	9583 sq ft lot	Single Family Home	http://www.realtor.com/reale
$229,000	1057 Windsor Dr, Provo, UT, 84604	0	0	0	1 acres lot	Land	http://www.realtor.com/reale
$265,000	2465 N 820 E, Provo, UT, 84604	5	2	2256	0 acres lot	Single Family Home	http://www.realtor.com/reale
$212,200	1162 S 1410 E, Provo, UT, 84606	3	3	2312	871 sq ft lot	Condo/Townhome/Row Home	http://www.realtor.com/reale
$550,000	319 E 100 N, Provo, UT, 84606	5	6	3644	0 acres lot	Multi-Family Home	http://www.realtor.com/reale
$209,900	153 S 500 W, Provo, UT, 84601	3	1	2664	7841 sq ft lot	Single Family Home	http://www.realtor.com/reale
$290,000	869 W Center St S, Provo, UT, 84601	4	2	2032	0 acres lot	Multi-Family Home	http://www.realtor.com/reale
$650,000	9053 S Meadow Dr E, Sundance, UT, 84604	5	2	3628	0 acres lot	Single Family Home	http://www.realtor.com/reale
$199,900	445 S 1400 E, Provo, UT, 84606	4	1	1394	7841 sq ft lot	Single Family Home	http://www.realtor.com/reale
$185,000	491 W 200 S, Provo, UT, 84601	3	1	1174	5663 sq ft lot	Single Family Home	http://www.realtor.com/reale
$154,900	1117 N 2780 W, Provo, UT, 84601	2	1	1024	871 sq ft lot	Condo/Townhome/Row Home	http://www.realtor.com/reale
$220,000	135 S 1860 W, Provo, UT, 84601	4	2	1675	7405 sq ft lot	Single Family Home	http://www.realtor.com/reale
$199,950	540 S 700 E, Provo, UT, 84606	3	2	1606	6534 sq ft lot	Single Family Home	http://www.realtor.com/reale
$299,000	2086 Park St, Provo, UT, 84606	5	3	2954	0 acres lot	Single Family Home	http://www.realtor.com/reale

Then, if users want to make some comparison between those records, another procedure is available for "Advanced Filter". Just enter the criteria and click the button "Make Comparison". This procedure will filter the records, as shown in the following picture.

Make Comparison

Comparison Criteria

Price		Bedroom	Bathroom	Square Footage	Property Type

	Price	Address		Bedroom	Bathroom	Square Footage	Lot Size	Property Type	More Information
1			Real Estate and Homes for Sale						
2									
3	Please enter the zip code of the city you want to search:								
4	*If you don't know the zip code, Please enter the name of the city:		Provo						
5	and the abbreviate of the state name:		UT						
6									
7	Comparison Criteria								Clear
8	Price			Bedroom	Bathroom	Square Footage	Property Type		
9	<500000			>3	>2		Single Family Home		
10									
11									
12	Price	Address		Bedroom	Bathroom	Square Footage	Lot Size	Property Type	More Information
14	$220,000	952 W 1200 S, Provo, UT, 84601		5	3	2178	9583 sq ft lot	Single Family Home	http://www.realtor.com/reales
27	$299,000	2086 Park St, Provo, UT, 84606		5	3	2954	0 acres lot	Single Family Home	http://www.realtor.com/reales
36	$249,900	474 W 470 S, Provo, UT, 84601		5	3	2376	1742 sq ft lot	Single Family Home	http://www.realtor.com/reales
38	$309,000	1519 S 620 W, Provo, UT, 84601		6	3	2727	0 acres lot	Single Family Home	http://www.realtor.com/reales
48	$279,800	2324 S Dakota Ave, Provo, UT, 84606		4	3	2699	7841 sq ft lot	Single Family Home	http://www.realtor.com/reales
51	$379,900	1742 N 2000 W, Provo, UT, 84604		6	3	3475	8712 sq ft lot	Single Family Home	http://www.realtor.com/reales
59	$409,900	1145 W 1140 N, Provo, UT, 84604		6	5	5632	0 acres lot	Single Family Home	http://www.realtor.com/reales
61	$440,000	4376 N Churchill Dr E, Provo, UT, 84604		5	4	4306	0 acres lot	Single Family Home	http://www.realtor.com/reales
75	$245,000	344 E 100 S, Provo, UT, 84606		5	3	2022	8712 sq ft lot	Single Family Home	http://www.realtor.com/reales
80	$359,900	560 E Stadium Dr, Provo, UT, 84604		6	4	2754	9148 sq ft lot	Single Family Home	http://www.realtor.com/reales
85	$280,000	1028 W 1100 N, Provo, UT, 84604		4	3	2335	9148 sq ft lot	Single Family Home	http://www.realtor.com/reales
95	$289,900	2371 S Dakota Ave E, Provo, UT, 84604		4	3	2973	8276 sq ft lot	Single Family Home	http://www.realtor.com/reales

After that, users could click the ribbon "Highlight" to highlight the records they are interested in, if not, they could click the button "Clear" to clean the table.

Price	Address	Bedroom	Bathroom	Square Footage	Lot Size	Property Type	More Information
	Real Estate and Homes for Sale						
Please enter the zip code of the city you want to search:	84604						
*If you don't know the zip code, Please enter the name of the city:							
and the abbreviate of the state name:							
Comparison Criteria							Clear
Price		Bedroom	Bathroom	Square Footage	Property Type		
Price	Address	Bedroom	Bathroom	Square Footage	Lot Size	Property Type	More Information
$189,900	933 N University Ave Apt 6, Provo, UT, 84604	3	2	1100	436 sq ft lot	Condo/Townhome/Row Home,	http://www.realtor.com/reales
$229,000	1057 Windsor Dr, Provo, UT, 84604	0	0	0	1 acres lot	Land	http://www.realtor.com/reales
$265,000	2465 N 820 E, Provo, UT, 84604	5	2	2256	0 acres lot	Single Family Home	http://www.realtor.com/reales
$650,000	9053 S Meadow Dr E, Sundance, UT, 84604	5	2	3628	0 acres lot	Single Family Home	http://www.realtor.com/reales
$198,900	1145 N 1880 W, Provo, UT, 84604	3	2	2084	871 sq ft lot	Condo/Townhome/Row Home,	http://www.realtor.com/reales
$174,500	901 W 2370 N, Provo, UT, 84604	2	1	990	0 acres lot	Single Family Home	http://www.realtor.com/reales
$200,000	188 E 4635 N, Provo, UT, 84604	3	3	2088	436 sq ft lot	Condo/Townhome/Row Home,	http://www.realtor.com/reales

Step 2: Calculate the Mortgage Payment

The second worksheet in the excel file helps users calculate the mortgage payment. When they click the ribbon "Loan and Interest". A user form will be

shown to require some information, such as annual interest rate, number of years, payments per year, loan amount and type of the payment.

A reference table of the interest rate is at the top of the worksheet. Since there are so many banks, and each of them has a different annual percentage rate, there is no standard. So users need to type in the annual interest rate, based on their credit score and the bank they want to choose. For number of years, usually, people will choose 10 years fixed mortgage, 15 years, or 30 years.

After entering all those information, the table below will displays how much interest and principal they need to pay in each period. And also the total interest and total mortgage payment, as shown in the following picture.

						Loan Amortization				

Annual Percentage Rate				Interest Rate (in decimal form)	3.37%	
(Reference Only)				Number of Years	15	
10 year fixed mortgage	3.304%			Payments Per Year	12	
15 year fixed mortgage	3.374%			Price	$500,000	Clear
20 year fixed mortgage	3.723%			Loan (Financed Amount)	$390,000	
30 year fixed mortgage	3.946%			Type (Begin=1, End=0)	0	

Year	Period	Payment	Interest	Principal	End of Period Balance	Total Interest	Total Mortage Payment
0	0	$0.00	$0.00	$0.00	$390,000.00	$107,515.09	$497,515.09
1	1	$2,763.97	$1,096.55	$1,667.42	$388,332.58		
1	2	$2,763.97	$1,091.86	$1,672.11	$386,660.47		
1	3	$2,763.97	$1,087.16	$1,676.81	$384,983.66		
1	4	$2,763.97	$1,082.45	$1,681.53	$383,302.13		
1	5	$2,763.97	$1,077.72	$1,686.26	$381,615.87		
1	6	$2,763.97	$1,072.98	$1,691.00	$379,924.87		
1	7	$2,763.97	$1,068.22	$1,695.75	$378,229.12		
1	8	$2,763.97	$1,063.45	$1,700.52	$376,528.60		
1	9	$2,763.97	$1,058.67	$1,705.30	$374,823.30		
1	10	$2,763.97	$1,053.88	$1,710.09	$373,113.21		
1	11	$2,763.97	$1,049.07	$1,714.90	$371,398.31		
1	12	$2,763.97	$1,044.25	$1,719.72	$369,678.59		
2	13	$2,763.97	$1,039.41	$1,724.56	$367,954.03		
2	14	$2,763.97	$1,034.56	$1,729.41	$366,224.62		
2	15	$2,763.97	$1,029.70	$1,734.27	$364,490.35		
2	16	$2,763.97	$1,024.83	$1,739.15	$362,751.20		
2	17	$2,763.97	$1,019.94	$1,744.04	$361,007.16		
2	18	$2,763.97	$1,015.03	$1,748.94	$359,258.22		
2	19	$2,763.97	$1,010.11	$1,753.86	$357,504.36		
2	20	$2,763.97	$1,005.18	$1,758.79	$355,745.57		
2	21	$2,763.97	$1,000.24	$1,763.74	$353,981.83		
2	22	$2,763.97	$995.28	$1,768.69	$352,213.14		
2	23	$2,763.97	$990.31	$1,773.67	$350,439.47		

Step 3: Decision Making: Monte Carlo Stimulation

The final step is to make a right choice. In real world, we compare price, place, space and some other features of the house. We will ask our spouse, our parents and our child as well. In order to simplify this procedure, I created a worksheet called "Decision Making".

Users need to give points to each house, based on some criteria. For example, I feel the price for house 1 is more affordable than house 2. Then, I will give 10 points to house 1 and 4 points for house 2. Cells have a light blue background needs to be filled in before they start the procedure.

Decision Making

Comparison Criteria

(Fill in the cells that have a light blue background, and don't change those in white.)

Clear

You	House 1	House 2	House 3
Price	10	4	6
Place	4	8	7
Space	6	6	7
Other Criteria	7	6	6

Pairwise Process	Price	Place	Space	Other Criteria	
Price	50	70	60	35	*Based on 100 ponits, for example, if you
Place	30	50	70	30	think place is more important than price, you could put 80 in (place, price); if not, you could
Space	40	30	50	70	put 30 in (place,price); If you think they are
Other Criteria	65	70	30	50	the same, enter 50.

Spouse	House 1	House 2	House 3
Price	8	3	4
Place	5	9	5
Space	5	8	8
Other Criteria	8	4	4

Pairwise Process (Ratios)	Price	Place	Space	Other Criteria
Price	1.00	2.33	1.50	0.54
Place	0.43	1.00	2.33	0.43
Space	0.67	0.43	1.00	2.33
Other Criteria	1.86	2.33	0.43	1.00
Totals	3.95	6.10	5.26	4.30

Father	House 1	House 2	House 3
Price	10	6	7
Place	5	4	6
Space	5	5	7
Other Criteria	5	7	6

Norming (Percentiles)	Price	Place	Space	Other Criteria	Average	StDev
Price	0.25	0.59	0.38	0.14	34.0%	19.4%
Place	0.11	0.25	0.59	0.11	26.5%	22.7%
Space	0.17	0.11	0.25	0.59	28.0%	21.5%
Other Criteria	0.47	0.59	0.11	0.25	35.5%	21.6%

After clicking the "Make Decision" ribbon, tables in grey will be filled in automatically, and a Monte Carlo Stimulation will take place in the Column O to Column R for 50 times. The house that has the highest number of wins will be the best choice based on the stimulation.

Decision Making

Comparison Criteria

(Fill in the cells that have a light blue background, and don't change those in white.)

Best Result

Based on Monte Carlo Stimulation, House 1 is the best choice.

OK

Average Ratings	House 1	House 2	House 3
Price	5.3	4.3	5.0
Place	6.0	4.0	4.7
Space	5.7	6.0	5.3
Other Criteria	6.7	4.0	5.0
Sum	23.67	18.33	20.00

Standard Deviation	House 1	House 2	House 3
Price	0.6	0.6	4.0
Place	2.0	1.0	3.8
Space	1.5	2.6	2.3
Other Criteria	0.6	2.6	2.6

NormInverse	House 1	House 2	House 3	Standardized Avg.	Random Avg.
Price	5.20	3.83	-1.18	46.52%	89.9%
Place	11.42	2.86	3.20	38.50%	74.4%
Space	6.81	7.68	1.78	18.77%	36.3%
Other Criteria	6.61	4.75	5.30	-3.80%	-7.3%
Wgt. Total	7.84	4.15	0.82	100.00%	193.29%
Pct of Best	100.00%	52.87%	10.44%		
Max=	7.84	House 1			

In this example, house 1 is the best choice for user.

Those three steps save hours of time for us in searching, comparing and making decision.

Conceptual Difficulties

Problem 1: Different Format in the Website Source

I encountered with many problems when doing this project, the hardest one is in automating internet explorer. For our homework, we did a project about the Chicago food. But the code of each record in that website has the same format. However, when I did this project, the format are different at http://www.realtor.com. For example, the price of the real estate may reduce because of seasonality. Then, three lines of code will be adding inside, as shown in the following picture.

```
<span class="srp-item-price-reduce" itemprop="price">
  <i class="ra ra-arrow-down color-green"></i>
</span>
```

What's more, some records don't have information about the bedrooms and bathrooms, or have "3+" bedrooms. If I use string type, then another problem

would come that I cannot make comparison, and "Make Comparison" ribbon would not work.

In order to solve this problem, I created two agents, getting a piece information in the first agent and using the other agent to cut down the information. Then many if statements applied in this agent to solve the missing value problem. If the record has "3+" bedrooms, just keep 3 in the table.

Problem 2: Validate the Name of the City and State

As I mentioned before, users could enter the name of city and state to search for the real estate. However, validating the name is hard. I downloaded the city information from a website by each state. As for an international student, it is surprised to know that there are so many cities in the United States, about 38,000 in total.

When comparing strings, I am not familiar with the "StrComp" statement, and I am not sure whether the output is True/False, or 0/1. Therefore, at the beginning, my code didn't work well when users enter city name and state name.

Problem 3: Link to the Websites

At the beginning, I planned to insert the pictures for each real estate. I successfully wrote the code and input those pictures. Then I realized that if I don't put the links, then users couldn't see more information. But when users open the links, the pictures just located in the middle of the websites. For this reason, pictures are redundant. Therefore, I deleted pictures in the table.

But another problem appeared, although the data type of "More Information" is string, and it contains the address of the websites, it doesn't link to that page automatically. I tried recording macros, but seems it didn't work. Finally, I found if I use "Format Painter", the address is hyperlinked to the websites.

Problem 4: Web Query and Formula Problem in Loan Amortization

In the "Loan Amortization" worksheet, there are many formulas applied to calculate the interest and principal. At first, I used a wrong formula, and I haven't realized. Then I found I have many negative number in "End of Balance", which doesn't make sense. I checked it twice, and eventually figured out the problem.

In this worksheet, I also planned to do a web query to get the annual percentage rate. But those information are protected in many websites, and since each bank has a different mortgage rate, I decided to give up this idea and just left a reference table at the top.

Problem 5: Hard to Clean the Tables Because of Formulas

In the "Decision Making" sheet, there are many tables, and most of the tables include formulas. Therefore, if I just use "ClearContents" statement, then all those formulas would be gone. Since I only wrote code for Monte Carlo Stimulation but not for those tables, I need to keep all formulas. After struggling for a while, I realized I could change the font color to solve this problem.

Those five problems are the main difficulties I met when doing this project.

Assistance

I searched many statements, such as "Instr", "StrComp", and "Clng" on Google, but I did this project entirely by myself.

Learning

This semester is the first time for me to learn about the programming. As for a beginner, it is hard to grasp all the concepts. I met with many problems in our homework and didn't know which statements should be used.

When I learned "Automating Internet Explorer", there were errors again and again. Even if I wrote the same code as Ar. Allen, that code didn't work for me. In the "Chicago food" homework, I dimmed more than 25 variables in order to get it worked. In "Big Boggle" project, I spent three hours just to figure out how to randomize the location of each grid. I had thinking about dropping this class since it is too hard for a beginner, but eventually I decided not to give up in the half way.

But now, I have successfully did my final project. It looks professional and works just as I had expected. Although there are things that could be improved, such as don't let users to delete rows or change the name of worksheet etc. I still feel very proud of myself. I hope it works efficiently to help users in finding their dream house.