TaxStats App

COP 5859 - Semantic Web Programming
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Abstract

Property tax information is published annually for each municipality/county in the United States. However, accessing this information can be challenging for some individuals, especially those who are less technically savvy. Therefore, we introduce TaxStats, an application that provides users with the ability to research real property tax information using a simple, user-friendly interface. This application/research tool provides users with statistical analyses of county tax information—to understand the averages, trends, and assessed/market values of real property for any given region. There are many applications for this program for various users, and there are endless opportunities for the future development of this application, including an interactive and color-coded TaxStats map.

Background

TaxStats is a research tool that provides users with the ability to conduct brief statistical analyses of county tax information—to understand the averages, trends, and assessed/market values of real property. There are many benefits/uses for this application. Real estate professionals can use this application as a tool for convincing buyers to purchase/not purchase in a particular area based on the tax statistics provided. Prospective and current homeowners can use this application to conduct their own research or due diligence when searching for an area to live. In addition, government officials can use this data for analytical purposes and for building reports.

In this paper, we discuss the (1) methods, (2) output/ results, (3) challenges, and (4) future development of TaxStats.

Methods

This section discusses the database used, tools/ languages required, initial configuration, and execution of this application.

Database

Obtaining tax information for any specific municipality requires users to access its respective county property appraiser database. This application uses Essex County, NY tax information for its initial release and testing, which can be assessed using the Essex County Treasurer's Office's tax query form. This form can be assessed using the following link:

http://www.co.essex.ny.us/Treasurer/FileCreate.aspx

To recreate the data set used in this application and described in this paper, the following steps must be taken:

1. In step 1, select the following fields: (a) Address, (b) Assessment, (c) Town, (d) Amount Due, (e) Tax Year, and (f) Acct Nbr
2. In step 2 , leave all drop down boxes as the default "No Selection"
3. In step 3, select "ALL TOWNS"
4. In step 4, select the following fields: (a) 2014 and (b) 2015
5. In step 6, click "CREATE FILE" to generate a download link on the top of the page
6. A "DOWNLOAD" button should appear next to the "CREATE FILE" button selected in the previous step. Click the "DOWNLOAD" button to begin downloading a CSV file/ the tax dataset

The completed form should appear as shown in **Figure 1** in the appendix. The CSV data set should appear as shown in **Figure 2**, with the exception of the first row column headings (which must be added to recreate the program).

Tools & Languages

The tools required for recreating this application are as follows:

1. Protégé: to create a semantic web programming ontology
2. Jena Reasoner: to reason with future datasets
3. Java SE Development Kit 7: as the programming/scripting language
4. Geonames API/ Web Client for Java: to access Geonames' database
5. Eclipse IDE: to develop/write the program

The code, ontology, dataset, etc. used in this Java program can be found in the GitHub repository link section of the appendix.

Initial Configuration

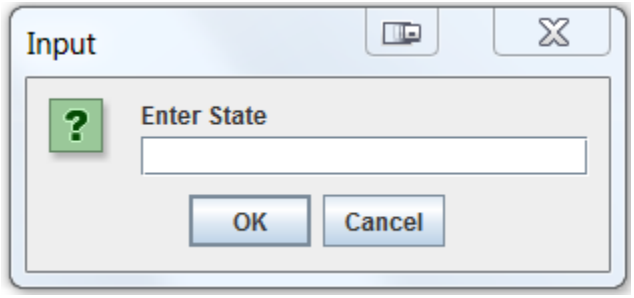
To execute/run this application the user must take the following steps for Eclipse IDE

1. Enable Geonames web services using their Geonames account
2. Download the following .jar files:
   (a) GeoNames .jar file
   <http://www.geonames.org/source-code/geonames-source-1.1.12.jar>
   (b) JDOM .jar file
   <http://www.geonames.org/source-code/jdom-1.0.jar>
3. Add the .jar files to the build path of the project
4. Enter Geonames username into line 32 of the driver.java file

Execution

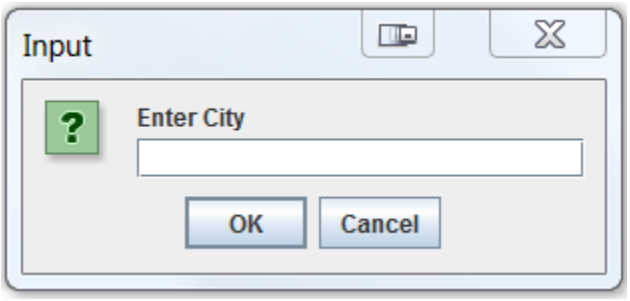
During the execution of this program the user is presented with two pop-up boxes that require input.

The first input box (shown below) prompts the user to enter a state. Note that this program is only written to produce results for the Essex_County_Dataset.csv dataset. Thus, the user is required to input "New York," as this is the only state that will currently work for this application.



State Input Box

The second input box (shown below) prompts the user to enter a city. The user must enter one of the Essex County dataset cities (e.g. Chesterfield, Crown Point, Elizabethtown, Essex, Kenne, Lewis, etc.).



City Input Box

Based on the state and city provided, a pop-up box will appear with the output/results.

Output/ Results

This application produces several key statistics based on the user's state and city inputs. The output appears in the form of pop-up box. The key statistical information/tax properties provided in the output box are:

1. City coordinates (latitude and longitude)
2. Average taxes due for 2014 and 2015
3. Average assessed value for 2014 and 2015
4. Average tax as a percent of assessed value for 2014 and 2015
5. Percent change between 2014 and 2015 for average taxes due and average assessed value.

A sample output for Chesterfield, NY can be seen below, and other sample output can be seen in **Figure 3** in the appendix. Each year this data can be updated and produce an output that provides the current and previous year's tax data for the given municipality.

CHESTERFIELD, NEW YORK Coordinates: 44.74478, -74.66657

TAX PROPERTIES

	2014	2015	% Change (2014-2015)
Average Taxes Due	$ 2231.76	$ 2114.953	-5.234 %
Average Assessed Value	$ 73833.861	$ 83859.46	13.579 %
Average Tax as a % of Assessed Value	3.023 %	2.522 %	-0.501 %

Sample Output (Chesterfield, NY)

Challenges

There are several key challenges that must be overcome in order to further develop this application in other counties and states.

In general, obtaining the required datasets for this application can be quite challenging and cumbersome. The property tax information for some counties vary in format, accessibility, and/or may be incomplete for the purposes of this application. Some counties do not publish complete tax information for each parcel of land in its tax roll datasets. For example, many counties, such as Broward County, FL do not provide the tax amount for each parcel of land in its downloadable data files; instead, users must look up this information one parcel at a time using whichever search tool is provided. In addition, some counties only publish the data one format (e.g. CSV), while other counties use a variety of formats (e.g. RDF or XML formats).

Hence, Essex County's tax roll database was chosen to begin the development of this application because it provides users with the ability to customize the data to include in the CSV file for download. Other counties simple provide a download with no customization options, while other counties require the user to purchase tax datasets—this variation makes further development quite challenging.

Future Development

Ideally, our team foresees this application being further developed to include more granular statistics using both Geonames and datasets from other databases. For example, data at the postal code level can be provided, where a user enters a postal code to search instead of a state and city. In addition, using this database we can add features such as distribution of land use; highest, average, and lowest property tax for each type of land use; list of historical properties, percent of out of state owners per city, etc.

Using the Geonames' longitude, latitude, and elevation data, this application can eventually be displayed on an interactive map of the United States. This map can allow users to zoom in to each state, county, city, and zip code. Each region can be color-coded to depict the distribution (highest and lowest) property taxes. Therefore, instead of a pop-up output box (as this application currently produces) the user will have a better understanding of the data provided from a visual perspective.

In addition, using the ontology/ taxonomy created with Protégé (**Figure 4**), coupled with a reasoner (e.g. Jena), this application can be used to extract similar properties from other tax databases. Our goal is to have this application provide the same or more granular statistics for each municipality nationwide.

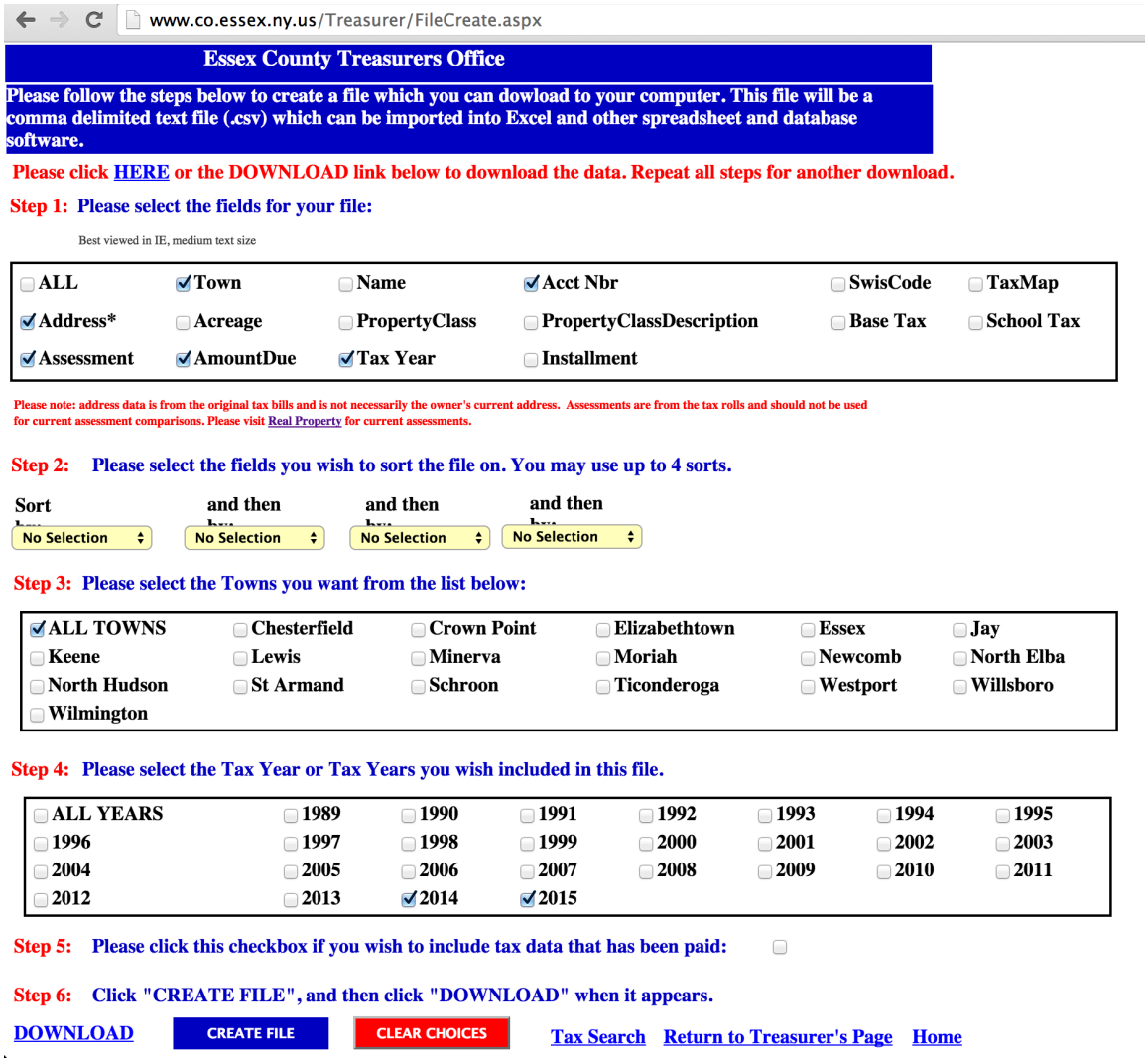
Conclusion

In conclusion, our team believes this application will provide a solution to the cumbersome task of researching tax information for each municipality. In addition, some of the statistics provided by TaxStats are not provided in any other user-friendly application. Therefore, this application will be useful to several different user groups,

including real estate professionals, government officials, prospective/current homeowners, etc. In addition, with the opportunities for future development, this application can be incorporated into the websites of each municipality or used on a national level as a research tool for those who subscribe.

Appendix

Figure 1: Completed Tax Query Form



www.co.essex.ny.us/Treasurer/FileCreate.aspx

Essex County Treasurers Office

Please follow the steps below to create a file which you can dowload to your computer. This file will be a comma delimited text file (.csv) which can be imported into Excel and other spreadsheet and database software.

Please click HERE or the DOWNLOAD link below to download the data. Repeat all steps for another download.

Step 1: Please select the fields for your file:

Best viewed in IE, medium text size

☐ ALL	☑ Town	☐ Name	☑ Acct Nbr	☐ SwisCode	☐ TaxMap
☑ Address*	☐ Acreage	☐ PropertyClass	☐ PropertyClassDescription	☐ Base Tax	☐ School Tax
☑ Assessment	☑ AmountDue	☑ Tax Year	☐ Installment		

Please note: address data is from the original tax bills and is not necessarily the owner's current address. Assessments are from the tax rolls and should not be used for current assessment comparisons. Please visit Real Property for current assessments.

Step 2: Please select the fields you wish to sort the file on. You may use up to 4 sorts.

Sort	and then	and then	and then
No Selection	No Selection	No Selection	No Selection

Step 3: Please select the Towns you want from the list below:

☑ ALL TOWNS	☐ Chesterfield	☐ Crown Point	☐ Elizabethtown	☐ Essex	☐ Jay
☐ Keene	☐ Lewis	☐ Minerva	☐ Moriah	☐ Newcomb	☐ North Elba
☐ North Hudson	☐ St Armand	☐ Schroon	☐ Ticonderoga	☐ Westport	☐ Willsboro
☐ Wilmington					

Step 4: Please select the Tax Year or Tax Years you wish included in this file.

☐ ALL YEARS	☐ 1989	☐ 1990	☐ 1991	☐ 1992	☐ 1993	☐ 1994	☐ 1995
☐ 1996	☐ 1997	☐ 1998	☐ 1999	☐ 2000	☐ 2001	☐ 2002	☐ 2003
☐ 2004	☐ 2005	☐ 2006	☐ 2007	☐ 2008	☐ 2009	☐ 2010	☐ 2011
☐ 2012	☐ 2013	☑ 2014	☑ 2015				

Step 5: Please click this checkbox if you wish to include tax data that has been paid: ☐

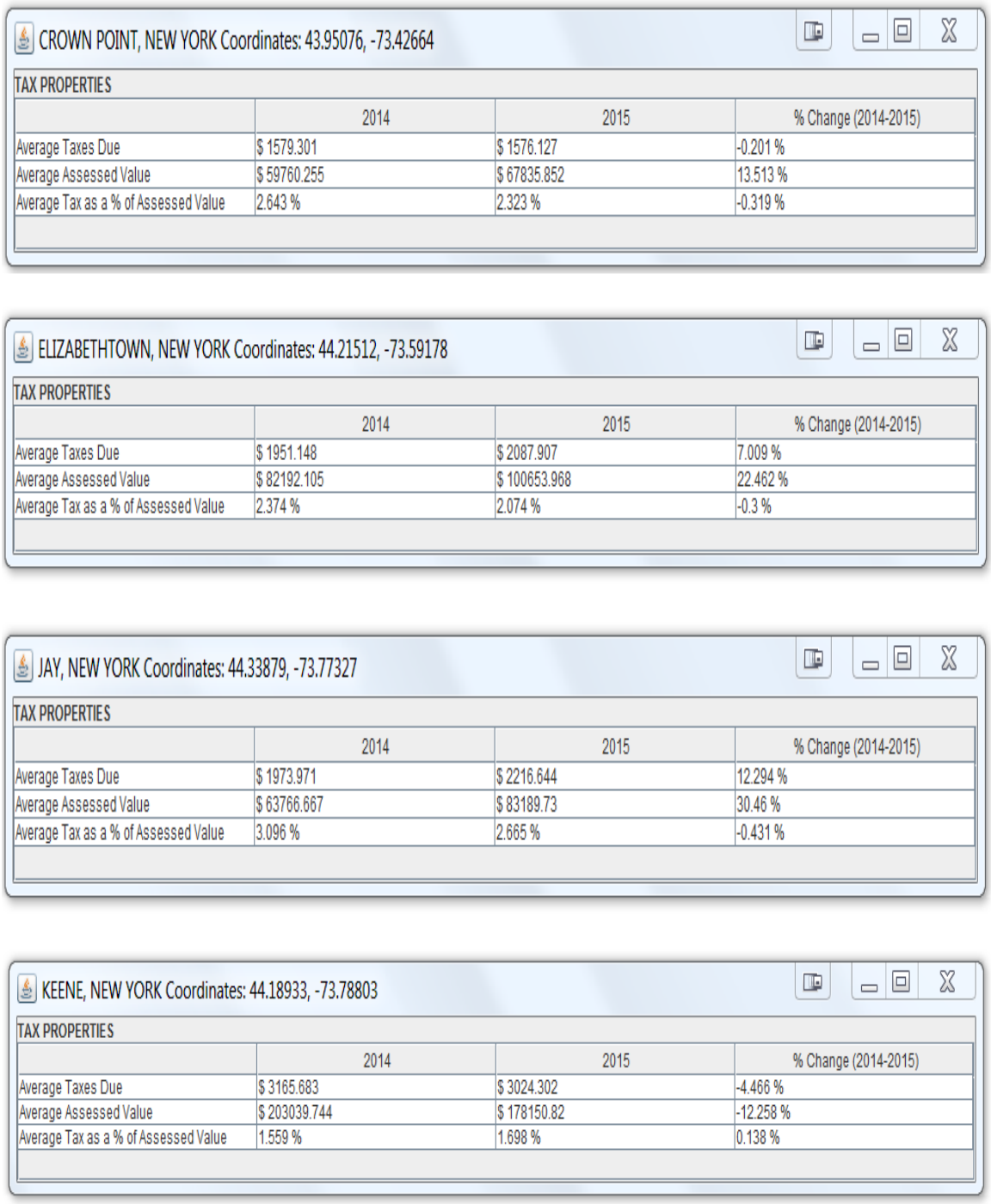
Step 6: Click "CREATE FILE", and then click "DOWNLOAD" when it appears.

DOWNLOAD | CREATE FILE | CLEAR CHOICES | Tax Search | Return to Treasurer's Page | Home

Figure 2: CSV Dataset

	A	B	C	D	E	F	G	H	I	J	K
1	Town	Parcel ID	Owner Addre	Owner Addre	Owner Address_3			Assessed Val	Taxes	Tax Year	
2	CHESTERFIEL	571A101409	PO Box 735	Plattsburgh	NY 12901			121600	398.78	2015	
3	CHESTERFIEL	571A184016	1131 Coney I	Brooklyn	NY 11230			22000	442.62	2015	
4	CHESTERFIEL	571A187007	122 Chazy La	Saranac	NY 12981			90600	2258.43	2015	
5	CHESTERFIEL	575J178524	1459 Rte 9	Keeseville	NY 12944			22300	291.11	2015	
6	CHESTERFIEL	575J102709	7 Scott Ln	Keeseville	NY 12944			122500	3694.42	2014	
7	CHESTERFIEL	575J102709	7 Scott Ln	Keeseville	NY 12944			159800	4457.18	2015	
8	CHESTERFIEL	575L107014	Beardsley Mi	PO Box 56R	Port Kent	NY 12975		57000	2013.18	2015	
9	CHESTERFIEL	575J193010	Bennage Rob	2565 Oak St	Kissimmee	FL 34744		13800	475.68	2014	
10	CHESTERFIEL	575J109204	7 Kessel Park	Keeseville	NY 12944			320800	1065.26	2015	
11	CHESTERFIEL	575J106907	1778 Springf	New Providence	NJ 07974			79200	2874.11	2014	
12	CHESTERFIEL	575J175033	23 Clark Rd	PO Box 153	Keeseville	NY 12944		46800	970.39	2014	
13	CHESTERFIEL	575J175033	23 Clark Rd	PO Box 153	Keeseville	NY 12944		49600	981.87	2015	
14	CHESTERFIEL	575J18118	374 Dugway	Keeseville	NY 12944			178900	2808.25	2014	
15	CHESTERFIEL	575J179012	801 Mace Ch	Keeseville	NY 12944			71600	2250.06	2015	
16	CHESTERFIEL	571A179017	PO Box 74	Keeseville	NY 12944			19000	631.51	2015	
17	CHESTERFIEL	575J104606	Bozek Edwar	415 Green St	Ausable Forks	NY 12912		82300	1982.76	2015	
18	CHESTERFIEL	571A102015	15 Church St	Keeseville	NY 12944			60700	1800.81	2015	
19	CHESTERFIEL	571A100605	PO Box 92	Keeseville	NY 12944			112000	3875.21	2015	
20	CHESTERFIEL	575J108012	Burrell Roser	PO Box 26	Keeseville	NY 12944		20600	647.36	2015	
21	CHESTERFIEL	575J106809	Carnwath Ro	196 Route 9N	Keeseville	NY 12944		119100	3139.2	2015	
22	CHESTERFIEL	575J106810	Carnwath Ro	196 Route 9N	Keeseville	NY 12944		1000	31.43	2015	
23	CHESTERFIEL	571A100606	196 Route 9N	Keeseville	NY 12944			42800	1422.55	2015	
24	CHESTERFIEL	575J106415	1045 Trout P	Keeseville	NY 12944			136400	3762.37	2014	
25	CHESTERFIEL	575J106415	1045 Trout P	Keeseville	NY 12944			163100	3900.97	2015	
26	CHESTERFIEL	575J178565	Castaldo Ann	845 Monroe	Monroe	CT 06468		900	6.47	2015	
27	CHESTERFIEL	571C102303	Christian Rita	31 River St	Keeseville	NY 12944		15700	205.96	2015	
28	CHESTERFIEL	571A101915	94 Chesterfie	Keeseville	NY 12944			59800	1037.99	2015	
29	CHESTERFIEL	575J106311	Clark Holly A	360 Soper Rc	Keeseville	NY 12944		103800	2901.53	2014	
30	CHESTERFIEL	575J106311	Clark Holly A	360 Soper Rc	Keeseville	NY 12944		152000	4173.1	2015	
31	CHESTERFIEL	571A100908	14 Clinton St	Keeseville	NY 12944			48300	250.43	2015	
32	CHESTERFIEL	575J180028	169 Ausable	Keeseville	NY 12944			40700	1279.02	2015	
33	CHESTERFIEL	575Z002002	Crescenzo Tu	80 McKinley	Massapequa	NY 11762		226900	7939.84	2014	
34	CHESTERFIEL	575Z002002	Crescenzo Tu	80 McKinley	Massapequa	NY 11762		164100	5245.38	2015	
35	CHESTERFIEL	575Z013005	Sitts Marilyn	PO Box 214	Port Kent	NY 12975		9600	272.5	2014	
36	CHESTERFIEL	571A102215	1 Hamilton L	Keeseville	NY 12944			2000	86.41	2014	
37	CHESTERFIEL	571A191016	1 Hamilton L	Keeseville	NY 12944			30900	1316.83	2014	
38	CHESTERFIEL	571A191016	1 Hamilton L	Keeseville	NY 12944			17700	796.93	2015	
39	CHESTERFIEL	571A102215	1 Hamilton L	Keeseville	NY 12944			400	26.78	2015	
40	CHESTERFIEL	575J109002	2313 Route 2	Essex	NY 12936			19800	223.89	2015	
41	CHESTERFIEL	575J183003	PO Box 1540	Plattsburgh	NY 12901			3348	37.85	2015	
42	CHESTERFIEL	575J105902	c/o Garry L D	647 Shunpike	Keeseville	NY 12944		27800	314.34	2015	
43	CHESTERFIEL	575J178112	3672 Lake Sh	Peru	NY 12972			221000	6945	2015	
44	CHESTERFIEL	571A183013	136 Pleasant	Keeseville	NY 12944			66300	2203.59	2015	
45	CHESTERFIEL	571A189001	6247 Main St	Westport	NY 12993			31800	1355.13	2014	
46	CHESTERFIEL	571A189001	6247 Main St	Westport	NY 12993			21200	919.35	2015	

Figure 3: Sample Output



CROWN POINT, NEW YORK Coordinates: 43.95076, -73.42664

TAX PROPERTIES

	2014	2015	% Change (2014-2015)
Average Taxes Due	$ 1579.301	$ 1576.127	-0.201 %
Average Assessed Value	$ 59760.255	$ 67835.852	13.513 %
Average Tax as a % of Assessed Value	2.643 %	2.323 %	-0.319 %

ELIZABETHTOWN, NEW YORK Coordinates: 44.21512, -73.59178

TAX PROPERTIES

	2014	2015	% Change (2014-2015)
Average Taxes Due	$ 1951.148	$ 2087.907	7.009 %
Average Assessed Value	$ 82192.105	$ 100653.968	22.462 %
Average Tax as a % of Assessed Value	2.374 %	2.074 %	-0.3 %

JAY, NEW YORK Coordinates: 44.33879, -73.77327

TAX PROPERTIES

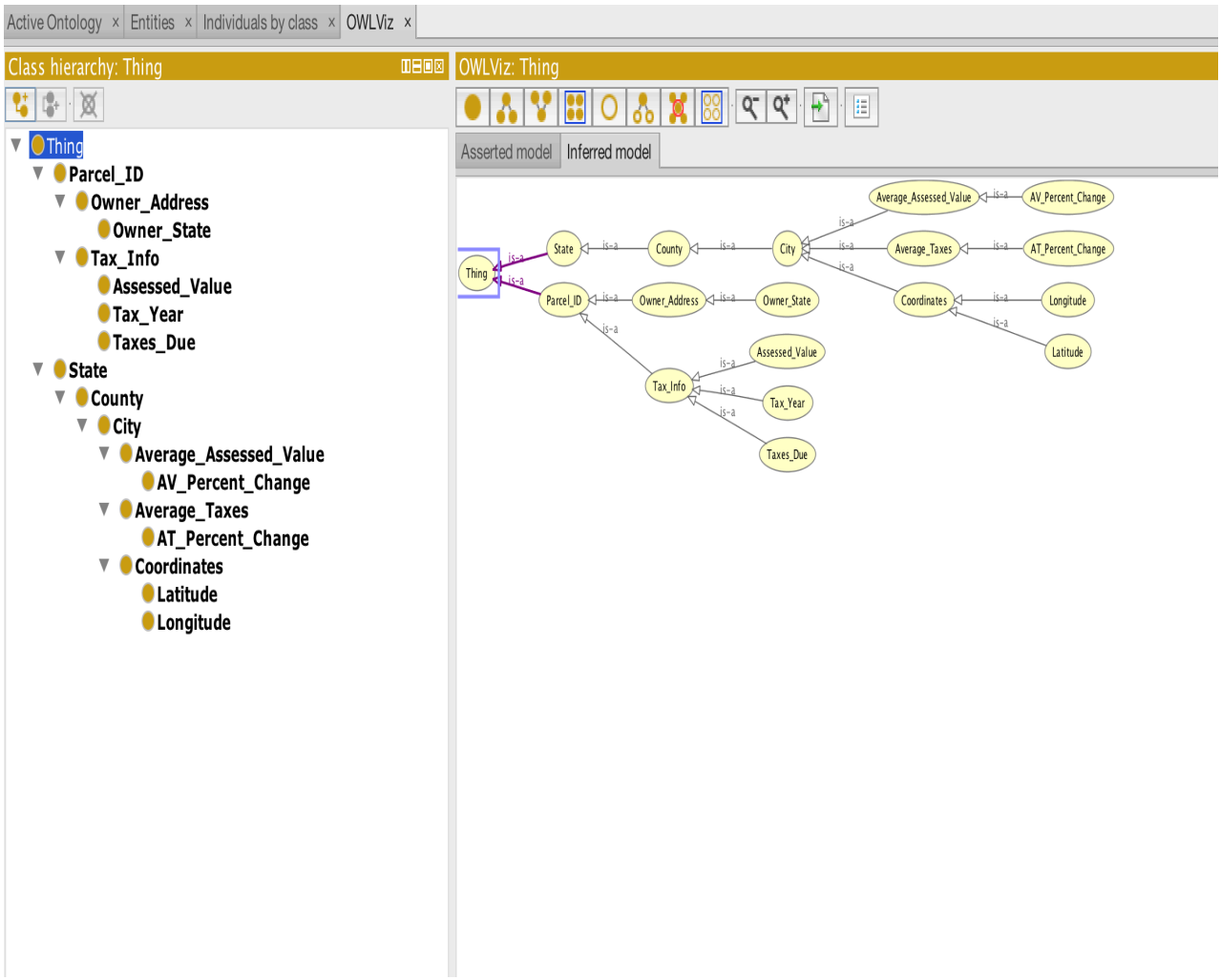
	2014	2015	% Change (2014-2015)
Average Taxes Due	$ 1973.971	$ 2216.644	12.294 %
Average Assessed Value	$ 63766.667	$ 83189.73	30.46 %
Average Tax as a % of Assessed Value	3.096 %	2.665 %	-0.431 %

KEENE, NEW YORK Coordinates: 44.18933, -73.78803

TAX PROPERTIES

	2014	2015	% Change (2014-2015)
Average Taxes Due	$ 3165.683	$ 3024.302	-4.466 %
Average Assessed Value	$ 203039.744	$ 178150.82	-12.258 %
Average Tax as a % of Assessed Value	1.559 %	1.698 %	0.138 %

Figure 4: Ontology/Taxonomy/Class Hierarchy using Protégé



GitHub Repository Link

https://github.com/Semantic-Web/Matthew-S/tree/master/Final%20Project