Iteration VII: Transition: Final Project Report

1. Inception: Team Identification

   Team Name: ConCensus

   Team Members:

Name	Contact Info
Sarem Shalforoosh	shalfos1@tcnj.edu
Calvin Kim	kimc16@tcnj.edu
Lisa Walker	walkel10@tcnj.edu
Danielle Pernice	pernicd1@tcnj.edu
Russell VanCleve	vancler1@tcnj.edu
Teeghen Haer	haert1@tcnj.edu

2. Inception: Objectives and Overview

The existing databases are universally difficult to read and understand. Municipalities often use demographic data to make legislative decisions and it is understood that municipalities are using the standard databases to access demographic data. The rising concern then, would be the level of comprehension each decision maker has about the data when creating new legislation. If there is confusion among the decision makers about the data of interest, then the appropriateness of the legislation could be compromised. The data configurations presented on the standard databases are crowded and unclear making it difficult to analyze trends and suggest ideas based on them.

We planned to make a census database web application that will provide users with a new perspective of the data collected. This web application was meant to present the data in a comprehensible fashion to avoid confusion among the users. We created a way to easily view and understand the data through this web application. Additionally, if there are trends in the data they will be easily identified to open a comprehensive discussion about.

In the process of creating a new and improved census database web application, we hoped to learn about legislative decision making and how influential databases like these are. We also hoped to learn about how to work efficiently, effectively and cohesively in such a short period of time to produce a working prototype of our idea. Finally, we hoped to learn how influential we could be as a group when interdisciplinary forces are combined to create and improve.

The goal of this project was to create a census database web application that was simple and comprehensible. Ultimately, the goal was to appeal to municipalities with the increased level

of comprehension the census database web application could offer which would optimize the ability of the municipality members to make more appropriate and effective decisions based on the data collected. While we had given some thought to impacting the census data count, we ultimately decided to focus on improving data visualization as a tool. The decision was finalized when we considered the possible impacts a comprehensive data visualization tool could have. Of course, these possibilities were dependent upon the municipality members capabilities to analyze and make decisions based on clear. Assuming that all municipalities are competent and fair, the possibilities included but was not limited to increasing the count for the census, increasing the amount of involvement in community events, and decreasing the crime rate.

3. Elaboration: Requirements Modeling and Analysis

Innovation Class Part:

- A lively, engaging description of the project, and how and why it will add value
    - This census database web application will provide users with a new perspective of the data collected. This web application will present the data in a comprehensible fashion to avoid confusion among the users. Much of the data presented to the public today is very crowded and confusing. We will create a way to easily view and understand the data through this web application. If the census database web application is simple and comprehensible then it is likely that municipalities will be able to make more appropriate and effective decisions based on the data collected.
- A discussion of social, economic and real-world issues that must be addressed for the project to deliver value, and how the team will do this
    - In order for this census database web application to produce value, it must be easier to understand than the census data available currently.
    - A social issue that may arise is despite the data being presented appropriately and clearly in the census database web application, municipalities may not want to change information sources. While we may have clear data, municipalities may question the effectiveness of the capability of the data visualization as we are delivering a new web application and do not have an existing consumer base. The team will address this potential social issue by ensuring the difference between

our data visualization and the current method of data visualization is significant and has the potential to increase the appropriateness of legislative decisions.

    - An economic challenge that may arise could include the cost of server hosting. As of right now it is free because we are using TCNJ server hosting but if the web app exceeded the TCNJ server hosting capabilities then the cost of server hosting could potentially be more than municipalities have budgeted for. The issue arises if municipalities have to pay for the server hosting of this web app that has the potential to help them better understand which decisions will be most effective and the web app costs exceeds the value it has to municipalities. However, if the value the web app delivers exceeds the opportunity cost of the municipality then the web app will thrive. The team will address this potential issue by testing the visualization web app with smaller groups of random people. The test will include a conceptual problem that could present itself in daily life and each person must use different quantitative factors presented in the web app to make a decision. A different group of random people will be presented the same problem but instead of using the web app we created, they will use the current method of decision making utilized by municipalities. This will determine if the web app is effective in altering decision making or if the difference is rendered insignificant.

- A description of the feedback you have received from project stakeholders, and an explanation of why you have chosen not to follow some requests or suggestions, if applicable
    - While we are not directly planning an impact to raise the count of the Census, we will provide a data visualization that can make municipalities more effectively and efficiently address issues that were complicated before by complex data. Mr. Solomon suggested that we choose one path: data visualization or increasing the count and as a team we decided to go with the data visualization as there were many complications with raising the count directly through a web based application. For example, creating an application that encourages people to contribute time and personal information to a government that they already have compromised trust in is no small feat. Additionally, much of the work that would need to be done to encourage people to use the application and introduce it to them would have to involve direct contact with people. Human to human contact is the best channel for trust which is ultimately what we believe will increase the count. This method is not exactly simple at this time due to the coronavirus pandemic.
- Analysis of any ethical or legal concerns posed by the implementation or use of the system
    - Ethical concerns that have been given much thought include the possibility of this data visualization app to be used in a discriminatory manner. There is always an

ethical concern when any demographic information is considered in legislative decision making. For example, if anything more specific than sheer numbers are used to redistrict it poses a legal and ethical problem. Not only is gerrymandering illegal, but it also presents an ethical dilemma to provide the information that makes manipulation of the data possible. The team has put privacy measures in place to make sure users cannot manipulate the data directly so to avoid any illegal and ethical dilemma for the user or the creators/designers.

Software Engineering Class Part:

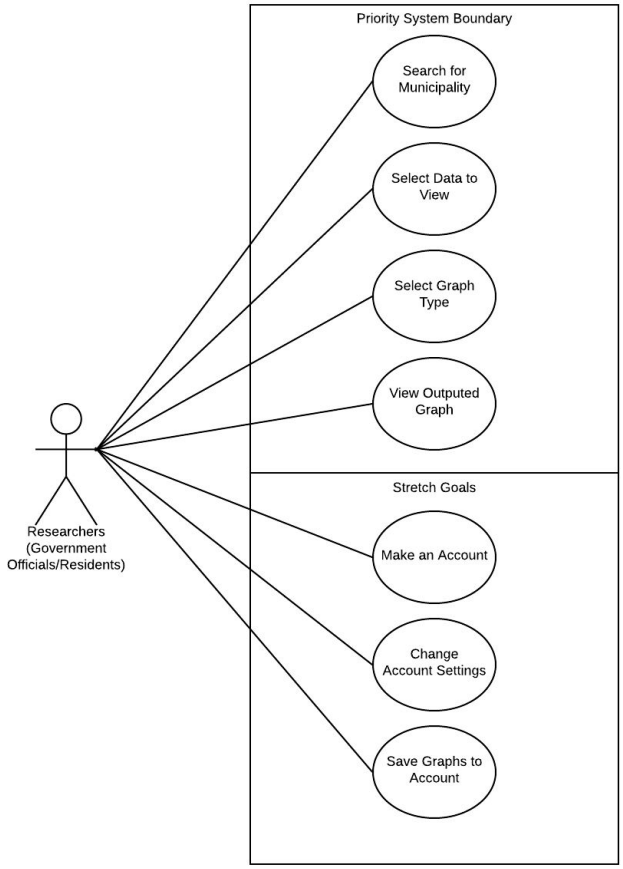


Figure 1. Use Case Diagram

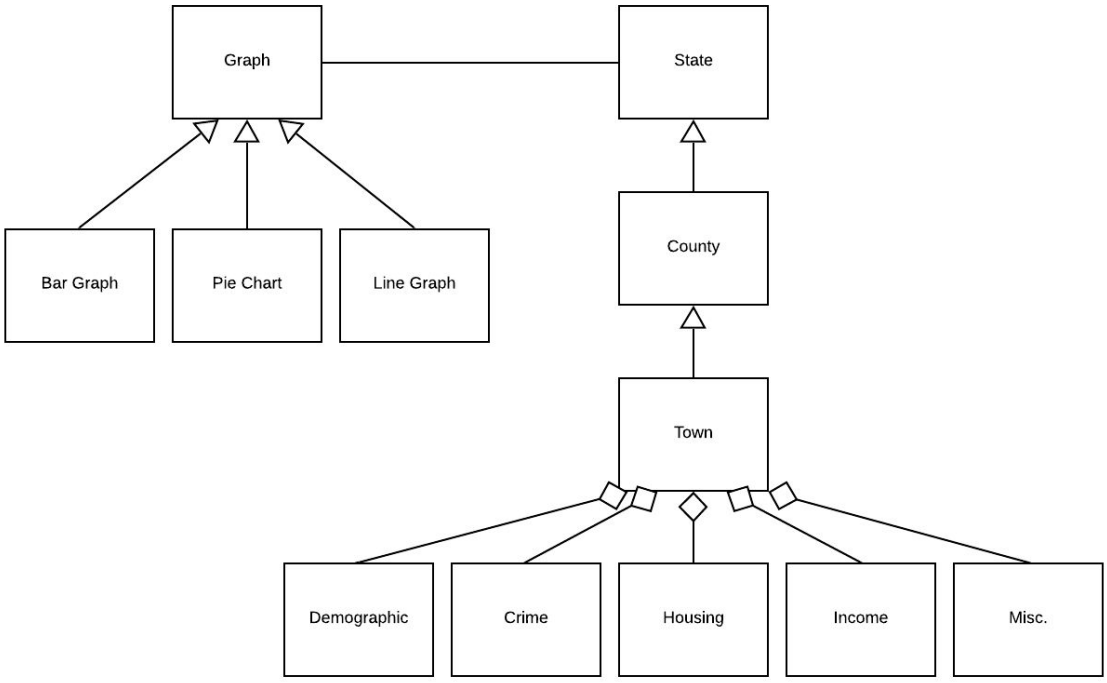


Figure 2. Analysis Class Diagram

Security and Privacy Concerns:

All users must be authenticated when trying to access the website. In addition, users will not be able to manipulate the census data itself. The only thing users will be able to manipulate is how the data is viewed in terms of data visualization. In addition, when developing this system, we will be utilizing information hiding in order to prevent others from manipulating or changing the code. In terms of privacy, there will be sets of data that will be saved onto each user profile. These datasets will only be visible to each individual profile. Since the Census data is available for anyone on the internet, the data stored in Postgresql Database does not need to be encrypted.

Data Backup and Recovery:

In our project, we will have two kinds of data banks. The first data bank will be the census data bank and the other data bank will be the user's data bank. We will also need to backup our code too.

For the census data bank:

- We will have the census data be written to a backup location before every time the census data updates with the most up-to-date data. Upon an update, the data will be verified to ensure it has not corrupted. If it is found to have corrupted it will use the backup version

of the data instead and send a message to the console to let the developers know something went wrong so they can further look into the system with minimal downtime.

For the user data:

- The system will create a backup of the user database every hour of operation. If at any point data is corrupted or lost, the system will make a copy of the backup version and use that as the main database instead.
- The downside of this method is that the users may lose some of their data, but they will not lose all of their data.

Implementation of this:

- For both of these, we can use PostgreSQL to automate these backups through a Cron Task. The Cron Task can be edited to change the frequency and time a backup can occur as well.
- Implementation Reference: https://www.linode.com/docs/databases/postgresql/how-to-back-up-your-postgresql-database/

Code Backup:

- We will be using github to backup our code and push all our commits on github. That way our code will be saved online digitally through a cloud.

Use Case Descriptions:

Table 1. Detailed Use Case Descriptions

Use Case: Search For Municipalities
Primary Actor: Researchers
The goal in Context: The researchers will be able to search through a list of municipalities and select the town they wish to view the data on.
Preconditions: The researcher knows what town they want to look up data on.
Trigger: The researcher is curious about a certain town's census data and wants to find out more about the town.
Scenario:

1. Users will immediately see a search bar upon visiting the web application.
2. Users will type in the name of the municipality of the desired town they want to look up.
3. As users types in the name of the municipality, suggested town names will be populated below the search bar, similar to a google search.

4. Users will complete the search and immediately be viewed with the dashboard of the municipality's data.

Exceptions:

1. The user could have misspelled the name of the municipality they are searching for. If misspelled, the user will be brought to a window that has a list of suggested municipalities based on search result.
2. The user could not find the municipality they were looking for. The user will be brought to a page stating that their search does not exist.

Open Issues:

1. Creating a list of suggested municipalities based on misspelled municipalities could be difficult to implement.
2. Creating a list of suggested municipalities as the user is typing into the search bar could also be tough to implement.

Use Case: Select Data to View
Primary Actor: Researchers
The goal in Context: The researcher will be able to select the type of data from a particular municipality they want to view.
Preconditions: The researcher has successfully been brought to the dashboard of the municipality they want to conduct analyses on and knows what kind of data they want to learn about.
Trigger: The researcher is brought to the municipality dashboard and is ready to select the dataset they want.
Scenario:

1. Users will be brought to the dashboard to select what dataset they want to learn about.
2. Users will select the dataset they want to analyze.

Exceptions:

1. Users cannot find the dataset they want to analyze for the particular municipality they are looking up. This could happen simply due to the fact that the information may not have been collected by the census. Maybe prompt the user a request form that will allow the user to request the type of data they are searching for the next census. This request form will be sent directly to the census.

Open Issues:

1. What kind of data should be populated in the database?
2. What data is most meaningful to government officials and what data is meaningful to residents of municipalities?

Use Case: Select Graph Type
Primary Actor: Researchers

The goal in Context: The researcher will be able to customize a graph that will use the census data points that they want to view.

Preconditions: The researcher has selected data from the Census Database and what range of years they want to look at.

Trigger: The researcher has finished selecting what data he wants to view and is ready to select the graph they want.

Scenario:

1. User will be brought to a page to select which kind of graph they want to use
2. User will select either a line graph, bar graph, or pie chart
3. One of the follow cases happen based on their selection:
    a. If line graph is selected, it will create a graph that shows the trend of the selected census data type over time with multiple municipalities on the plot. This will create a group of graphs where each graph corresponds with a selected data type that the user wants to view.
    b. If bar graph is selected, it will create a graph that shows the values of the selected census data type over time with multiple municipalities on the plot. Each municipality's bar will be side-by-side one another and located at their respective year. This will create a group of graphs where each graph corresponds with a selected data type that the user wants to view.
    c. If a circle graph is selected, it will create a graph that shows the percentage of the selected data type compared to other municipalities. This will create a group of graphs where each graph corresponds with a selected data type that the user wants to view. The user will have to select a specific year they would want to view as well.
4. The user will then submit their selections

Exceptions:

1. The user made a mistake in their data selection. The user will be able to go back to the select data page and pick which data types and data range they would prefer to use instead.
2. The user made the graphs, but they want to edit their graphs. The user will have their current settings saved from their current session to the website and be able to adjust the data points they want to use and what kind of graph they want to see.

Open Issues:

1. We should review all other kinds of ways these graphs could be formatted and see if there is a feasible way to implement them that allows the application to stay simple and easy to use. For example, the pie chart can be made to only view one municipality but show a comparison of multiple kinds of census data versing each other. But if something like this was implemented, could it take away from the simplicity of the application if too many features/options were to be added.

Use Case: View Output Graph
Primary Actor: Researchers
The goal in Context: The researchers will be able to visual the census data based on the graph and data parameters they set
Preconditions: The researcher has selected the data and selected their graph type
Trigger: The researcher has clicked the submit button on the graph selection page
Scenario:

1. The view sends a request to the controller and gives all the data and graph parameters the user has given
2. The controller will request all the data it needs from the model
3. The controller will use the data and make the graphs based on the configurations
4. The controller will send the graphs to the view
5. The view will open a page that displays all the graphs that were requested

Exceptions:

1. The data from the model is missing or corrupted. The controller will request the model to use a copy of the backup file and proceed as normal with the data extraction

Open Issues:

1. Giving the users a way to save their graphs and format it onto their dashboard
2. Figure out a method of displaying the graphs for any kind of graph request that the user makes while maintaining a pleasurable UI design

Use Case: Make An Account
Primary Actor: Researchers
The goal in Context: The researcher can make an account where they can save customized data.
Preconditions: The researcher is interested in saving data they have searched for and want an account to store it on.
Trigger: The researcher has selected a button on the homepage to create a new account.
Scenario:

1. User is on main page of website and is interested in making an account
2. Clicks on “Make a new account” button on the webpage
3. Fills out all correct information
4. Submits information and gets notification that an account was made successfully

Exceptions:

1. User enters in username already being used: Message will come up that prompts them the username is already in use and they need to choose a new one

Open Issues:

1. Should there be a certain length or certain types of characters that a user can use for their password?

Use Case: Change Account Settings
Primary Actor: Researchers
The goal in Context: The researcher can change their account settings to include customized features, such as what municipalities they would like to see data on.
Preconditions: The researcher is logged into their account and interested in changing any settings they currently have their account set to.
Trigger: The researcher clicks on the button on the homepage that will take them to the customizable account settings.
Scenario:

1. User is logged in and wants to make changes to their account
2. Clicks on the "Account Settings" button on the main page of the website
3. Makes any changes they would like to occur
4. Clicks "Save" button to ensure all new account information will be saved
5. Will bring them back to the main page and have a pop-up message that states "Account changes made successfully"

Exceptions:

1. User is not able to change what they want about the account: Not every single feature they have access to will be customizable, so only the features they are able to change will be included in the account settings

Open Issues:

1. How many things about their account should a user be able to change?

Use Case: Save Graphs to Account
Primary Actor: Researchers
The goal in Context: The researcher can search for certain graphs and save them to their account so they can access them at any time.
Preconditions: The researcher is logged into their account, searched for graphs on certain municipalities, and is interested in saving some of the graphs for future use.
Trigger: The researcher clicks the button underneath the graph of their choice that will allow the graph to be saved to their account.
Scenario:

1. User is logged in and has searched for graphs they are interested in saving to be able to access at another time
2. Clicks on "Save Graph" button underneath the specific graph they would like to save
3. Pop-up message will state "Graph saved successfully"

Exceptions:

1. Incorrect graph is saved by the user: They will be able to go into their saved graphs and delete them from the list

Open Issues:

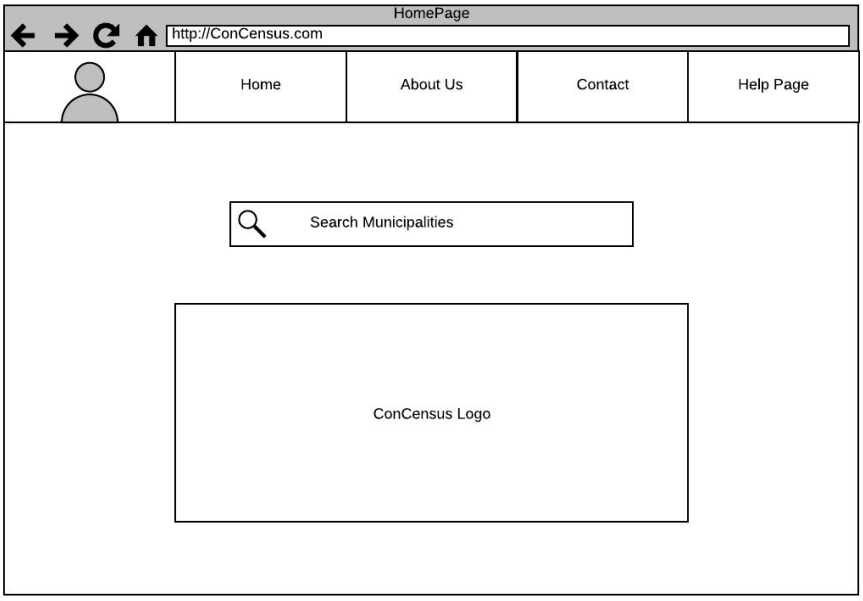
1. Where on the account should saved graphs be stored to ensure users can easily find them?
2. How can it be ensured that any saved graph can also be deleted by the user?

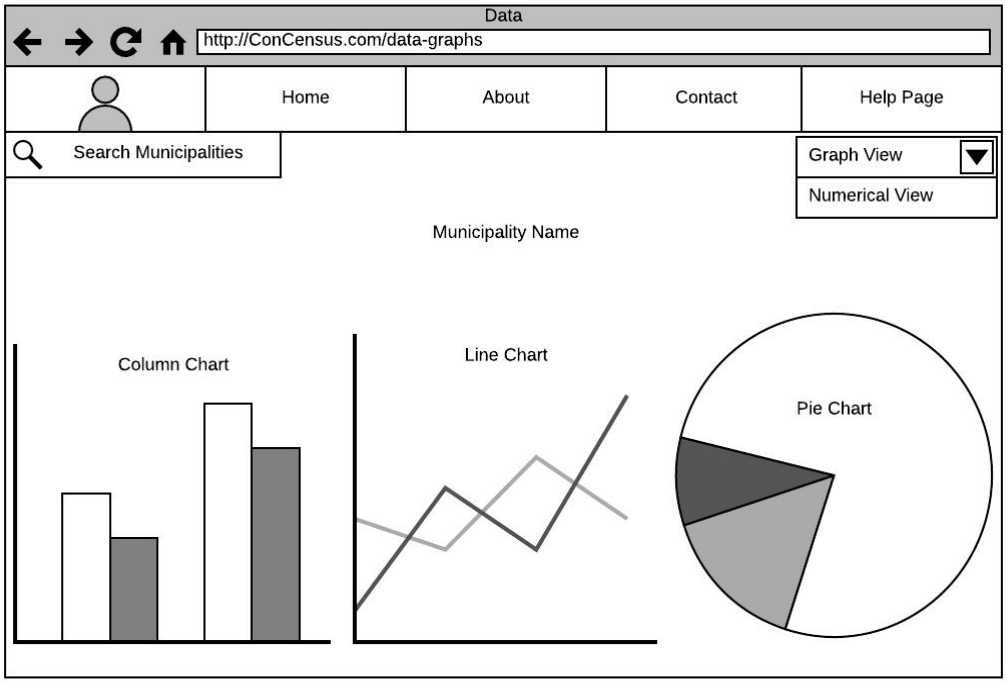
4. Elaboration: Design

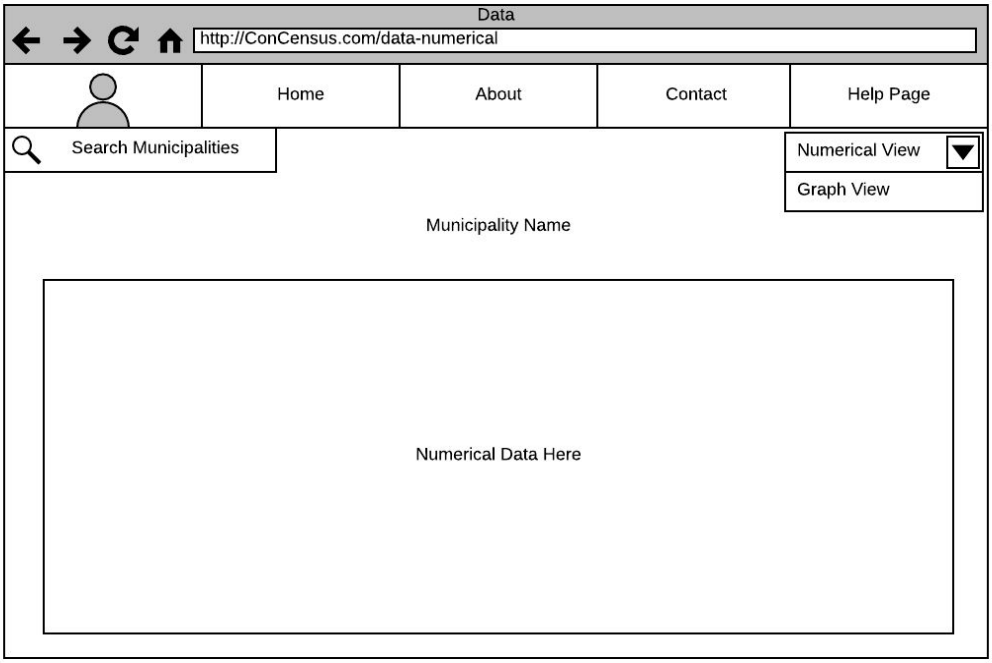
Innovation Class:

- Mockups of user interface showing the screens that user will see. Explain, with examples, how the system will satisfy the core principles of user interface design.

When deciding how to make the outline of the website we focused on a large fundamental characteristic that we deemed necessary for a successful website. This was being user friendly, which includes making the site easy to navigate, the data easy to read, and the layout of the pages simple, yet attractive. The homepage is a basic home page. It gives the user the ability to search a municipality and then they will be directed to a page that provides data for the given municipality. When viewing the data, graph view will be the default view for the Census Data, but you can choose numerical data by going to the upper right corner of the page and selecting Numerical View. We also included an about us page that will hold basic information about CoCensus, as well as a contact page that allows you to directly contact CoCensus with any questions.




Data
http://ConCensus.com/data-graphs
Home
About
Contact
Help Page
Search Municipalities
Graph View
Numerical View
Municipality Name
Column Chart
Line Chart
Pie Chart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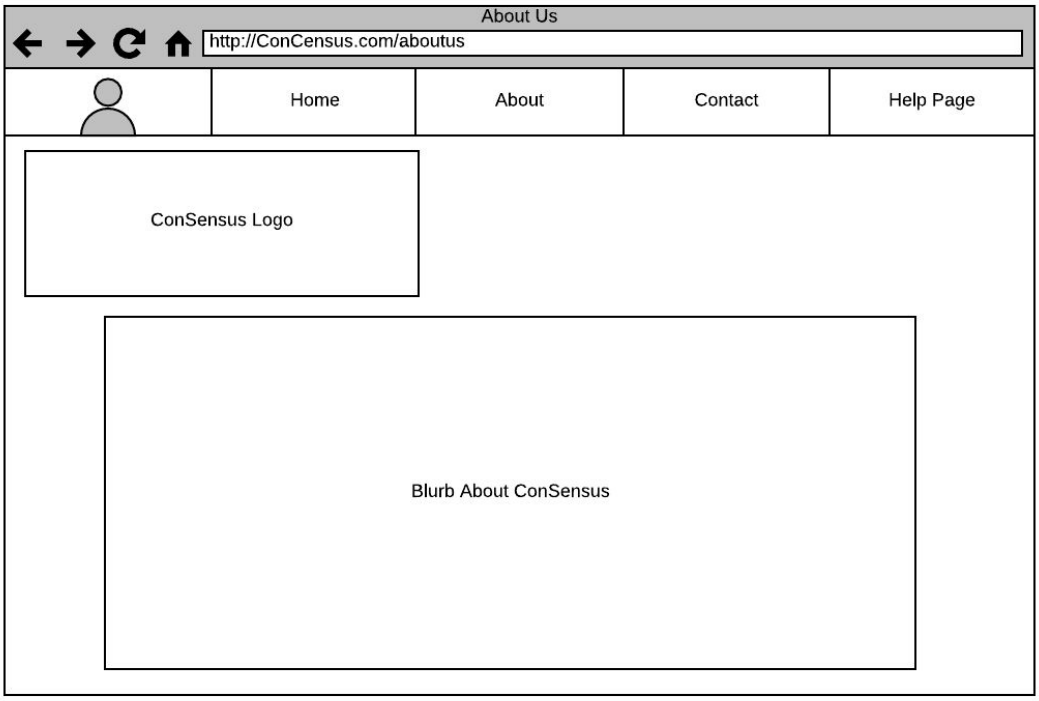
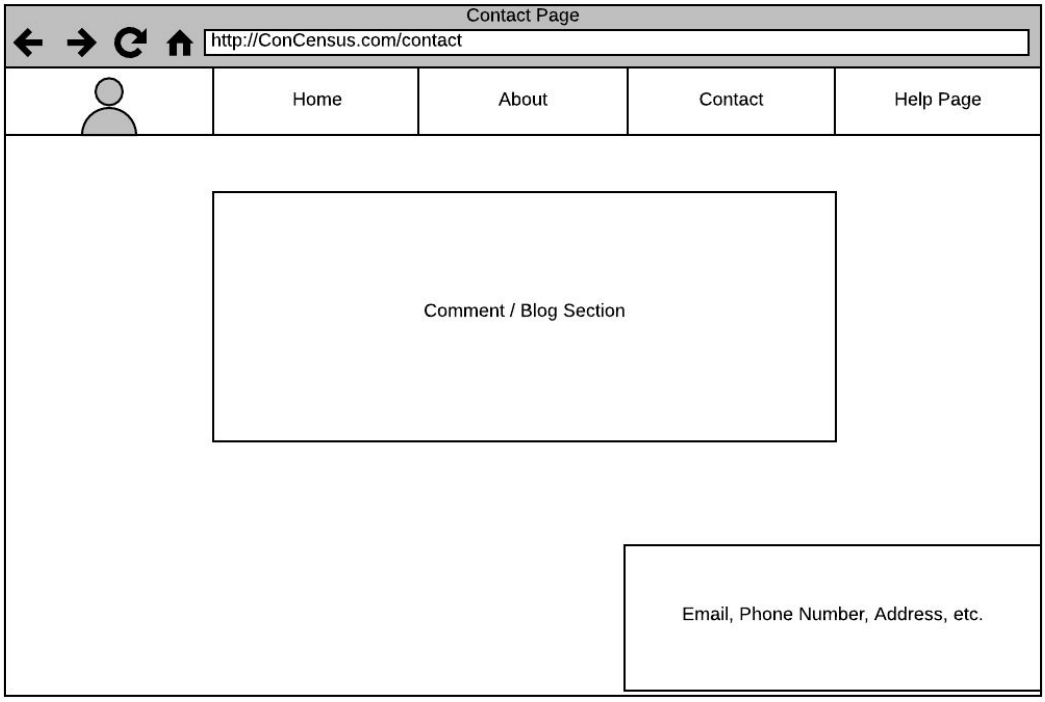

About Us
http://ConCensus.com/aboutus
Home
About
Contact
Help Page
ConSensus Logo
Blurb About ConSensus


Contact Page
http://ConCensus.com/contact
Home
About
Contact
Help Page
Comment / Blog Section
Email, Phone Number, Address, etc.

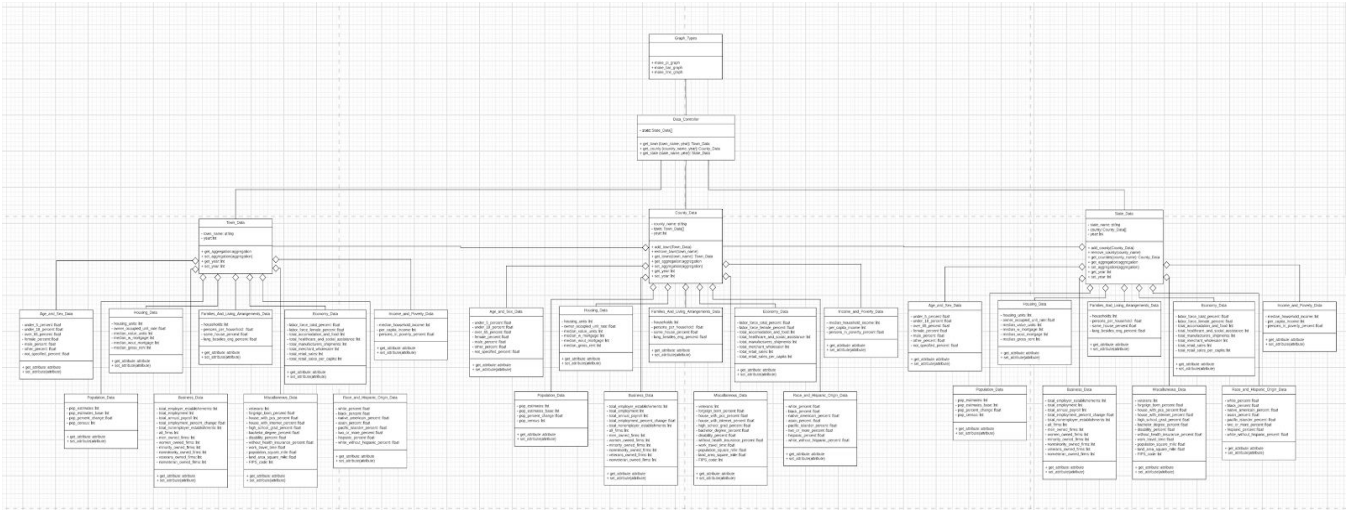
- A discussion of the types of user testing that can be conducted on the project.
    - The first form of user testing that can be conducted is called “guerilla testing”. Once the web app is created we must be sure that the user face is easy to understand and navigate. In order to do this, we will travel to local coffee shops and bookstores where people tend to gather for extended periods of time and ask volunteers to take a look at the web app and try to navigate it for a few minutes then gather feedback on the convenience and comprehension of the web app. Questions could include: Did you find this easy to navigate? Do you understand the information presented? What was your favorite and least favorite data display figure and why?
    - Once we get feedback from the general public that most likely do not look at this kind of data on a daily basis, we will continue on to ask municipality officials to test the web app but they will be encouraged to do more that just look at the data. A random sample of municipality officials from a 30 mile radius will be split into 2 groups: the experimental group and the control group. The experimental group will be given our new web app with the updated data display figures while the control group will be given the existing data display figures. Both groups will be asked a series of decision making questions that relate to the data they will be presented and they will be timed in order to determine if one method or the other is more efficient. The results will determine if the new data display alters the decisions being made regarding census data or if the existing data display and our new data display does not differ significantly.
- A discussion of innovative ways to encourage public volunteers and future students, whether programmers or social innovators, to maintain, improve and grow the project.
    - Once put into effect, everyone will see how this project can add more value to their lives regardless of occupation or demographics. This site will help users to understand why the government makes decisions the way they do. Census data is used to reapportion seats in the U.S House of Representatives, publish redistricting data, determine funding from state government to local municipalities including: Medicaid, highway and construction planning, special education grants to states, and the national school lunch program. The data also goes into determining the need for public sectors such as roads, hospitals and schools, and determining the need for emergency response in case of a disaster (such as the COVID-19 national pandemic). Being able to visualize this data can help users to see the change in statistics overtime in their area
    - Many businesses will be able to use this data and be able to better understand the area and the people they are working with and hiring. This will be beneficial to potential business owners, who were once students, learning about making change in the world. With businesses being able to better view and interpret census data,

it'll make for easier decision making. Decisions such as business site location, determining a target market for a designated area, and identifying county and business demographics will enable businesses to expand their markets. Being able to better read and analyze this kind of information can be useful to anyone, and should be a motivation to continue contributing with feedback to help improve the site overtime, and help it to grow into a resource people will utilize.

- Revised and deepened narrative documentation from prior steps, where applicable.
    - Not Applicable

Software Engineering Class:

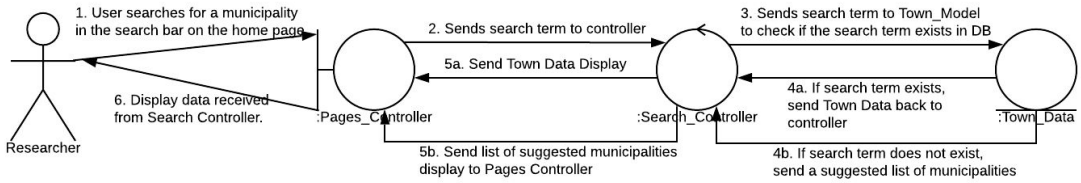
- Detailed Design Class Diagram



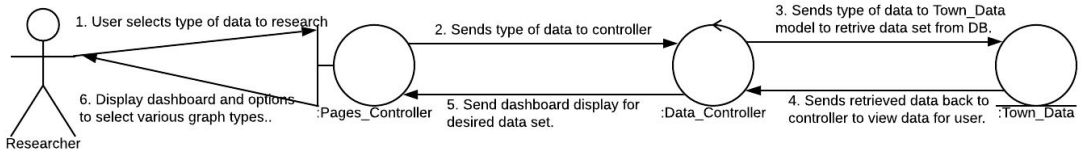
Link to better view the whole diagram:
https://www.lucidchart.com/invitations/accept/21535540-1acf-4ed5-8605-e06536750b63

- System Sequence Diagram(s) or Collaboration Diagram(s)

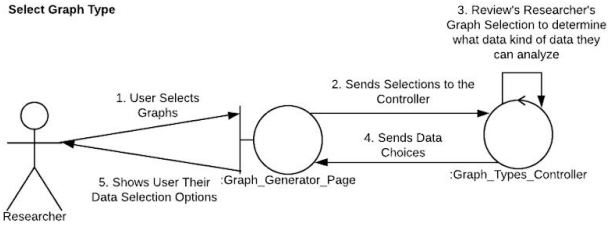
Search for Municipality



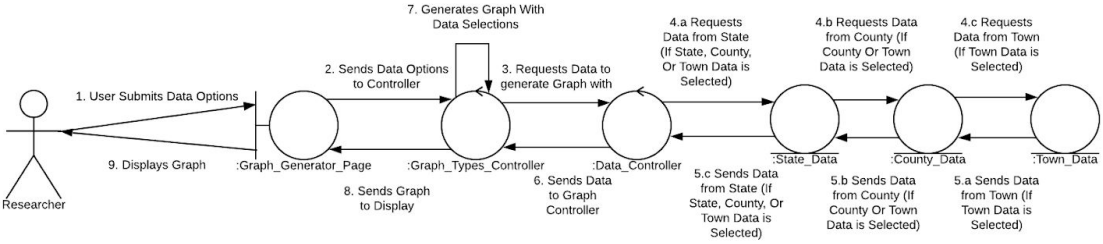
Select Data to View



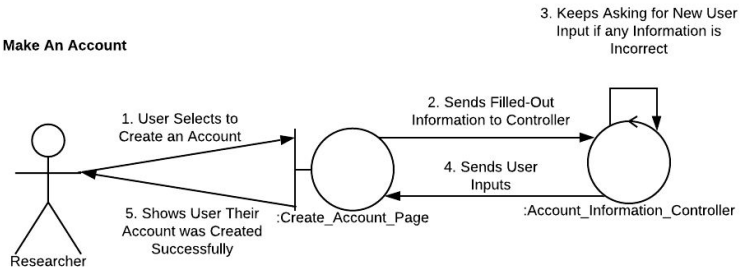
Select Graph Type



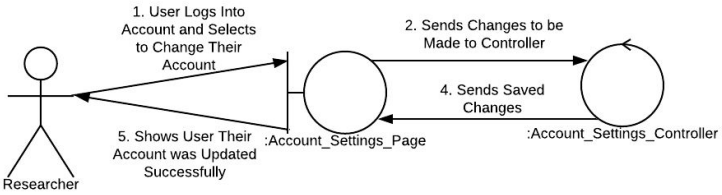
View Outputted Graph



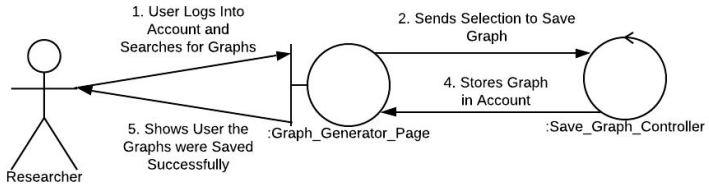
Make An Account



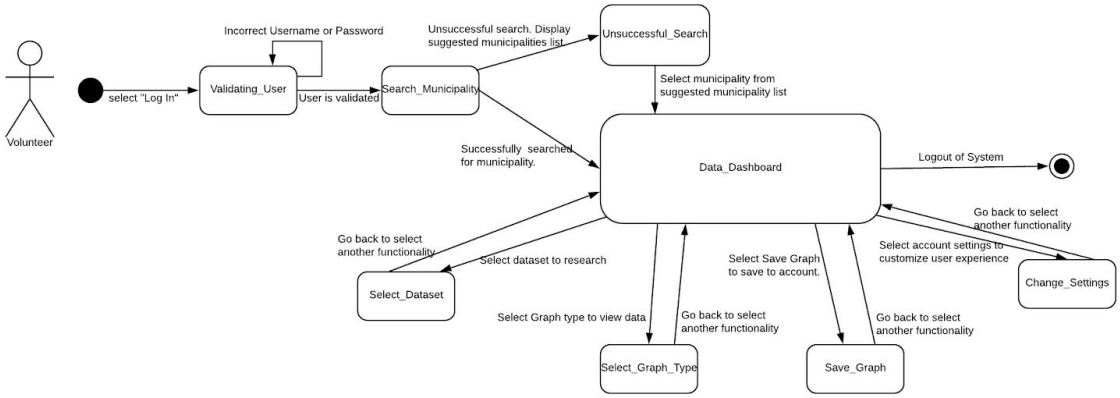
Change Account Settings



Save Graphs to Account



- Detailed Statecharts for each major functionality



- Detailed Test Case Design (TCD) that will be used to test the system in Iteration V. Refer to the Use Cases from Iteration III while developing the TCD, and ensure complete test coverage.

Description: ConCensus is a data visualization website that produces data visualization based on census data for municipalities. We have the user interface setup, user authentication/registration set up, and the different data visualization examples set up.

Progress and known issues: So far we have the base template of our application running. The home screen works and all the tabs on the data presentation work. There is a functioning search bar where you can select a municipality from and then see its data. Also, where it says "want to save your work" is the section that allows you to login and make an account. Everything else on the page is either nonfunctional or leads to an unknown page/an exception.

Green = Fully Implemented
Yellow = UI Implemented but non-functional
Red = Not Implemented at all

Functionality Tested	**Inputs**	**Expected Output**	**Actual Output**
Searching for a Municipality	User selects a municipality in the dropdown bar on the home page	List of different types of data for municipality is displayed	
Selecting data to view	A specific piece of data is selected by the user to view	List of different graph types available for that data is displayed	
Selecting graph type	User selects a graph type to view	All selections made by user are displayed	
Viewing output graph	All selections are made by the user and they submit these data options	Displays the correct graph	
Making an account	User selects to make an account and fill out all the mandatory fields	Notification that account was created successfully	
Changing account	User accesses	Notification that	

settings	account settings, changes anything they desire, and saves these changes	account settings were changed successfully	
Saving graphs to an account	User selects to save a graph that they searched for	Notification that graph was successfully saved to the user's account	

5. Construction: Implementation

GitHub repository for ConCensus: https://github.com/TCNJSwEngg/S20-T11

URL to access ConCensus on the VPN: http://csc415-s20-team11.hpc.tcnj.edu:3000/

Using ConCensus without needing to be on the VPN: https://concensus-tcnj.herokuapp.com/

6. Construction: Testing (This consists of the code review and the testing reports submitted by other students in the class that demonstrate successful execution of test cases)

7. Transition: Maintenance (This is satisfied if the source code is appropriately documented and uploaded to Github, and the final report is appropriately labeled and organized)

8. Transition: Product Hand Over

In order for any user to access the web application and use its functions, they need this URL:

https://concensus-tcnj.herokuapp.com/

Instructions for installing the application code off GitHub and selecting the correct Census data (as seen in the README in the GitHub repository):

Install this repository:

```
git clone https://github.com/TCNJSwEngg/S20-T11.git
```

IF YOU DO NOT USE GIT CLONE, THE ENTIRE GIT SYSTEM WILL BREAK! USE CLONE!

Once cloned, navigate to the S20-T11/src/ directory and install the project dependencies.

`bundle install` `rails db:migrate`

In order to populate the DB with the Municipality Social Data, do the following:

1. Run the rails server with `rails server --binding YOUR_IP_ADDR`
2. Navigate to `hostname:3000/municipality_social_data`
3. Select Import CSV button and upload the appropriate CSV file.