Final Project: Spices Around the World

CS 480x/BCB 4002
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Project Proposal and Motivation

Overview and Motivation

The project is focused on creating a map of the world that links regions where a spice is native and/or originated to particular regional cuisine regions. An origin country/region would be linked to other cuisine regions. This is repeated for a number of spices recorded. Our goal is to shown all these connections such that users get to see what spices are linked between cuisines and to understand the interconnectedness of cuisines via spices.

We selected this project because we enjoy cooking and spices. This project also presented the possibility of generating an interesting visualization that linked a network with a geographic map.

Inspirations

One of the initial inspirations for this project is founded in our team's interest in spices, cooking, and cuisines. Spices are a major factor in what constitutes a dish in a particular cuisine. Every dish is often categorized into a general geographic cuisine, specific cuisine, and regional cuisine. For example, a dish from the Szechwan region (known as Szechwan cuisine) is part of Chinese cuisine. Chinese cuisine is part of the greater geographical Asian cuisine.

Inspirations

Each cuisine, regardless of type, are categorized by the different spices and emerging flavors that comes their respective dishes. It is through those spices that new dishes are developed, cuisines evolve, and new cuisines even form. Therefore, it would be interesting to examine where different spices are native and what other cuisines they have impacted through their use. It can also show the different spices that are used in each cuisine.

Questions that we wanted to answer

When beginning this project there were a handful of questions that we wanted to address:

- What kind of spices are used in the various cuisines?
- What spices are the most linked between cuisines?
- Can we understand the interconnectedness of cuisines through this spice network?

Data Source

- https://www.spicejungle.com/list-of-spices
- https://www.spicesinc.com/t-list-of-spices.aspx
- https://www.mccormickscienceinstitute.com/resources/history-of-spices#:~:text=Indian%20Origins,gardens%20of%20Babylon%20(2).

The top source, Spice Jungle, was the main data source of the project. Though both were proposed as potential source of data, the former was selected for one main reason: detail. Each spice record included details about origin and the cuisines that utilize the spice. When coming up with the final design of our visualization, this information became very relevant. In addition, the final listed source ended up being used to discern the origin of the spices in our data set (despite what the link implies, there were more cuisine types) for certain spices.

For our final visualization, the data was collected into a csv file to be used in d3. More on the specific data entered into the csv file will be discussed within the Design Evolution section.

Exploratory Data Analysis

Exploratory data analysis is hinged on understanding cuisines and cuisine regions

Not much work was done in regard to manipulating or changing the data through other means to see how it would look. Our exploratory analysis was focused on learning the different cuisine regions, and understanding how to organize our data in a csv properly (which is discussed in the design evolution section). There was more exploration performed on the creation of the network. We worked to understand the topic of centroids to be able to bring our visualization into fruition.

Design Evolution

Initial Plans

These plans were formulated in the process of submitting a proposal and brainstorming. The plan was to generate a bunch of nodes, one set of cuisine nodes and one set of spice nodes. The cuisine nodes would be linked to the spice nodes if a spice was used in that particular cuisine. An interactive environment where a user could toggle a specific cuisine or flavor to be highlighted was thought of initially. A sample of this network is drawn here.

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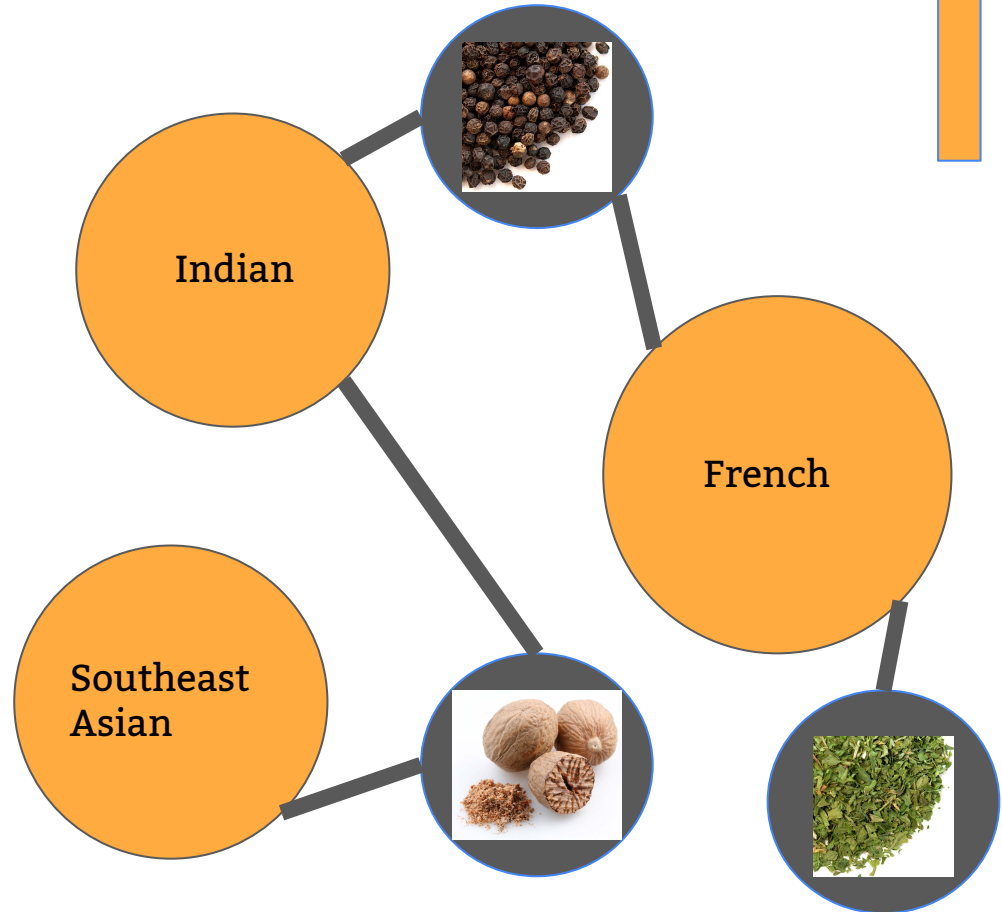
Initial Plans Drawing
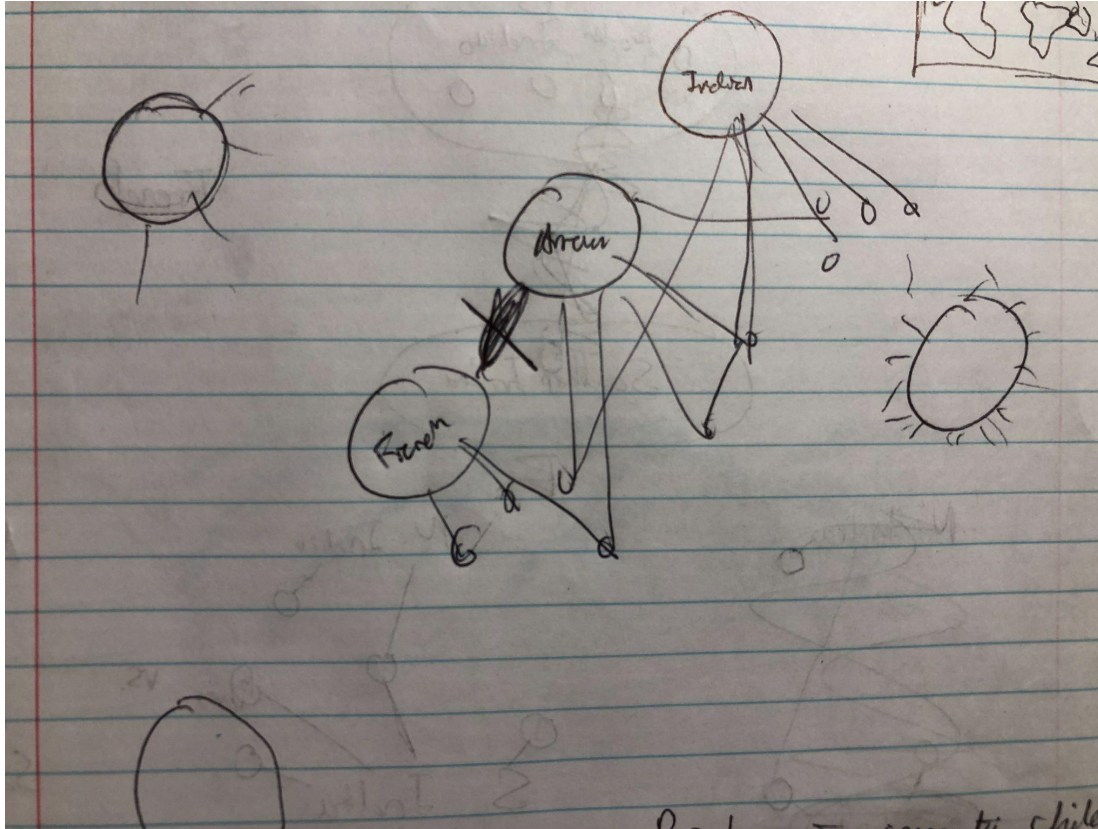
The New Network Direction - A Map

When discussing our project proposal together, we decided to take the spice network in a whole new direction by utilizing a map. Our intention with this visualization was to demonstrate the migration of spices away from their native region. This migration was captured through the use of lines when you hover over a given region of the map. The extending light blue lines represent the areas that the spice has migrated towards outside of its original native region. We would create classes as the spice name and associate them with lines/regions to be able to change color on mouseover. Additionally, text would appear at the bottom of the map indicating where the spice originated (cuisine or country).

# Related Work Inspirations that Shaped the New Direction

Connection map from csv in d3.js (d3-graph-gallery.com)

- A primary visualization inspired our idea of creating this map-based network
  - This visualization showed how we code create a map-based network that expanded the design of the final project visualization from a simply network to a map-based network

Voronoi Arc Map - bl.ocks.org

- A secondary visualization that inspired our project was this voronoi arcmap.
  - The creation of this node network utilizing different regions took the initial idea of a network of cuisines to spices and fleshed it out to involve a live map

Voronoi Arc Map

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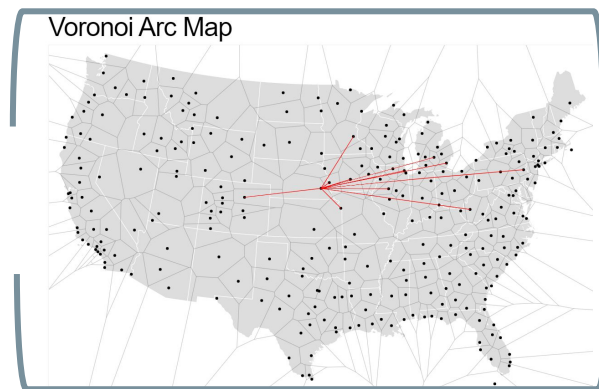
Map Rudimentary Design

Based on our team discussion and other related work inspirations, we came up with a rudimentary design for our map interactivity. In this design, there would be a parent region that served as the location where the spice originated (approximately). There would be other regions constructed that would represent the cuisines. These cuisine regions would be child regions to the parent region in the object. The links would be the spices themselves, connecting the two regions.
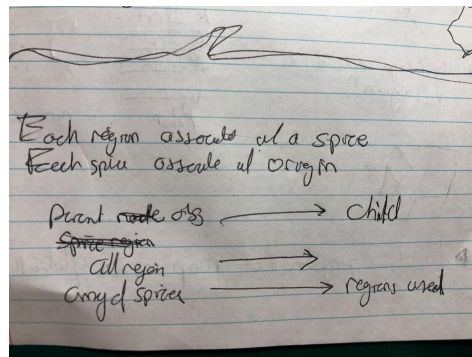

```
var spices =
{
        region =
        {
                nativeSpiceArray =
                [spiceObject[childLocations]]
        }
}
```

Rudimentary Map Design Visualized
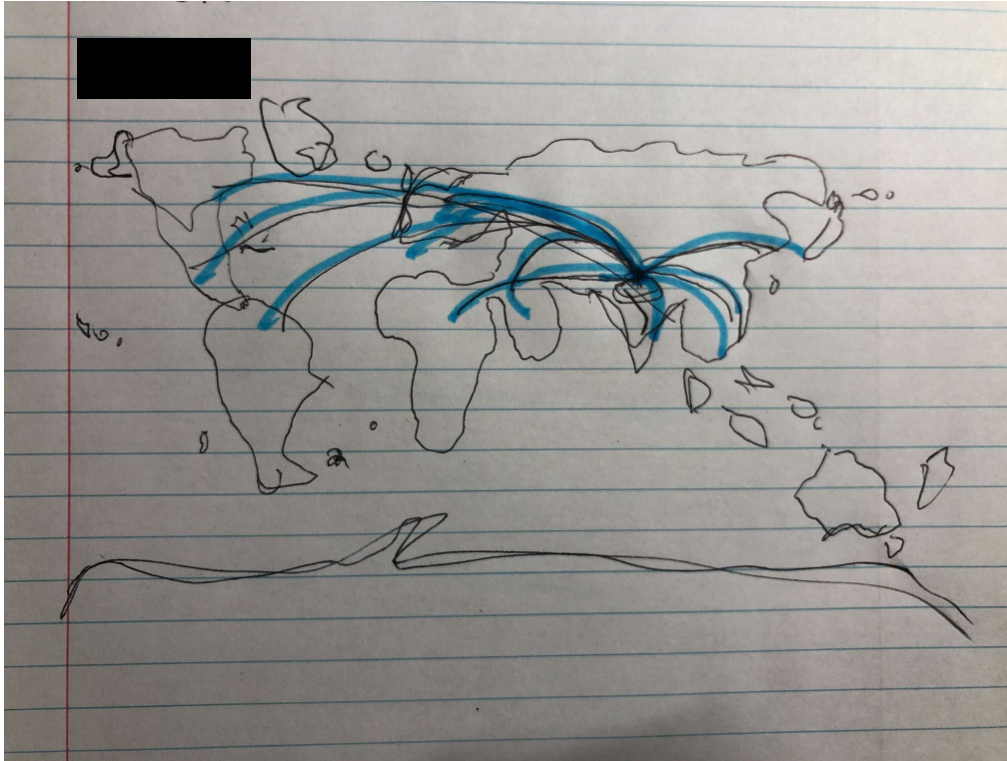
Here is a sample for a random spice. The parent (origin location) is India. From that point, multiple links (the spice) connect the parent to child (cuisine region). This map is shown using a mercator projection. This projection was selected for the final visualization

Data Organization - Spices

Alongside this new visualization design method, a means to organize the data had to be decided. In our case, we decided that the best course of action would be to compile a csv file. Within the csv file, the header file would consist of three columns: spice, cuisine, and origin. The spice refers to the spice in question. The cuisine refers to a singular cuisine that includes the spice. Origin refers to the place (country or region) in which the spice is native. If a spice is used in multiple cuisines, then the spice is entered in multiple times. In each of those entries, those only aspect about the row that changes is the cuisine. A sample csv format is shown to the right. This data will be used outright, and is not cleaned afterwards.

| Spice	Cuisine	Origin
Chervil	French	Cuisine of the Caucasus
Chervil	European	Cuisine of the Caucasus
Aji Paprika Chiles	Asian	Peru
...	...	...

Header ←

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Data Organization - geoJSON

In addition to spices, we needed to be able to map a bunch of cuisine regions that are not often limited to political boundaries. To do so, we created a geoJSON file using geojson.io. In this geoJSON file, the standard world map (used in lecture) was uploaded as a base. From that base, regions that represented different cuisine types were drawn over this map. Each of these regions were given a specific id, a specific name property, and a region property (set to "True") in order to distinguish the cuisine regions from the countries. As mentioned previously, we chose to a do a mercator projection. A sample screenshot of the geoJSON is shown to the right. The overlap identified shows how interlocking cuisine types are.

Notice the overlap

Visualization Draft

Provided here is a original draft of our plan for the visualization. It included a title, introductory text, a potential picture slideshow, a primary svg for the map, a secondary svg for a legend option, concluding text with links, and sources.
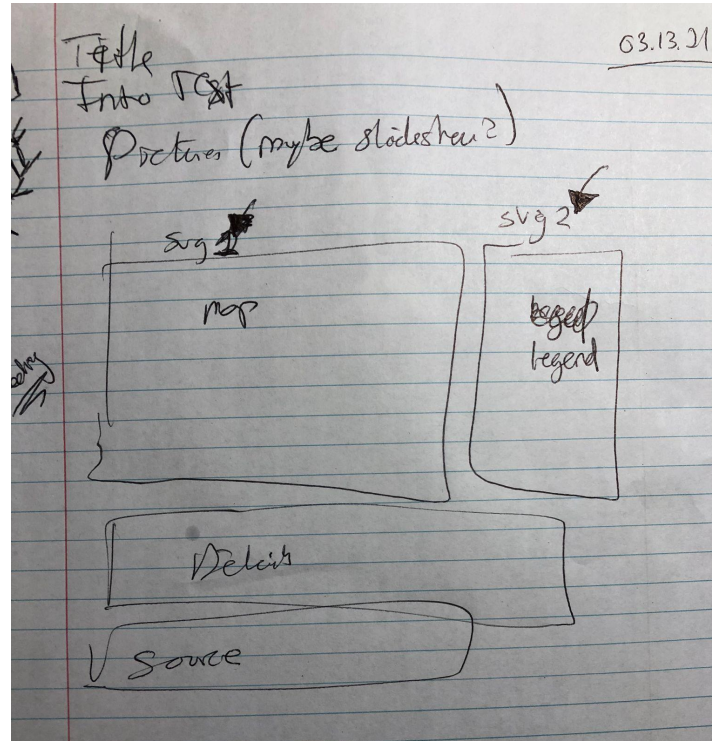
React Server: Rise and Fall

In our planning, it was decided that we would host this project using a React server. We had developed the required organization and necessary code thanks to Nick Wood's diligent efforts. The server itself was running well. However, we encountered a problem when trying to visualize the map that we initially could not diagnose. In an attempt to remedy the problem, we shifted our project to a simple index.html page. While this did not fix our problem visualizing the map, we eventual found a solution. Time restraints, however, prevented us from shifting back to the React server.

Final Implementation

Design of the Visualization

The overall visualization can be divided into two main aspects: the details and the network. In the details section, some text is provided above and below the network section with images of two spices in the environment. This text brings about some introductory information and some conclusive information at the beginning and end of the page respectively. In the network section, a map of the world is visualized alongside with all lines that connect a spice's origin to other areas. When hovered over, all the lines pertaining to that spice are highlighted. Additionally, the number spices native to each country is displayed. Zooming out on the browser lets the user better see the visualization.

In terms of interactivity, there is one main aspect of interactivity: the links. The links, when hovered over, are highlighted to show the lines pertaining to the same spice. Text appears at the bottom of the map indicating where the spice originated (cuisine or country) and how many links exist from the origin to other cuisines for that spice.

The visualization, mainly the map, is very compact and clustered. When mousing over, the particular set of links for a spice are highlighted to decrease this clutter when viewing the spice in question.

A Picture of Our Final Visualization
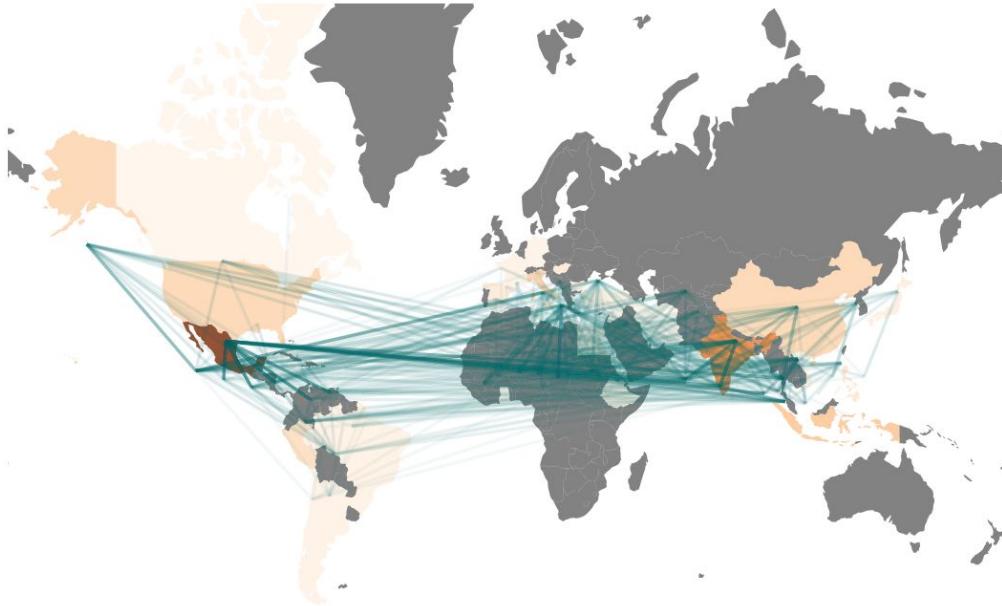
Another Picture of Our Final Visualization
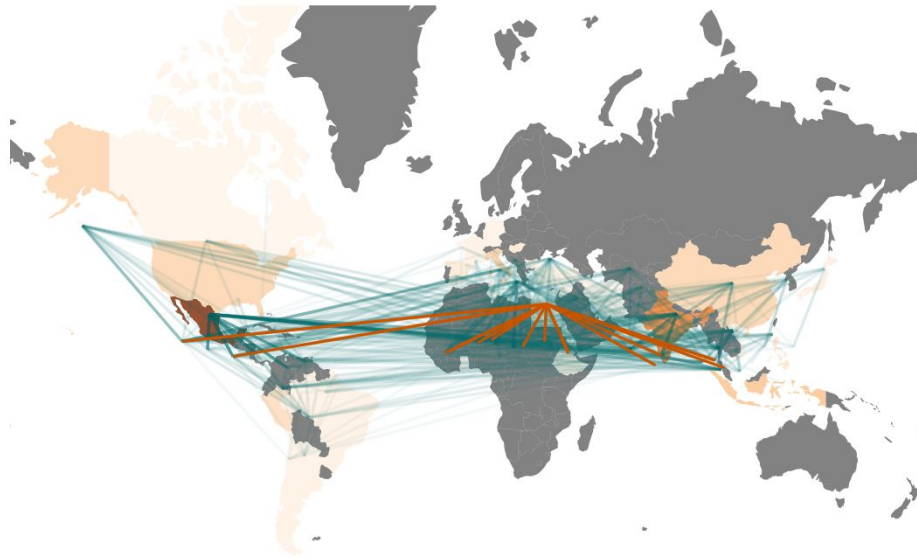
The spice Spearmint originates in Egypt and appears in 15 different cuisines.

Other Meeting Discussions

The yellow boxes at the bottom of these Updates represent the update number for that particular meeting date. Just gives a basis of the main points and takeaways from the meetings

Update 03.08.21

Expanding the project idea

- Creating the project idea
  - After receiving our proposals back, we met as a group to discuss how we want to make this visualization. The initial plan was scrapped for a map based network visualization plan
  - Set up the means to practically organize the data.
  - We decided to email Dr. Harrison to assess our plan and discuss its feasibility.

Update 03.09.21

Meeting with Dr. Harrison

- Understanding the possibilities
  - We met with Dr. Harrison today in order to assess the practicality of our project in the time frame remaining.
  - He approved of our idea, and provided some useful points on how to highlight links of a network, geoJSONs, and map projections in d3

Update 03.13.21

Understand Priorities and Assigning Work

- Understand Priorities
  - We developed an understanding as to what needed to be accomplished for the project.
  - We also got an understanding for what we each needed to accomplish moving forward for another meeting on 03.15.21 (Monday).

Update 03.13.21

Understand Priorities and Assigning Work

- Assigning Work
  - We assigned work to ourselves based on the previous topic of understanding priorities.
    - Nick Wood would take care of setting up the backbones of the server using React. He would begin work on a slideshow of spices to scroll by the screen as well.
    - Colin Scholler would begin to work to begin creating a map for the visualization. He would coordinate on a second svg legend with the map.
    - Adrian Orszulak would finalize the the geoJSON file and csv data. He would coordinate on the first and second svg.

Update 03.15.21

Work and Screencast Planning

- Work Related
  - With the deadline of the project approaching, our team assessed our current position and the materials of the project that needed to be completed.
  - The team set a hard deadline of 7:00 pm, Wednesday on 03.17.21 to have the project completed in order to record the final video.

Update 03.15.21

Work and Screencast Planning

- Screencast Planning
  - We developed a timeline in order to record the video on time.
  - We decided to upload the video to YouTube, and placing the link to the video in the final implementation.

Update 03.17.21

Cutting and Finalizing

- Cutting
  - Unfortunately, time constraints due to classes and life had made the team cut out the slideshow of spices that was planned to run on the page. This was not as worrisome as the slideshow of spices was not definitive. In a similar vein, the second svg with the legend was also cut.
  - Errors running the geoJSON made us remove the server feature. We are simply running this on git-pages from a single html page

Update 03.17.21

Cutting and Finalizing

- Finalizing
  - Today, the team assessed their completed progress book, recorded a video, and submitted their final project as a pull request.

Evaluation

How well we did complete our goal

In the end, we did create a visualization of the spice network that show how a spice, from a particular origin region or country, is then linked to (implying use) in different cuisines. In addition, we visualized the number of spices that originated in each country on a black to orange scale as a bonus. We did have to make some cuts from the original plan however due to time restraints, such as the second svg and the server. Moving forward, this visualization attempt to incorporate these aspects into the visualization for a greater overall appeal. Additionally, an immediate improvement that should be done moving forward is to declutter the map in addition to the mouseover function implemented. This will go hand in hand with the implementation of the second svg.

Questions that we answered

From our initial list of questions, were able to answer some of them. Their prompts and responses are seen below.

- What kind of spices are used in the various cuisines?
  - We can see that many spices are used in several different cuisines. However, cuisine specifics are not provided.
- What spices are the most linked between cuisines?
  - Some of the most common ones are Spearmint, Chili Powder and Nutmeg. You can distinguish them by the number of links pertaining to those spices.
- How interconnected are spices between cuisines?
  - As one can see from the map, many spices are connected a number of cuisines across the world. Not all spices share this interconnectivity, but a large subset of them do.
- Can we understand the interconnectedness of cuisines through this spice network?
  - This is definitely a loaded question, as many factors, not just spices, factor into what makes a cuisine. However, we can see through our network that many spices are shared amongst various cuisines. This would lead to the conclusion that given the

Questions that we answered

As an added bonus, we were able to answer a question we did not initially think of when designing this visualization. This question and its answer are listed below.

- Which particular nations are home to the greatest number of spices according to our dataset?
    - As previously noted, we can see this with a black to orange color scale where the more orange a country is, the greater the number of spices originates from it. It seems that, based on our dataset of spices, Mexico is home to the most spices. Following Mexico is India and then Indonesia

Limitations of our dataset

It is important to acknowledge that are dataset is not a complete list of all the spices with completely accurate origins. Firstly, the one source we utilized made creating the dataset and getting the necessary cuisine data easy. Secondly, many origin places were not as specific as one would hope from the source used. The secondary source that was listed previously was often used to find the origin as well. Additionally, certain spices are so widespread natively there is no single region of origin. These aspects are not represented well for a handful, but not most, spices. That is why the answers to our questions are all phrased in terms of our dataset. Moving forward, more spices and an ability to map over larger areas without too much clutter should be taken into account when creating a dataset.

Photo Credits

Slide 5: https://en.wikipedia.org/wiki/Sichuan &
https://www.kitchenstories.com/en/stories/an-edible-map-of-asian-cuisines

Slide 6: https://aliciashomemade.com/

Slide 8: https://www.spicejungle.com/list-of-spices

Slide 12: https://www.spicejungle.com/black-peppercorns &
https://www.britannica.com/topic/nutmeg & https://www.spicejungle.com/parsley-flakes

Slide 15: https://www.d3-graph-gallery.com/graph/connectionmap_csv.html &
https://bl.ocks.org/mbostock/7608400#index.html

Proposal Details

Adrian Orszulak (Petitioned in team survey to be with Colin Scholler and Nick Wood)   arorszulak@wpi.edu /
Slack: Adrian Orszulak   The Spice Network Road I love using spices in cooking and have a lot of experience with a
handful of them (both growing and mixing spices). Understanding how they all interact and what they are used for is
important for cooking. Which spices pair to which cuisine type or how do these spices mix well are the questions that
would be sought after.   https://www.spicejungle.com/list-of-spices and
https://www.spicesinc.com/t-list-of-spices.aspx provide an extensive list of spices - indicating cuisine and providing
some interesting description. If we wanted to do one based on flavor/compatibility - some more examination will
need to be done. These will most likely be entered into a csv file manually for use.   The design is resting on two
ideas. Firstly, it could be a network based visualization that connects each cuisine to a spice that is used. Ideally, you
could select/deselect the cuisine using a button to show particular cuisines. Secondly, it could be a network based
visualization that connects flavor to a spice used to obtain it. Ideally, you could select/deselect the flavor to show the
particular cuisine. Both could use a bar chart or related to show the number in each particular category. Currently
leaning towards cuisine based. Of whichever is the selected, the other category can be displayed as a chart.   I am
not sure about how to select/deselect certain aspects of a network. This will take some time to figure out for sure.
Awesome. Cooking vis is great. I am reminded of Moritz Stefaner who once did a project on Muesli. See if you can
find it? Could serve as inspiration.