The University of British Columbia

CPSC 547 - Information Visualization

Dr. Tamara Munzner

Country vs. Country:

Food & Allergy Edition

Jose R. Carvajal

joc08@mail.ubc.ca

Lucca Siaudzionis

lsiau@cs.ubc.ca

Alireza Iranpour

alireza.iranpour@cs.ubc.ca

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Abstract

Mindful of the significant segment of the world population that have food allergies [1, 2, 3], the rise in air travel for leisure [4], and the convergence of food consumption habits in the face of globalization [5], the aim of this project is to design a tool that is simultaneously user interactive, visually informative, and helpful to guide users in their decision making. Informing our research is the question of: where is it safe to travel in light of my allergies or significant dietary restrictions?

Introduction

The purpose of this project is to create an interactive visualization tool, in the shape of a website, that allows users to answer the question of: where is it safe for me, or my children, to travel to in light of our food allergies? Informing the motivation for this project is the lack of an existing tool that serves a similar purpose, the large portion of the population that is affected by food allergies, especially children, and the rise in globalized food consumption habits and leisure travel.

Presently, according to the World Allergy Organization, 220 to 520 million people around the world live with food allergies [3]. According to a study by Loh and L.K. Tang, the percentage of the world population challenged by food allergies can be as high as 10%, with a great prevalence noted amongst young children [2]. To provide context, in the United States, this accounts, yearly, for 2,000 hospitalizations and 200 deaths per year [3]. Although, at present, 170 foods have been known to cause allergic reactions due to consumption, eight main allergens: milk, eggs, fish, crustacean shellfish, tree nuts, peanuts, wheat, and soybean are responsible for the majority of adverse food reactions [1].

At a global scale, while the mosaic of world cuisines is complex, at a national level it is reasonable to say that certain ingredients compromise the basis of that nation's cuisine. For instance, for historical, colonial, and environmental reasons, well beyond the scope of this project, traditional Costa Rican food consists of the following ingredients: rice, beans, coffee, potatoes, plantains, bananas, pork, maize, coconut, beef and fish [10]. As such, despite being a famous travel destination due to its natural resources, it also boasts of a national traditional cuisine that is relatively allergen friendly and bland: in terms of spice.

Our hope is that in mind of our globalized world which has seen a dramatic expansion in leisure air travel [4] and in the consumption of non local goods due to greater interconnectedness of goods, cultures and capital [5], that information on food allergens is not unattainable or overwhelming when making travel decisions. As such, the present authors ask themselves the following questions: in mind of my severe food allergies, and with the available knowledge of the

most common ingredients used in each country's cuisine, what countries is it relatively safe for me to travel to? And, where can I access this information for free, in an easy to consume, easily personalized, and informative tool?

The aim of this tool is to inform end users in their decision to travel and how to prepare if they decide to travel in light of their dietary restrictions. The tool is not meant to homogenize cultures or to make destinations unfriendly. Rather, as an end user, it should help me decide what measures I should keep in mind if I decide to travel to a country with a high presence of allergens that affect me in their traditional cuisine.

Related Work

Presently, the authors have found no similar work or comprehensive tool that addresses this issue. Despite the existence of certain blogs or articles that show best practices on how to travel despite your food allergies [6, 7, 8, 9] there exists no data base or interactive tool that links together the eight most common food allergens and their prevalence or presence in traditional national cuisines. As such, we find this project relevant in its ability to provide a useful service that is currently being unmet.

Data Abstraction

The dataset will be assembled by our team. The dataset will consist of two tables.

1. The first table will be a "popular ingredients" table. Each row will represent an allergen (for example, peanuts) and each column will represent a country. The cell values will be binary, having a value of 1 (or "True") if the allergen is considered a popular ingredient in the country, and a value of 0 (or "False") otherwise.
    - Possible cell values: {0, 1}.
    - Expected number of rows: between 10 and 20.
    - Expected number of columns: between 170 and 200.
2. The second table will be the "food consumption" table. Each row will represent a common type of food category (such as shellfish or eggs) and each column will represent a country. The cell values will be quantitative, and standardized to represent "annual kilogram consumption per capita."
    - Expected cell value range: [0, 100].
    - Expected number of rows: between 15 and 25.
    - Expected number of columns: between 170 and 200.

Task Abstraction

The following is a tentative set of requirements that we aim to implement.

R I - Encode allergen-safety of a country.

For each given allergen, we will encode how "safe" a country is in relation to it. We will use the information of an ingredient being popular in said country as a proxy for this information. When available, we will also use the per-capita consumption to create a score. If an allergen is common/heavily consumed in a country, then that place will be deemed unsafe for people with that allergy.

R II - Support search for "allergen-safe" countries

This is an interactive feature. A user should be able to input their personal set of allergens and easily visualize which countries are considered "safe to travel." The encoding mentioned in the previous requirement will be vital for this task. Comparison a country's safety with that of its geographical neighbours should be simple.

R III - Handle incomplete data (missing values)

As we gather data for our dataset, it is inevitable that many values will be missing. In fact, that has already happened several times since we started the process. The likely solution we will take is to omit those values with, for example, grey colour-coding. However, other solutions will be explored as well.

R IV - Easily add new food attributes

The implementation for our solution should be scalable. It should be easy for the maintainer to add support for new allergens when the data for such is provided.

Solution

We can use choropleth maps to visualize the level of safety of each country. For instance, luminance can be used to encode the commonality of an allergen in the local cuisine of the countries. As a result, darker countries would imply a higher risk for travel. We may also explore necklace maps as an alternative to choropleth maps.

Potential tools that we may use include Tableau and PowerBI. We will use Python to perform our data wrangling and data processing. Our platform is expected to be web-based where users can specify their allergies and compare different countries in terms of their level of safety.

Scenario

1. The user can select one or multiple allergens in a side menu.
2. The map will display their level of safety.

Potential interface appearance

Figure 1 illustrates a mockup of the potential user interface for our visualization too.

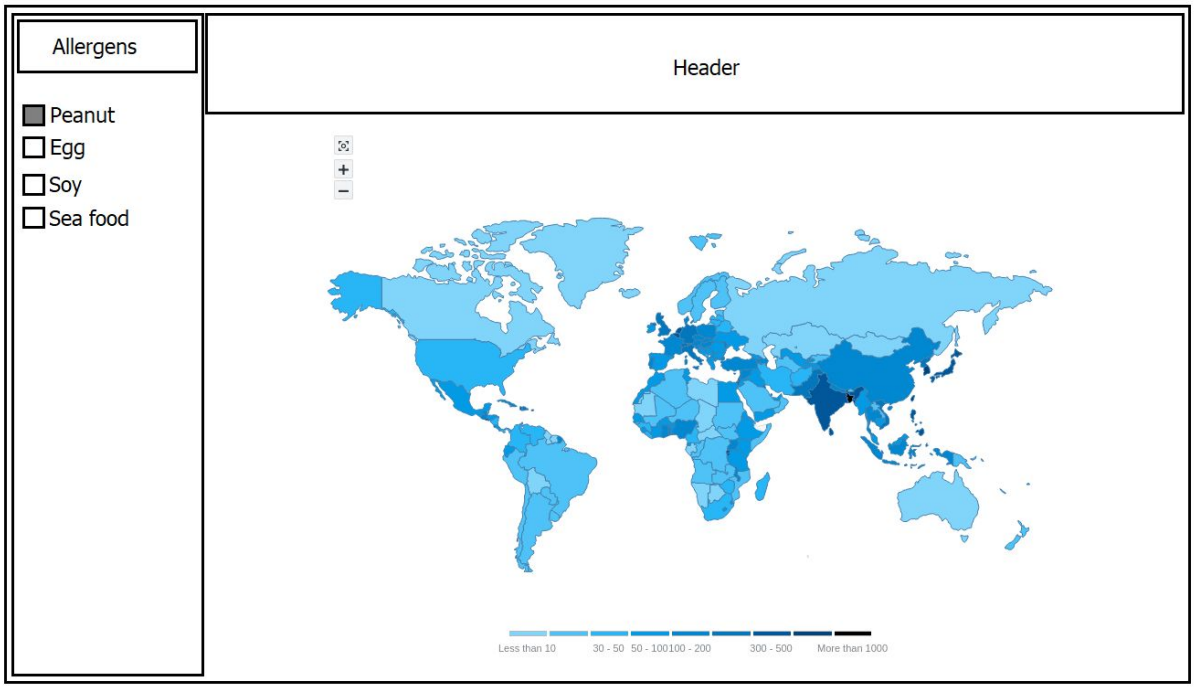

Figure 1: UI mockup

Milestones

Date	Milestone
November 10th	• Data is gathered. • Data is transformed to its desired state.
November 17th	• Country safety for a given set of allergens is encoded. • Update report is completed.
November 24th	• MVP tool is completed.
December 1st	• Final tool is completed.
December 10th	• Presentation is completed.
December 14th	• Final report delivered.

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