WORCESTER POLYTECHNIC INSTITUTE

CS573 PROJECT PROPOSAL
FEED GRAIN DATA VISUALIZATION

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MOTIVATIONS AND BACKGROUND

The project aims to create a visualization system for the US feed grains data. Feed grains are grains grown for feeding livestock, such as corn, sorghum, and barley. Feed grains, as an integral component of food chain, its sufficient and reliable supplies helps stabilize food supplies and thereby helps further ensures food security, and eventually contributes to national security. On the other hand, as a major source of animal feeds, feed grains production has significant impact on feed industry which directly determines production of animal protein and therefore is closely related to public health and welfare. Additionally, feed grains is also an important commodity trading in global market and therefore, plays an essential role in determining ranking and influence of a nation across the world. Creating a visualization system for feed grains enables us not only to perceive supplies and demands of the US feed grain, but also to acquire in-depth understanding on structure of feed grain consumption and detect trends of international and domestic prices of feed grains. Besides, we are motivated as well by challenges of designing visualizations raised by complexity of the data.

PROJECT OBJECTIVES

The visualization system is designed to demonstrate inbound and outbound flows of feed grains as well as consumption patterns and trends of prices. In addition, since trading accounts for a fair amount of supplies and disappearance, import and export data will also be visualized. In sum, the visualization system is created to answer a question that how the US feed grains is supplied and demanded. Specifically, the visualization system will be able to provide following benefits,

- Discover the overall inbound and outbound flows of feed grains.
- Uncover inbound and outbound flows of individual grains, for example corn and sorghum.
- Detect consumption pattern or trend from the data.
- Identify changes of feed grains imports and exports over time.
- Explore trends of domestic and international prices of feed grain over time.

DATA

The data is collected from Data.gov, which is managed and hosted by the US General Services Administration, Office of Citizen Services and Innovative Technologies. The link to the data is here.
The data incorporates four feed grains, corn, sorghum, barley, oats and foreign coarse grains. Important tables and attributes are listed below,

- Supply: beginning stock, production, imports
- Disappearance: food, alcohol use and industry use, seed use, feed and residual use, exports and ending stock
- Domestic and International Prices: average prices received by farmers and cash prices at principal markets
- Exports and Imports

DATA PROCESSING

Data cleaning is necessary, since the dataset contains missing data and in the meantime, data tables have different time frames. For an instance, supply and demand data covers a long time span from 1975 to 2016, while import and export data is in a range from 1988 to 2016. Also, the data needs discretization for maps, since it is not a good idea to use color to represent continuous variables. At last, our data is in excel which has to be converted into csv for d3 to process. The data processing will be implemented with js functions.

VISUALIZATION DESIGN

We will apply Ben Shneiderman's principle of Overview First, Zoom and Filter, Details on Demand. A chart will be displayed first to present how feed grains flows from supplies to demand as an overview. See Figure 1 for the overview chart. The flow chart is equipped with a widget which enables users to select year. Each button in the overview chart can be clicked for individual grain data. Then a small window displaying a specific statistic for an individual grain will appear.
For supplies and demands, three prototypes are,

- Prototype 1: two pie chart, one for supplies and one for demands.
- Prototype 2: a stacked bar chart in which each bar shows supplies of all species.
- Prototype 3: a slope chart with a time bar.

Prototype 3 will be selected for the visualization system, because it can show trends of supplies/demands over time.
For domestic prices, three prototypes are,

- Prototype 1: a line chart in which prices at all markets are plotted with a legend.
- Prototype 2: a stacked bar chart in which each bar shows all prices at markets at a specific month.
- Prototype 3: the US map with a color scale to show prices from low to high at major domestic markets.

Prototype 3 will be used in the visualization system, because the map is intuitive and easy to perceive. Also, the two alternatives are not able to provide clear visualization with dozens of categories (domestic markets).
For export and import data, three prototypes are,

- Prototype 1: two pie charts, one for exports and one for imports.
- Prototype 2: two slope charts showing quantities of exports and imports over time with a time bar.
- Prototype 3: a world map which demonstrates countries trading with the US with arrows whose thickness represents levels of trading volumes.

The prototype 2 and 3 will be selected for the visualization system, because pie charts are incapable of showing a great deal of categories (countries).

FEATURES

Must-Have Features

In general, the visualization system must be able to demonstrate supplies, consumption, prices, imports, and exports over time. Required features includes,

- Presents sources of feed grains and structure of disappearance.
- Displays quantities supplied/demanded for selected time span as well as trends of supplies/demands for individual grains.
- Shows domestic and international price and their trends for a selected time period.
- Illustrates trends of the US imports and exports of feed grains.
- Shows major countries which trade feed grains with the US.

Optional Features

Besides must-have features, the visualization system also has a set of good-to-have features. In principle, we expect the visualization system to illustrate relationships among supplies/demands, prices and exports/imports. Furthermore, to enhance user experience, we would like to create delicate layouts and simple yet effective interactions.

- Smooth arrows and curves in charts
- Zoom in/out functions in maps
- Filter data with mouse actions
- Aggregate data for visualization with one click

PROJECT SCHEDULE

- Nov. 1-Nov.8: Data cleanup and change file format
- Nov. 9-Nov.23: Implementation of the first half of the visualization system, overview chart, supply/demand charts and price charts
- Nov. 24-Dec.07: Implementation of the second half of the visualization system, export and import charts
- Dec. 07-Dec.13: Testing and debugging

PROTOTYPES

Figure 1: Overview Chart

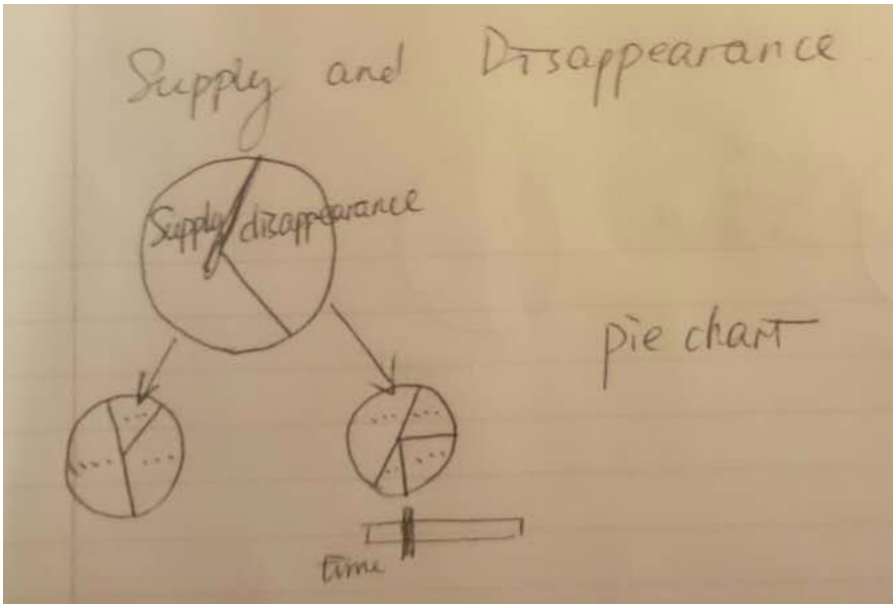

Figure 2: Pie Charts for Supplies and Demands

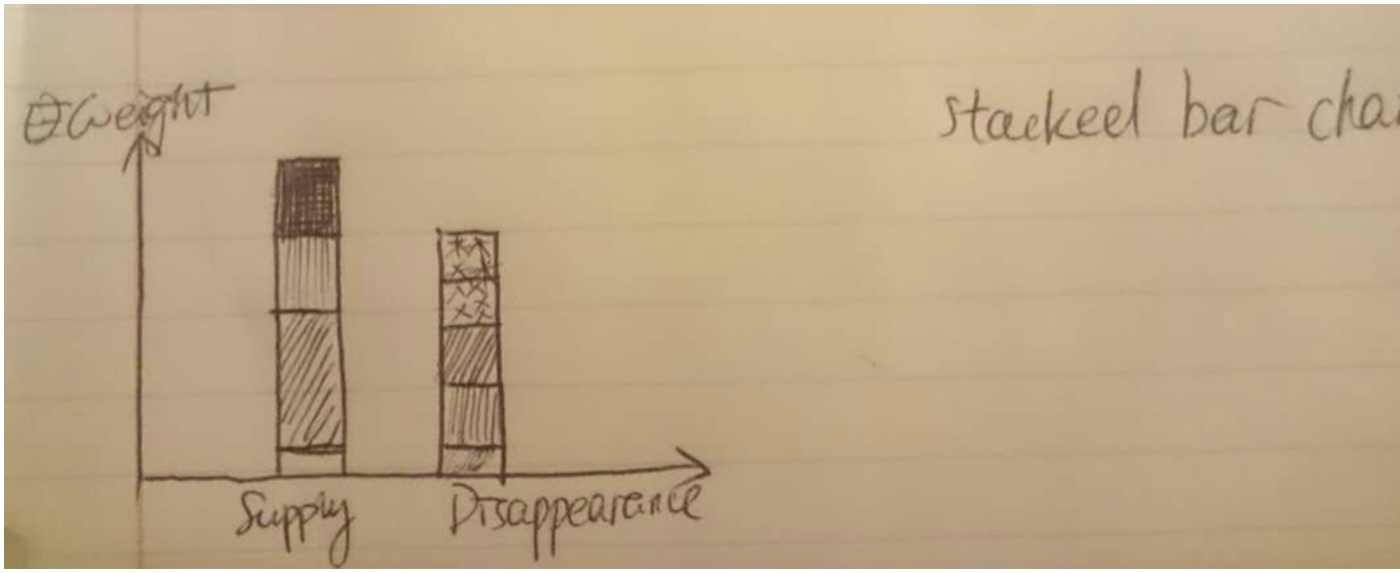

Figure 3: Stacked Bar Chart for Supplies and Demands

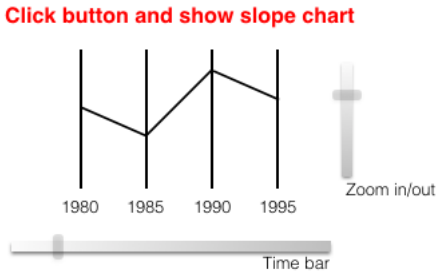

Figure 4: Slope Chart for Supplies and Demands

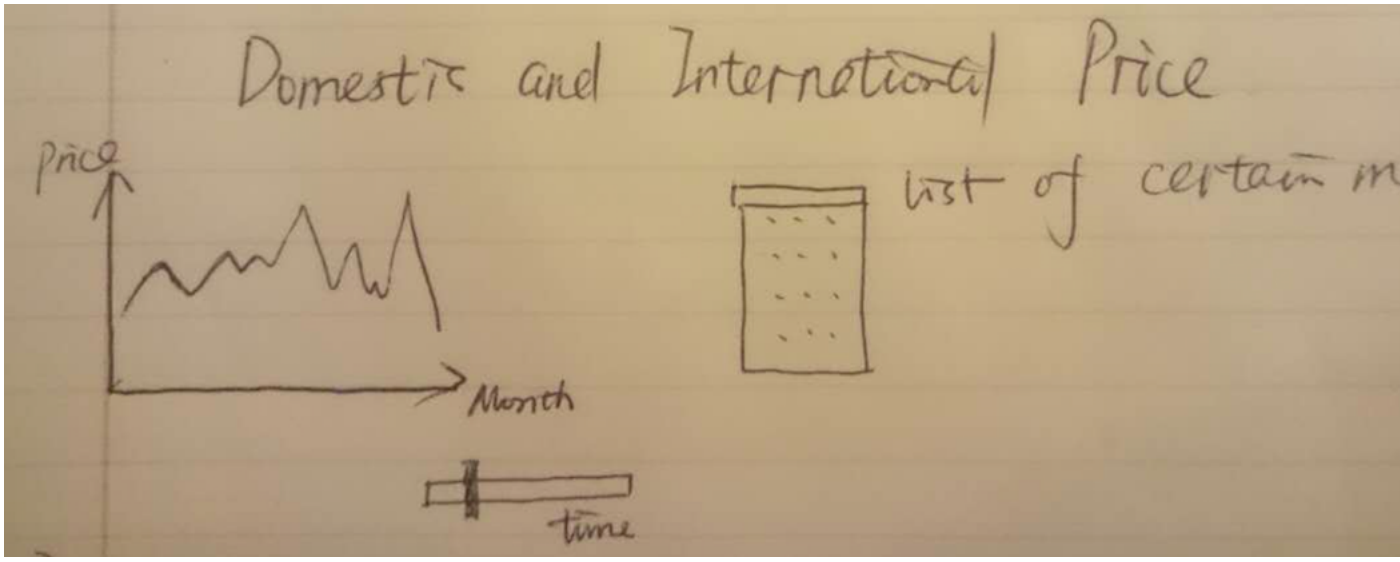

Figure 5: Line Chart for Prices at Domestic Markets

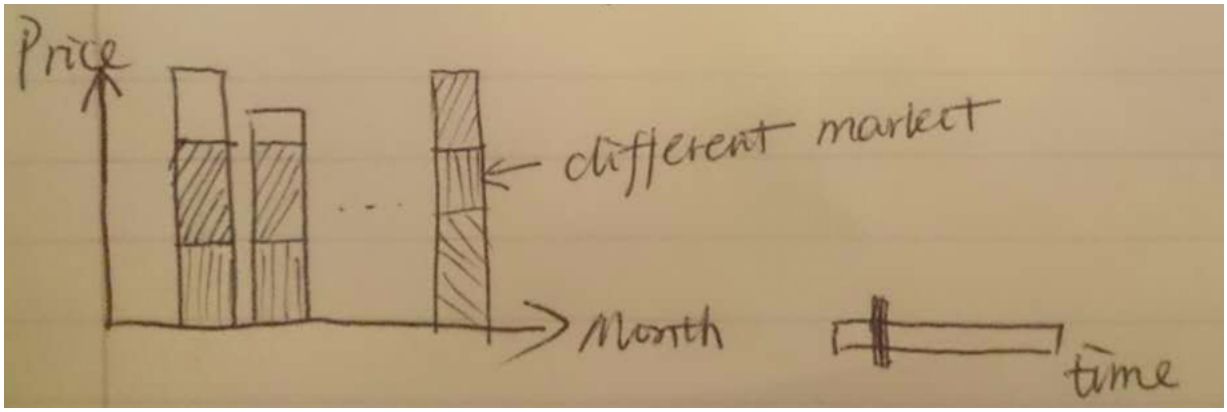

Figure 6: Stacked Bar Charts for Prices at Domestic Markets

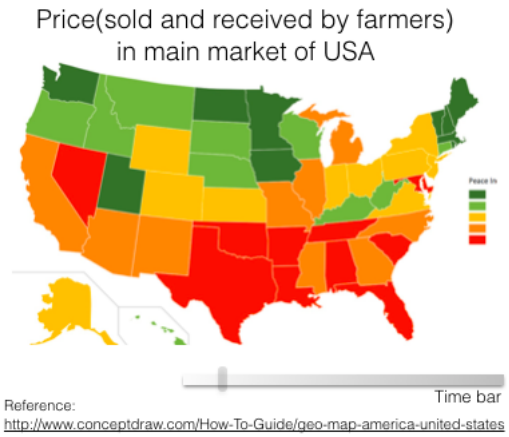

Figure 7: The US Map for Prices at Domestic Markets

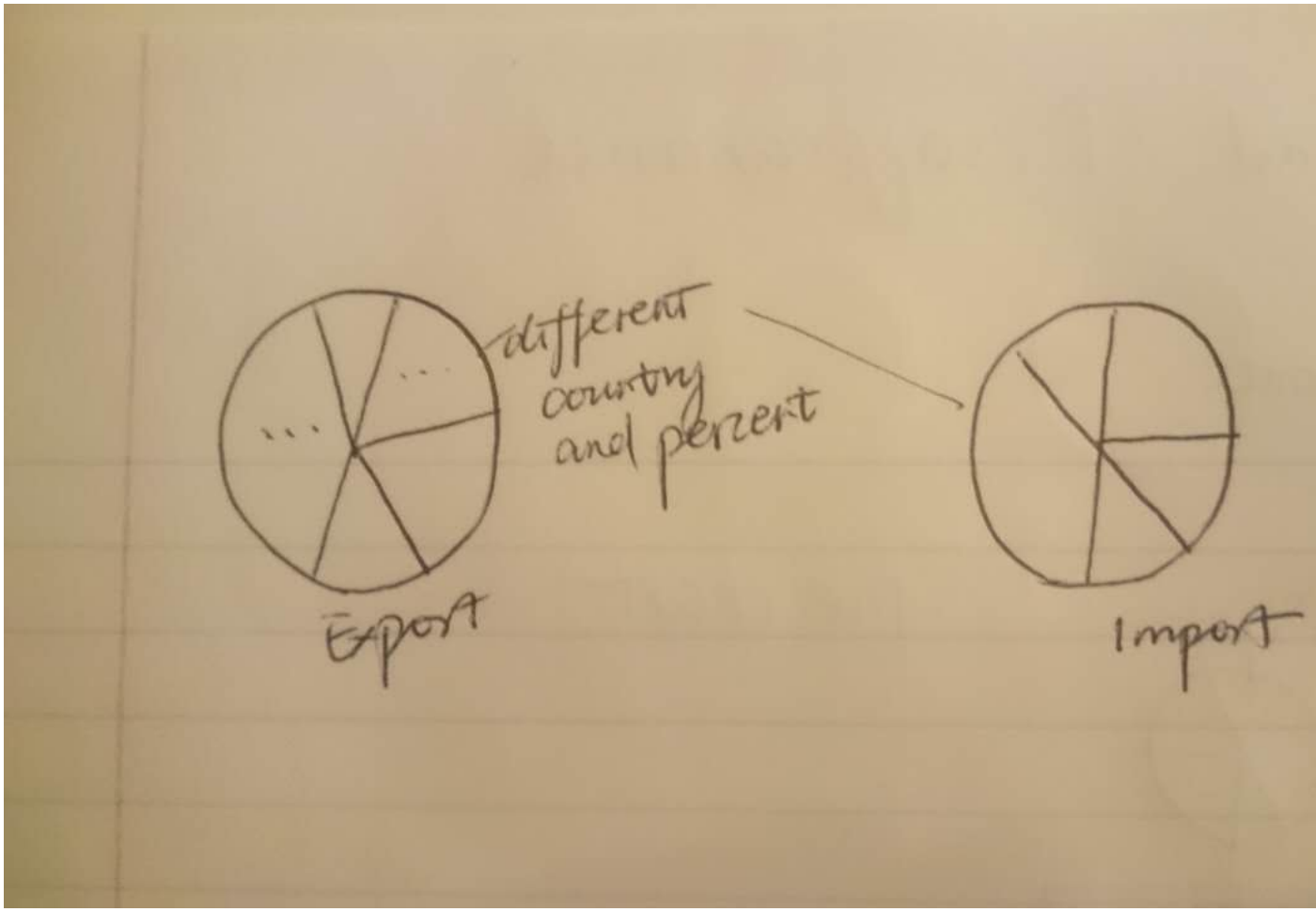

Figure 8: Pie Charts for Exports and Imports

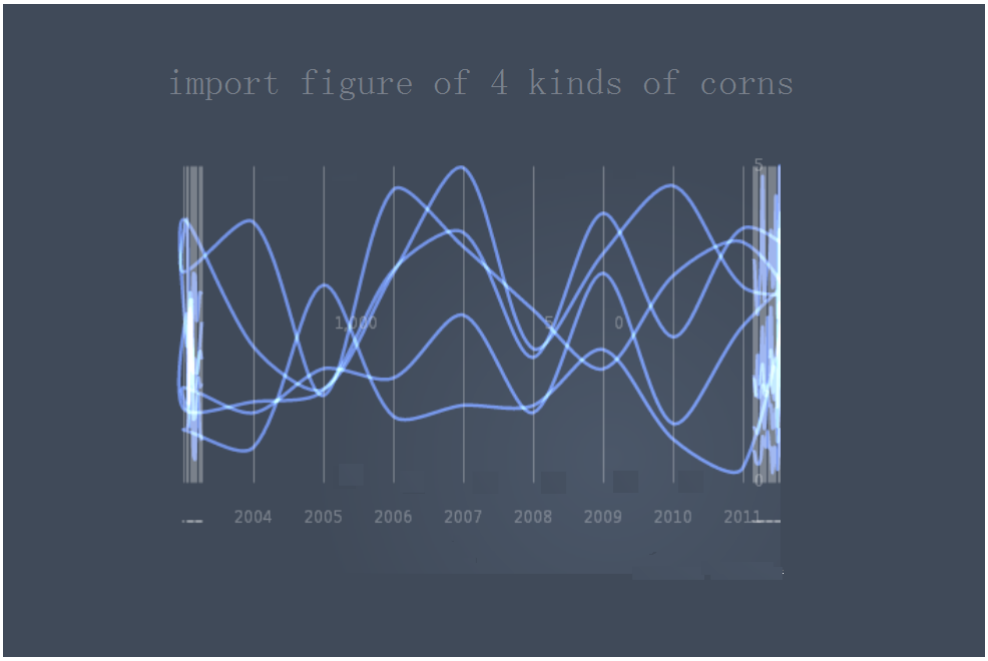

Figure 9: Slope Chart for Exports/Imports

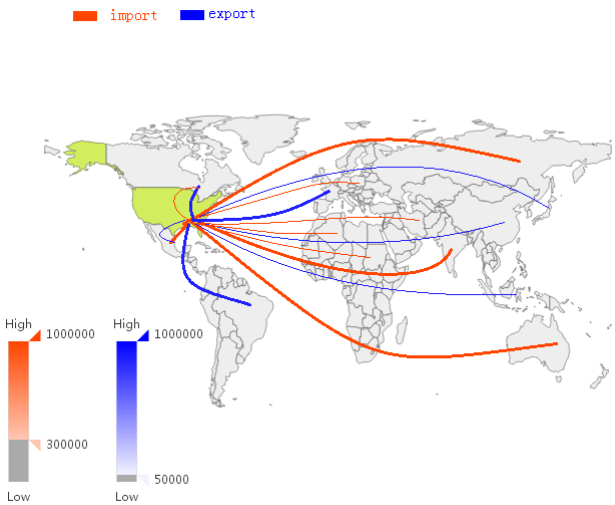

Figure 10: World Map for Exports/Imports