World Population Growth - Narrative Visualization Essay

-Usha Bommasamudram

I have created a project on **World Population Growth** for Narrative Visualization Project (CS416). I have followed **Martini Glass Structure** for this project, there are various components in this project, explained about elements of this project as following.

1.Messaging: (What is the message you are trying to communicate with the narrative visualization?)

Based on the analysis of the world population dataset spanning from **1951 to 2023**, it is evident that while there have been *fluctuations in the annual increments of population growth*, the overall trend has been consistently upward, indicating continuous population growth. Despite fluctuations in growth rates from year to year, *there has not been a sustained period of population decrease on a global scale.*

The first two scenes show how Total population has always increasing over the years and how the increment in population has fluctuations.

2.Narrative Structure: (Which structure was your narrative visualization designed to follow How does your narrative visualization follow that structure)

I have used **Martini Glass Structure** for visualization in this project

1) **Introduction (Home Scene)** – Details regarding the project, links for resources and a button for navigation into Scene One.
2) **Scene One(Total Population Overview)** – Line graph between world total Population and Year for all the years from 1951 to 2023, this gives overview of the dataset with respect to Total population. This slide has Navigation buttons to go to Home or Scene Two.
3) **Scene Two(Population Increment Overview)** – Line graph between increment in Population and Year for all the years from 1951 to 2023, this gives overview of the dataset with respect to Increment in population. This slide has Navigation buttons to go to Scene One or Scene Three.
4) **Scene Three(Interactive Exploration of World Population Growth)** – It is a interactive scene which shows Line graphs same as Scene one and two with desired duration and graph either Total Population / Increment in Population over the years.

The graphs has tooltips and annotations to give more details on dataset. This slide has Navigation buttons to go to Scene Two or Home.

3.Visual Structure: (What visual structure is used for each scene? How does it ensure the viewer can understand the data and navigate the scene? How does it highlight to urge the viewer to focus on the important parts of the data in each scene? How does it help the viewer transition to other scenes, to understand how the data connects to the data in other scenes?)

As mentioned in the narrative structure followed the Martini Glass structure, each scene has different details presented with *annotations*, *tooltips*, heading, small description about the graph, *buttons to navigate*, most of the details are self-explanatory.

I have created scenes which are easy to understand, navigate and explore the graphs, annotations, tooltips provide more information on the dataset. Small descriptions under titles and notes provide the user with more details on how to explore the project.

1) **Introduction (Home Scene)** – This Scene shows an image of people, small description about the dataset, **links for resources** and a button for navigation into Scene One.
2) **Scene One (Total Population Overview)** – This Scene shows a line graph between world total Population and Year for all the years from 1951 to 2023, this gives overview of the dataset with respect to Total population. This slide has **Navigation buttons** to go to Home or Scene Two. This has **annotations** to highlight the trend.
3) **Scene Two (Population Increment Overview)** – This Scene shows a line graph between increment in Population and Year for all the years from 1951 to 2023, this gives overview of the dataset with respect to Increment in population. This slide has Navigation buttons to go to Scene One or Scene Three. This has **annotations** to highlight the changes in the graph.
4) **Scene Three (Interactive Exploration of World Population Growth)** – It is a interactive scene which shows Line graphs same as Scene One and Two with desired duration and graph either Total Population / Increment in Population over the years. The graphs have **tooltips and annotations** to give more details on dataset. This scene has Navigation buttons to go to Scene Two or Home.

4.Scenes: (What are the scenes of your narrative visualization? How are the scenes ordered, and why)

I have followed **Martini Glass structure** so Introduction and **first two scenes are author driven** and non-interactive, these scenes have annotations to understand the scenes, navigation buttons to move forward and backward. **The third scene is interactive** / reader

driven, the user can view the results based on the options he chooses with the duration and graph. This scene has annotations and tooltips which provide more details about the dataset.

1) Introduction (Home Scene):

- **Details:** Introduction about world population data from 1951 to 2023, highlighting details about project.
- **Resources:** Provide links or references to resources dataset, source code and essay.
- **Navigation:** Included a button labeled "Scene One" to proceed to the first scene.

2) Scene One (Total Population Overview):

- **Graph**: Display a line graph illustrating the world's total population over the years.
- **Description**: Describe the graph's significance in providing an overview of global population growth trends from 1951 to 2023.
- **Annotations**: Include annotations at key point to highlight events or factors influencing population changes.
- **Navigation**: Buttons labeled "Home" for returning to the introduction or "Scene Two" to proceed to the next scene.

3) Scene Two (Population Increment Overview):

- **Graph**: Show a line graph depicting the annual increment in the world population over the years.
- **Description**: Explain the graph's role in demonstrating fluctuations in population growth rates over time.
- **Annotations**: Provided annotations to explain fluctuations population increments.
- **Navigation**: Buttons labeled "Scene One" for comparison or "Scene Three" for interactive exploration.

4) Scene Three (Interactive Exploration):

- **Duration Selection**: Allow users to select the range of years in the form of radio buttons **1950-1975, 1976-1990, 1991-2005, 2006-2025, All**
- **Graph Type**: Provided options to switch between Total Population and Increment in Population graphs.
- **Interactive Features:**
  - **Tooltips**: Implemented tooltips to provide detailed information when hovering over data points.
  - **Annotations**: Included annotations to offer insights into overall of the graph.
  - **Navigation**: Buttons labeled "Scene Two" for comparison or "Home" to return to the introduction.

5. Annotations: (What template was followed for the annotations, and why that template? How are the annotations used to support the messaging? Do the annotations change within a single scene, and if so, how and why)

Annotation Structure in Scenes One and Two:

Annotations consisting of a line with an end circle point and accompanying text label to provide detailed information about specific data points or trends in the line graphs like where increasing or decreasing of number in population.

Annotation Structure Third Scene:

Placed annotations in the corner of the graph to provide an overall summary or trend analysis based on user-selected input parameters (duration and graph type).Provided the **tooltip** to explore the desired datapoint in the line graph in this interactive graph.

Opted for a gray color scheme for annotations to maintain visual harmony and ensure they are informative yet not dominating the colors of the graph.

5. Parameters: (What are the parameters of the narrative visualization? What are the states of the narrative visualization? How are the parameters used to define the state and each scene?)

Parameters in narrative visualization project play a crucial role in defining and transitioning between different states of scenes. Here's a breakdown of how parameters are used to define states and scenes in this project:

1) **Parameters for Scene One and Two:**
    - **Graph Type:** Parameter indicating whether the graph displays Total Population or Increment in Population over time (Year).
    - **Navigation Button ID:** Parameter passed when the user clicks navigation buttons (e.g., "Scene Two"), which triggers the transition to the corresponding scene based on the ID passed.

State Definition:

- **Scene One:** Displays a line graph of Total Population over years.
- **Scene Two:** Displays a line graph of Increment in Population over years.

Scene Transition: When the user clicks on a navigation button, the ID of the button is passed as a parameter. This parameter determines which scene should be activated next, transitioning the user to Scene One or Scene Two accordingly.

2) **Parameters for Scene Three:**
    - **Duration** (Years Range)**:** Parameter representing the user-selected range of years to display on the line graph.
    - **Graph Type:** Parameter indicating whether the graph displays Total Population or Increment in Population based on user selection.

State Definition: Interactive scene where users can customize the graph by selecting a duration and choosing between Total Population or Increment in Population.

Interaction and State Change:

- **Graph Rendering:** Parameters (duration and graph type) are used to dynamically render the line graph based on user inputs.
- **State Change:** Changing the duration or graph type updates the state of the graph, reflecting new data and trends. This interaction allows users to explore different aspects of population data dynamically.

3) **Navigation and Scene State:**
    - **Navigation Buttons:** Clicking on navigation buttons triggers a change in the active scene by passing the relevant scene ID as a parameter.
    - **State Management:** Parameters facilitate the transition between scenes, ensuring that the appropriate scene (Scene One, Scene Two, or Scene Three) is activated and displayed based on user interaction.

In summary, parameters such as graph type, duration, and navigation button IDs are used in defining the state of each scene in your narrative visualization project. They enable dynamic rendering of data, facilitate user interaction, and manage the flow between scenes effectively, enhancing the overall user experience and understanding of global population trends over time.

6.Triggers: (What are the triggers that connect user actions to changes of state in the narrative visualization? What affordances are provided to the user to communicate to them what options are available to them in the narrative visualization?)

I have used triggers and affordances in guiding user interactions and communicating available options effectively. These elements are integrated into the project as following:

Triggers:

- **Navigation Buttons:** Used to transition between scenes (e.g., Home to Scene One, Scene One to Scene Two, etc.). These buttons trigger onclick events that execute the necessary functions to change the active scene based on the user's action.
- **Option Buttons (Scene Three):** Enable users to select parameters such as Years Range and Graph Type. These buttons trigger actions that dynamically update the line graph based on user selections. Added Event listeners to handle the actions.

Affordances: Apart from annotations and tooltips to give more information to user about the project following details are provided.

- **Scene Titles and Button Names:** Clearly mentioned title and about graph to indicate the purpose of each scene, providing users with a clear understanding of where they are and what to expect.
- **Text Notifications:** Placed within Scene Three to guide users on how to interact with tooltips effectively, ensuring they are aware of the available functionality.

Important Project Links:

DataSet: https://www.kaggle.com/datasets/maheshmani13/world-population-growth

Source code: https://github.com/ushab2illinois/CS416_Narrative_Visualization_Project

Project URL: https://ushab2illinois.github.io/CS416_Narrative_Visualization_Project/

References:

As part of the development and understanding concepts I have referred to various resources, few of the main websites are

1) https://d3-graph-gallery.com/graph/custom_annotation.html

2) https://www.w3schools.com/

3) https://www.youtube.com/@datavizdad

4) https://www.youtube.com/@d3Vienno

This project has been a good learning experience to understand the concepts of Narrative visualization and practical knowledge on D3.js. Thank you so much for guiding and helping me in learning process.