Fuel impact on Mileage and Environment

Messaging: With this project I am trying to help one choose a car which is environment friendly. The presentation uses data from 2017, including the following fields:

- Make
- Fuel
- EngineCylinders
- AverageHighwayMPG
- AverageCityMPG

Narrative Structure: The presentation follows interactive visualization slide show. The visualization embeds user interactivity on each slide. The visualization communicates the role of fuel type and cylinders on fuel efficiency along with interaction to get more information on the topic.

User interaction is embedded on each scene using:

- Navigation links to other scenes
- Tooltip on mouser over on each chart element
- Option to change parameter on drop down selection
- Links to external resources for further reading

Author led communication on each scene using:

- Messaging is conveyed not just with charts but relevant further reading is provided which user can follow through.
- Annotated charts are used to communicate trends in data and anomalies.
- Animation on charts is used to highlight important data.

Visual Structure: To keep the consistent visual structure

1. Positive trends are annotated in green
2. Negative trends are annotated in red
3. Animations are introduced to highlight the maximum and minimum fuel-efficient cars
4. Links are provided on slides to help user navigate within the scenes, all the links are colored teal in all scenes to bring consistency.
5. External links are provided on each scene for further reading. All the external links follow default HTML coloring for href link.
6. Animations do not start immediately so that the user has time to read the chart and once animation starts it highlights the important details on the chart.

Scenes: Visualization follows user-directed ordering and consists of three scenes, all the scenes follow the similar visual structure to communicate with user, user interaction and navigation.

- Scenes contain annotated charts.
- Every scene has navigation links in teal color for user to go to next slide or previous slide.
- External link to read on any scene is provided as a hyperlink and is placed rightfully near its or related concept introduction.
- Animations are used to draw attention to important details.
- Annotations are used to show trends in data.
- To allow for user interactions, every chart in every scene has tooltip which can be seen at mouse over and disappears on mouse leave event.
- Scenes 2 and 3 contain dropdown to change the Average MPG category parameter.

The **first scene** gives the overview of environment friendly cars based on their average city and highway MPG.

- The chart chosen for this is scatter plot so that entire dataset can be shown in condensed format. Also, because the data for X and Y axes are independent quantitative continuous.
- The most fuel-efficient cars are shown in green and most inefficient cars are shown in red.
- The colors change from green (most efficient) to white (somewhat efficient) to red (inefficient).
- Annotations are used to communicate trends in data and helps in classification based on environment friendliness.
- Animations are used to highlight the most efficient vehicles and environment friendly (electric) vehicles.
- For navigation scene provides “Fuel Based Comparison” link to navigate to the next scene.
- The scene has annotation “Please mouse over individual circle for more details..” to encourage user to hover over the circles on scatter plot for getting more information on the chart data.
- Tooltip is available on mouse over which provides information of car make, fuel type, number of cylinders, average highway MPG and average city MPG.

The **second scene** compares the vehicles using either Gasoline or Diesel as type of fuel. The scene uses 2 charts based on fuel type, the charts depict the impact of number of cylinders on fuel efficiency and by keeping the scales for Y-axis same for 2 charts, it allows user to draw parallels between the fuel types.

- Two charts are coordinated with the parameter Average MPG category.
- The data is sorted based on number of cylinders for easier visualization.
- Charts are color coordinated based on number of cylinders for easier transition from one fuel type chart to another.
- For coloring I used d3.schemeDark2, an array of eight categorical colors represented as RGB hexadecimal strings.
- State of the scene is defined by parameter MPG category; user can modify it using the drop down.
- The drop down is colored orange to provide visual affordance to user and it lists all possible options in the dropdown.
- The scene has annotation “Please mouse over individual bar for more details..” to encourage user to hover over the bar on bar chart for getting more information on the bar datum.
- Tooltip is available on mouse over which provides information on car make, number of cylinders and average MPG.

The **third scene** concludes the role of cylinders and fuel type on car fuel efficiency.

- Top 10 non-electric cars with Average MPG are shown in a bar chart and every bar shows the type of fuel used by the vehicle.
- As the chart shows best of the fuel-efficient cars, I restricted the color to green for positive connotation. The colors for chart range from dark green (most fuel efficient) to light green (least fuel-efficient in top 10).
- Annotation is used to show the anomaly in data from Honda.
- State of the scene is defined by parameter MPG category; user can modify it using the drop down.
- The scene leaves user with further reading section that helps customer find more on Fuel types, cylinders and standards manufacturers have to follow to meet environment friendly scales.
- If the user gets convinced from the presentation and is looking for a new vehicle, scene provides link to best fuel efficient cars rated by SmartWay of the year.
- Tooltip is available on mouse over which provides information on car make, fuel type, number of cylinders and average MPG.

- The scene has annotation “Please mouse over individual bar for more details..” to encourage user to hover over the bar on bar chart for getting more information on the bar datum.

Annotations: Annotations across the scenes depict trends in data and highlights the important details.

- Colors for annotations are kept consistent across the scenes to promote visual consistency.
    - Positive trends are colored green
    - Negative trends are colored red
    - Annotation to highlight data is done using black color.
- Annotations for highlights are performed by a drop line and text associated with it.
- Annotations for showing trends are done using arrows in the direction of trends and corresponding trend information.
- Annotation is shown on every scene to encourage user to mouse over on chart to see more details.

Parameters: The visualization uses Average MPG as parameter to render corresponding charts. Average MPG is a scene level parameter which stores state of the data being presented on the webpage. The state is used as filter on data. The initial state is set to AverageCityMPG and user can modify the MPG category to view data accordingly.

Parameters on scenes

- Average MPG category
    - Scene 2 and 3 have parameter Average MPG category which changes the chart accordingly.
- Scene changing links
    - Every scene has links to navigate within scenes.

Transitions: Visualization provides trigger to modify Average MPG category using a drop-down menu. This user driven input allows for user led structure, is defaulted to one value at the start. The drop down is colored orange to attract attention of the user and it lists all possible options in the dropdown. D3 transitions are added on each chart for user guidance.

<u>Impact of transition</u>

- *Selection of DropDown*
    - User can interact with webpage 2 and 3 using “Average MPG category” drop down to modify parameter Average MPG category.
    - Default value of Average MPG category is set to AverageCityMPG.
    - When any category is modified in the dropdown it triggers callback function changeCategory.
    - It reads the selected parameter and updates the charts accordingly.
        - Scene 2
            - Selected category parameter is passed to both charts on the page which changes Y-axis scale and datum values.
            - Y-axis text also changes based on parameter value.
        - Scene 3
            - Based on selected category parameter, top 10 cars are filtered and rendered.
            - Y-axis scale and datum values will be changes per category parameter.
            - Y-axis text also changes based on parameter value.

- *Click on link to change scene*
    - User can use navigation links on the webpage to interact with the story.

- Scene 1
  - Scene 1 has link to scene 2 as “Fuel and Cylinder Based Comparison”.
- Scene 2
  - Scene 2 has link to scene 1 as “Overview” and to scene 3 as “Conclusion”.
- Scene 3
  - Scene 3 has link to scene 1 as “Start Over” and to scene 2 as “Fuel and Cylinder Based Comparison”.