Final Project Report

CPSC 583 - Winter 2019

Author: Sukhjot Sekhon

ID Number: 30001710

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1 – Introduction

In this project, I present, outline, and reflect on how I progressed through early stages of design to the final visualization. I begin with a dataset of my interest then sketch potential designs using the 10+10 model. With the sketches, I put my ideas into code with several variations and later prototype interaction for the final visualization.

My main goal in this visualization was to learn about how to create information visualizations effectively. Moreover, I wanted to learn how to create visualizations that are powerful and convey a message clearly. Creating a simplistic visualization in which the data speaks for itself was very important to me in the process.

Some conclusions I made concern the importance of going though this multi-stage process. Without going through the stages of sketching, creating variations, and prototyping, I believe my final visualization wouldn't be as effective. By exploring multiple ideas at every stage, I was able to make design decisions more critically. Without this, having narrow focus on one idea, which may not be the greatest, is a more common outcome.

2 – Data Description

The original data set consisted of 16717 rows and 16 attributes. This was reduced to fit the scope of the project to 130 entries and 5 attributes. The final data set includes all games from the years 2014, 2015, and 2016 with a user score and at least 1 million global sales. The attributes in this dataset are name of title, platform (console type), game genre, sales count (global), and user score from Metacritic.

This dataset was published on kaggle.com by the user Rush Kirubi. Rush Kirubi acknowledges that he scraped user and critic scores from metacritic.com and merged it with user Gregory Smith's web scrape from VRCharts.com containing other information.

It would be fascination to see the popularity of different genres by console and view the success of different genres, platforms, and titles. I believe success can be measured as a metric of global sales and user score. Furthermore, being able to draw various correlations such from things such as sales and ranking would be interesting. We can also compare how genres shifted from older versions of platforms to newer ones like comparing PS3 with PS4.

link: https://www.kaggle.com/rush4ratio/video-game-sales-with-ratings/

3 – Design Process

3.1 – Sketch-able Data Subset

The sketch-able dataset consists of 23 entries from the original dataset containing 130 entries. I aimed to obtain data from different genres, platforms, and years so that the subset is diverse. My methodology was to take the top two entities with the most global sales from each genre, platform, and year. Although there are 7 genres, 6 platforms, and 3 years, some of these entries were duplicates so they got removed. One issue with this dataset is that for each year, not all consoles and genres are captured. However, I believe this was a good dataset capturing the key data features without being overly large for ideation.

3.2 – Design Direction in Sketches

My design direction was to create my initial ten sketches as diverse as possible to have more varied options to explore when selecting the best design. I wanted to encode multiple variables in these sketches while keeping them as simplistic as possible. It was also important to me in my design to make these sketches be able to be expanded to and work in an interactive environment. A lot of colors are present in my sketches, so it is evident that I believe colors are good at encoding my data as well as making it visually pleasant.

3.2.1 – First Ten

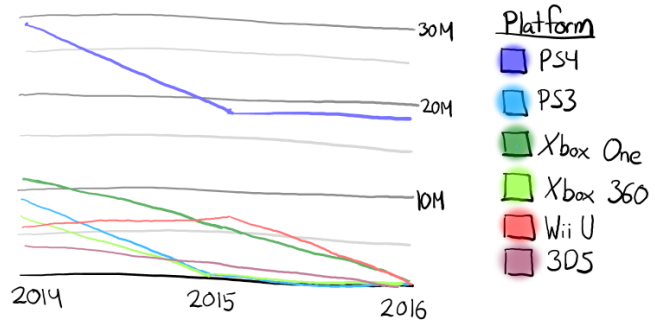
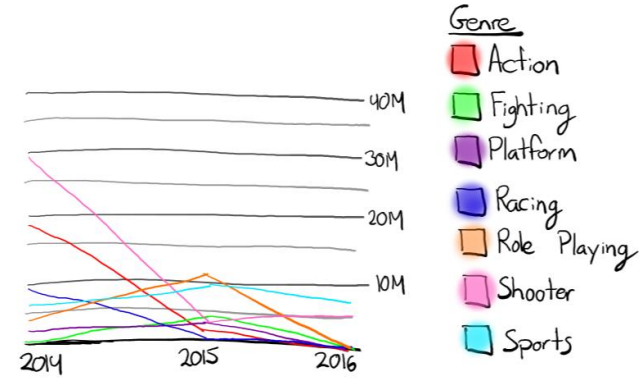
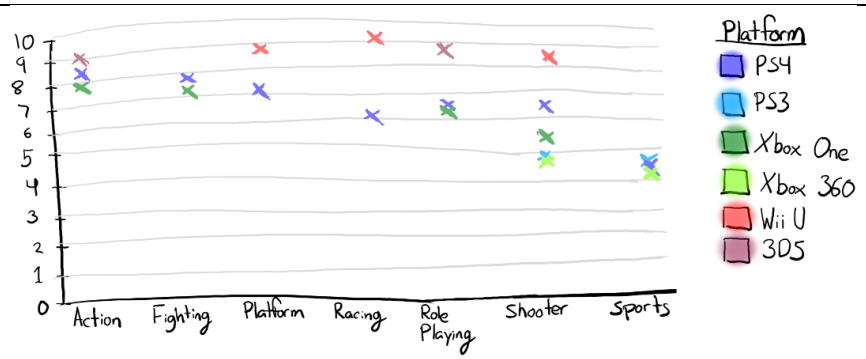
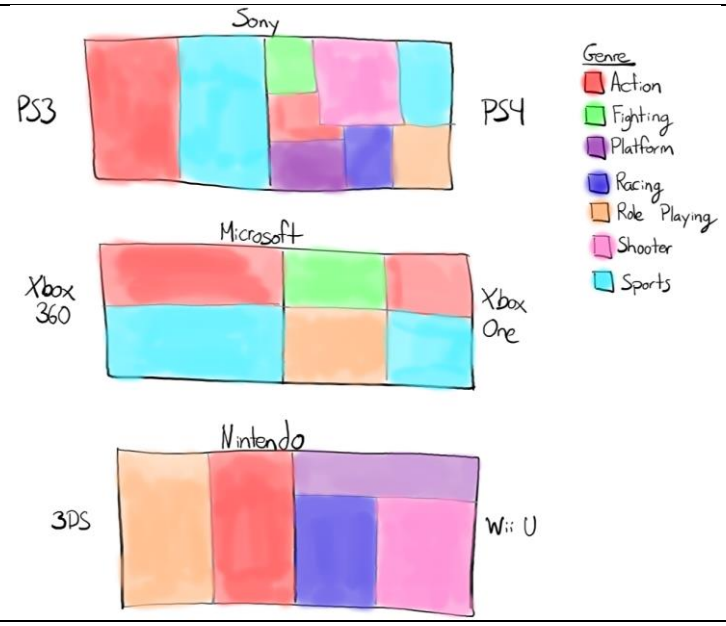
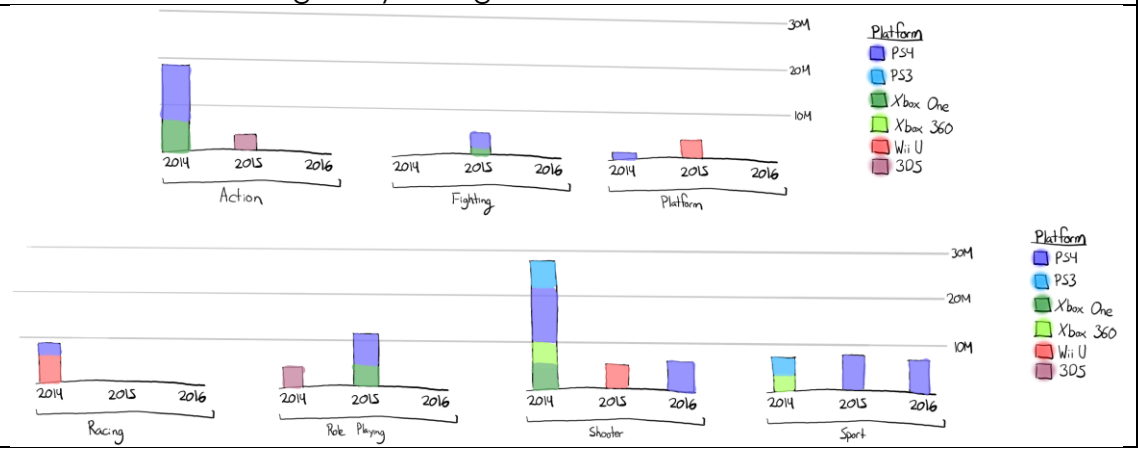
Figure 1	
	In this sketch, I visualized the popularity of different platforms with a line chart.
Figure 2	
	This visualization is similar to figure 1, but it illustrates the sales of genres by year.

Figure 3	
	In this sketch, I show how different platforms perform in different genres by their user ratings through a scatter plot. Retrospectively, should have used a bar chart.
Figure 4	
	This visualization aimed to show the distribution of different genres by console by using a treemap. Additionally, I show how the genres in different console manufactures changed by their generation.
Figure 5	

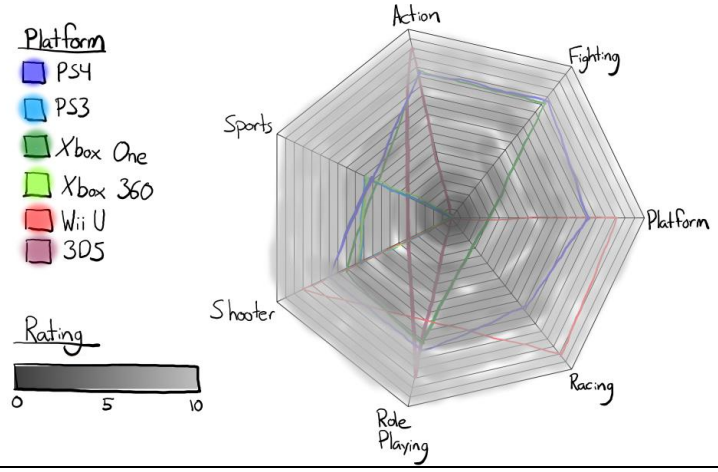
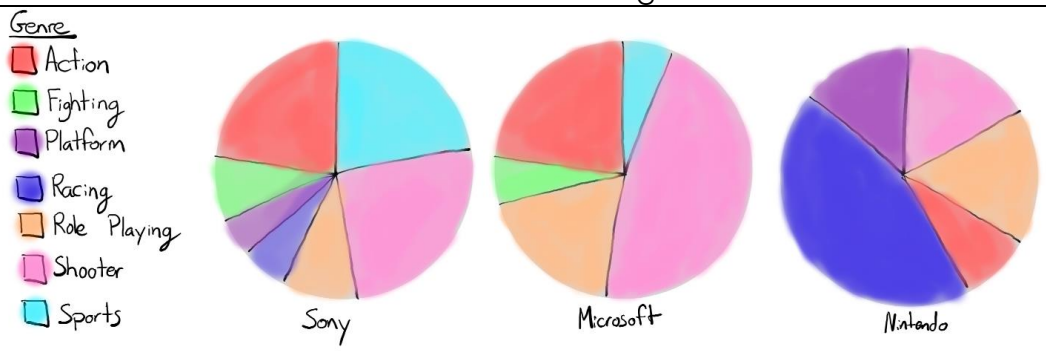
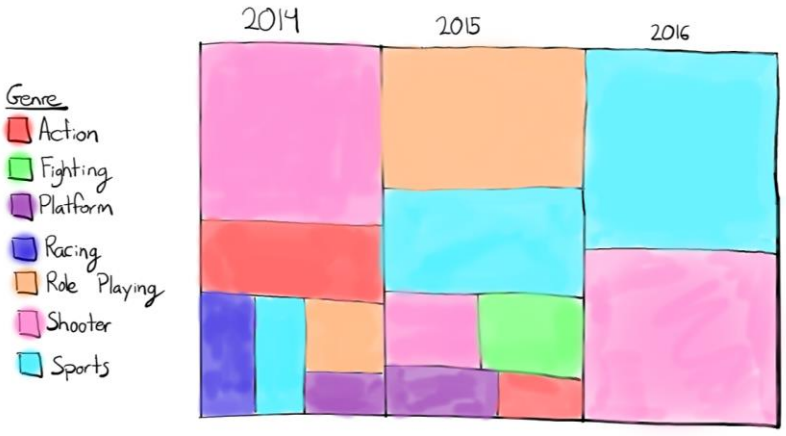
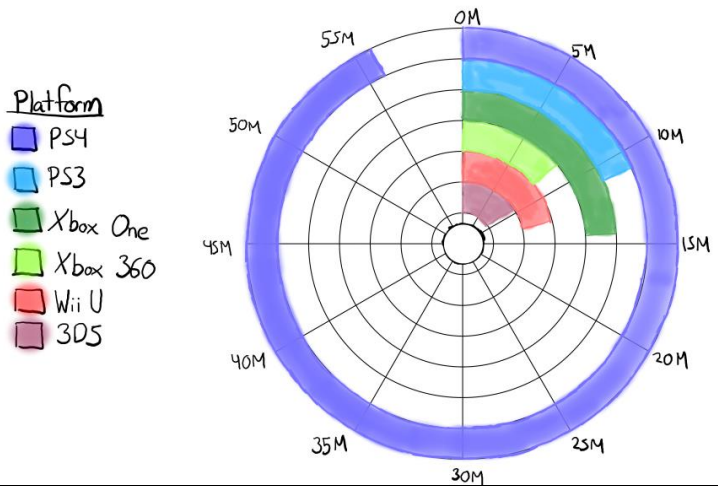
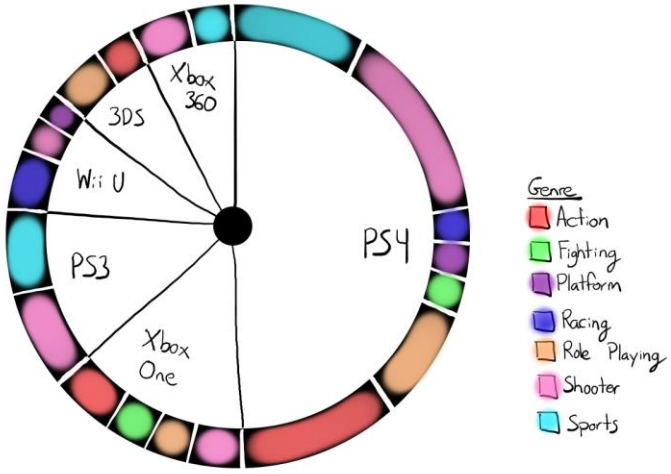
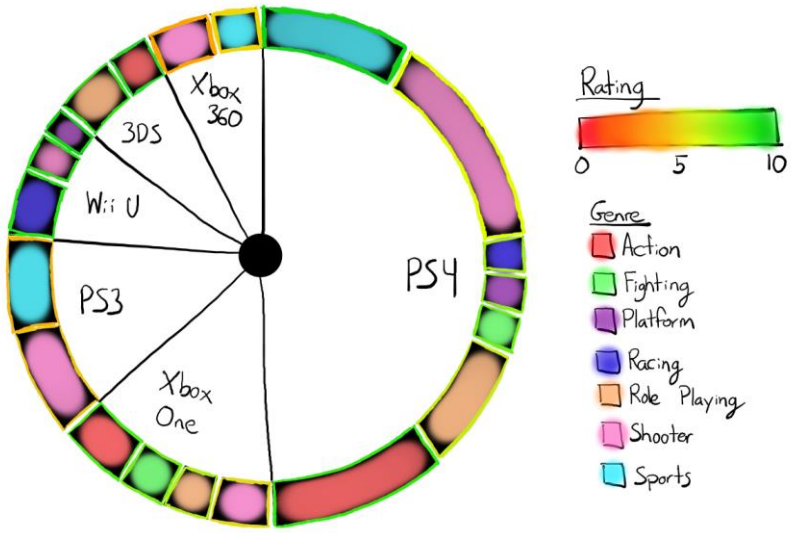
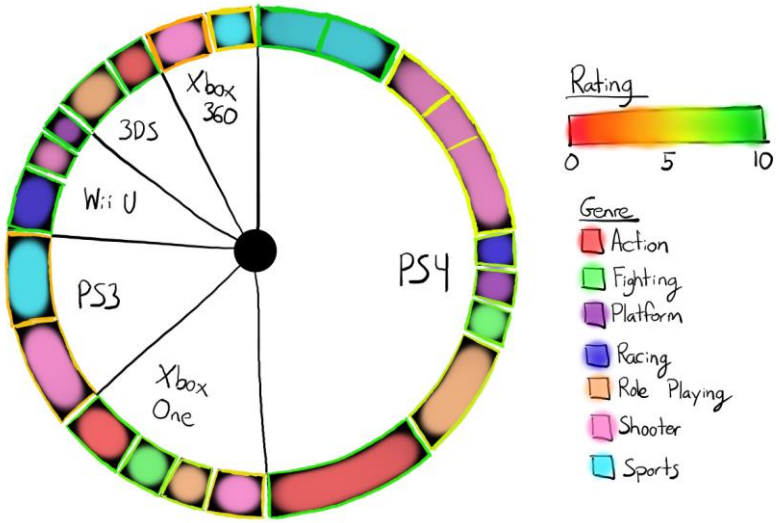
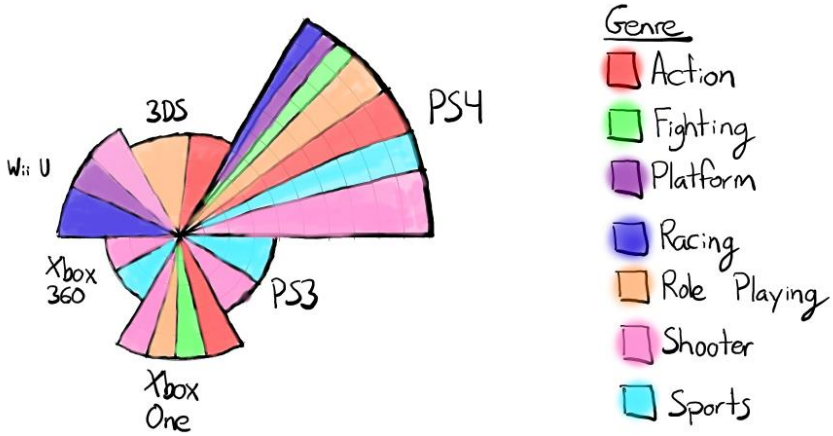
	In this sketch, I show the popularity of consoles per console per year through a stacked bar chart. I found this interesting; However, I found the design to be too large.
Figure 6	
	For this sketch, I show the average rating of different genres by console using a radar chart. I believe that this sketch was great; However, I think I could have used a better method to show the ratings.
Figure 7	
	This sketch shows how popular different consoles are per console manufacturer.
Figure 8	
	I used a treemap to show the popularity of different genres by year.

Figure 9	
	This radial bar chart shows the success of different platforms by sales.
Figure 10	
	This is the visualization was developed further and was inspired by a sunburst chart. This shows the popularity of different consoles as well as the popularity of different genres per console. A lot of data can be encoded into this design and looks like a disk.

3.2.2 – Second Ten

Figure 11	
	This shows the ratings per genre as a colored outline.
Figure 12	
	Similar to figure 11 but different entries of games are split (for interactive design).
Figure 13	

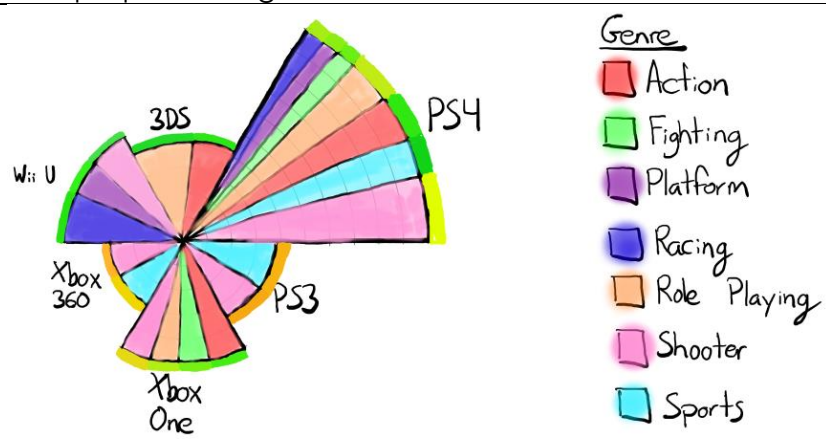
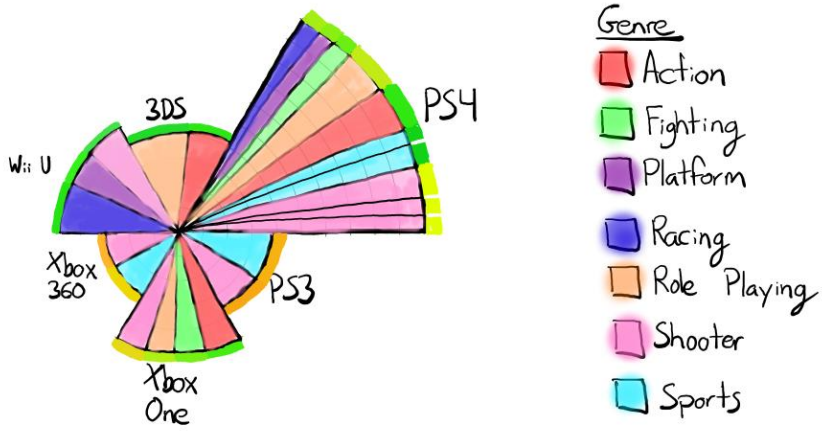
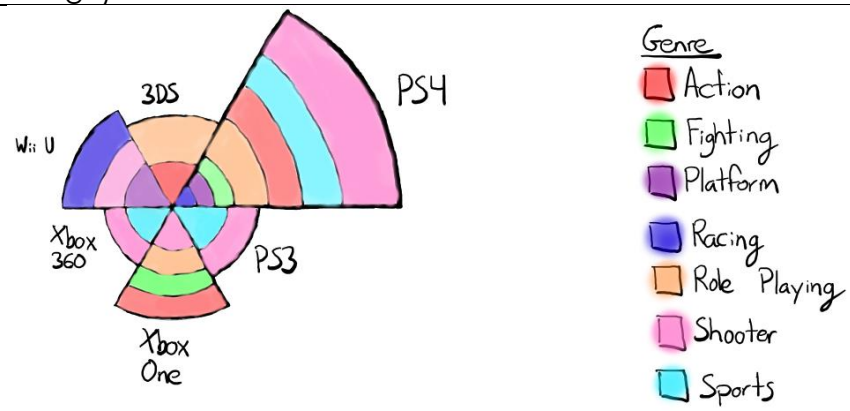
	This visualization is a variable radius pie chart based on console popularity with proportional genres.
Figure 14	
	Similar to figure 13 but ratings of different genres are shown as a different layer.
Figure 15	
	Similar to figure 14 but different entries of games are split (for interactive design).
Figure 16	
	Similar to figure 13 but genres are split radially rather than perpendicularly.

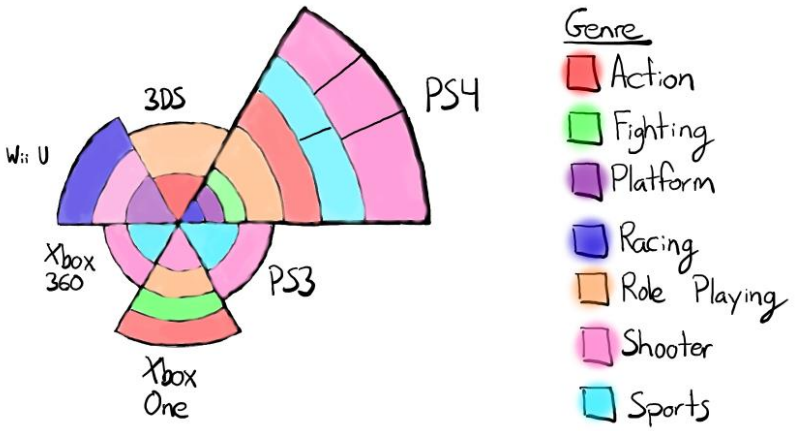
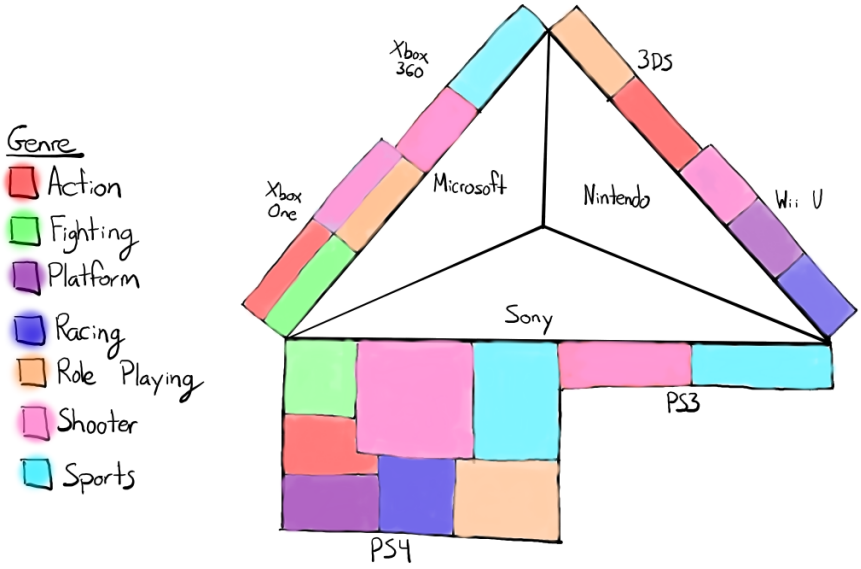
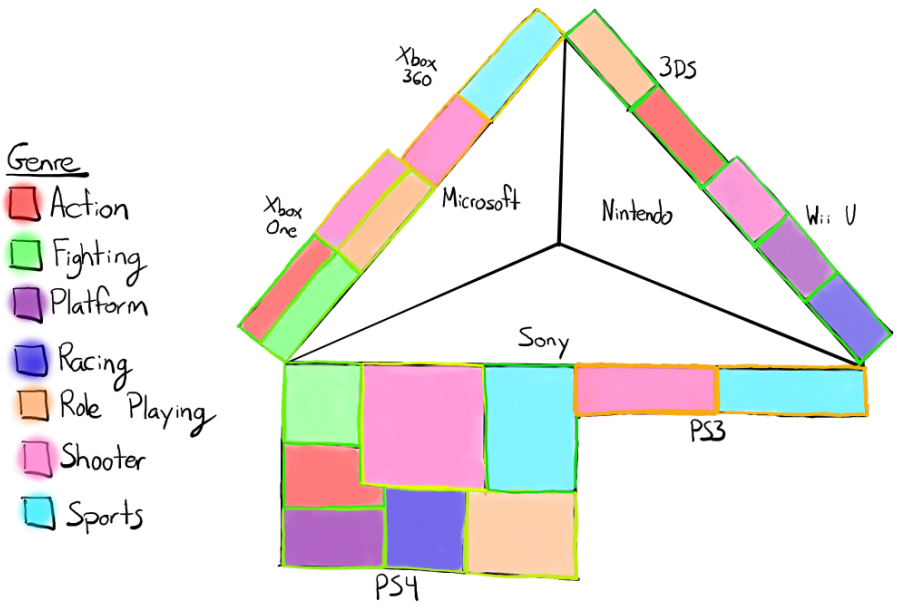
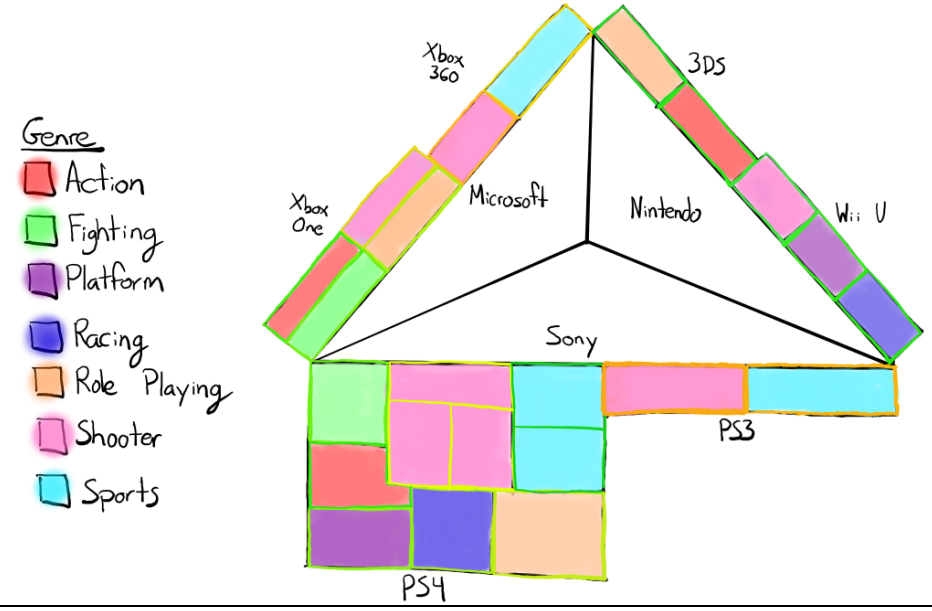
Figure 17	
	Similar to figure 16 but different entries of games are split (for interactive design).
Figure 18	
	This triangular design build on the previous designs but had some improvements and drawbacks. Different consoles by one console manufacturer can be compared more easily (e.g. PS3 vs. PS4). However, comparing across console manufactures is more difficult. A treemap inspired from figure 4 is used here in which the height of each console represents its number of sales, so everything is proportional.

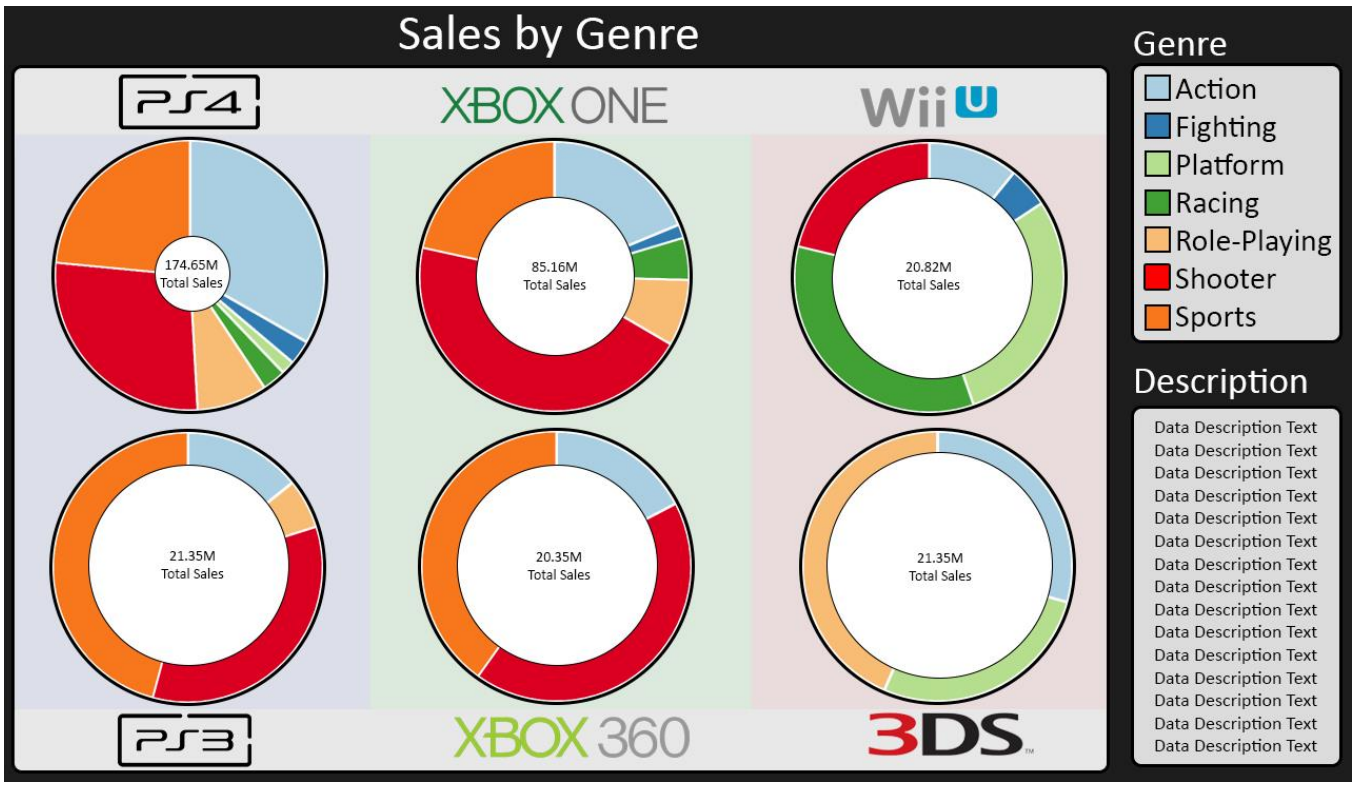
Figure 19	
	Similar to figure 18 but ratings per genre are shown as a colored outline.
Figure 20	
	Similar to figure 19 but different game entries are split (for interactive design).

3.3 – Process

The initial ideas came from using Tableau with the sketch-able subset to grasp the dataset as well as exploring diverse visualization options. Although the initial visualizations were more traditional designs from Tableau, it was important to me to get more creative in the next stages of my process. Using a tablet allowed me to get more creative than I would on paper because I had the ability to undo changes. I tried to have my first ten sketches be as varied as possible, so that I have more unique designs to choose from in the second ten.

Please see descriptions from each figure to see a more step-by-step version of my process and different themes I explore within the dataset.

3.4 – General Design Direction

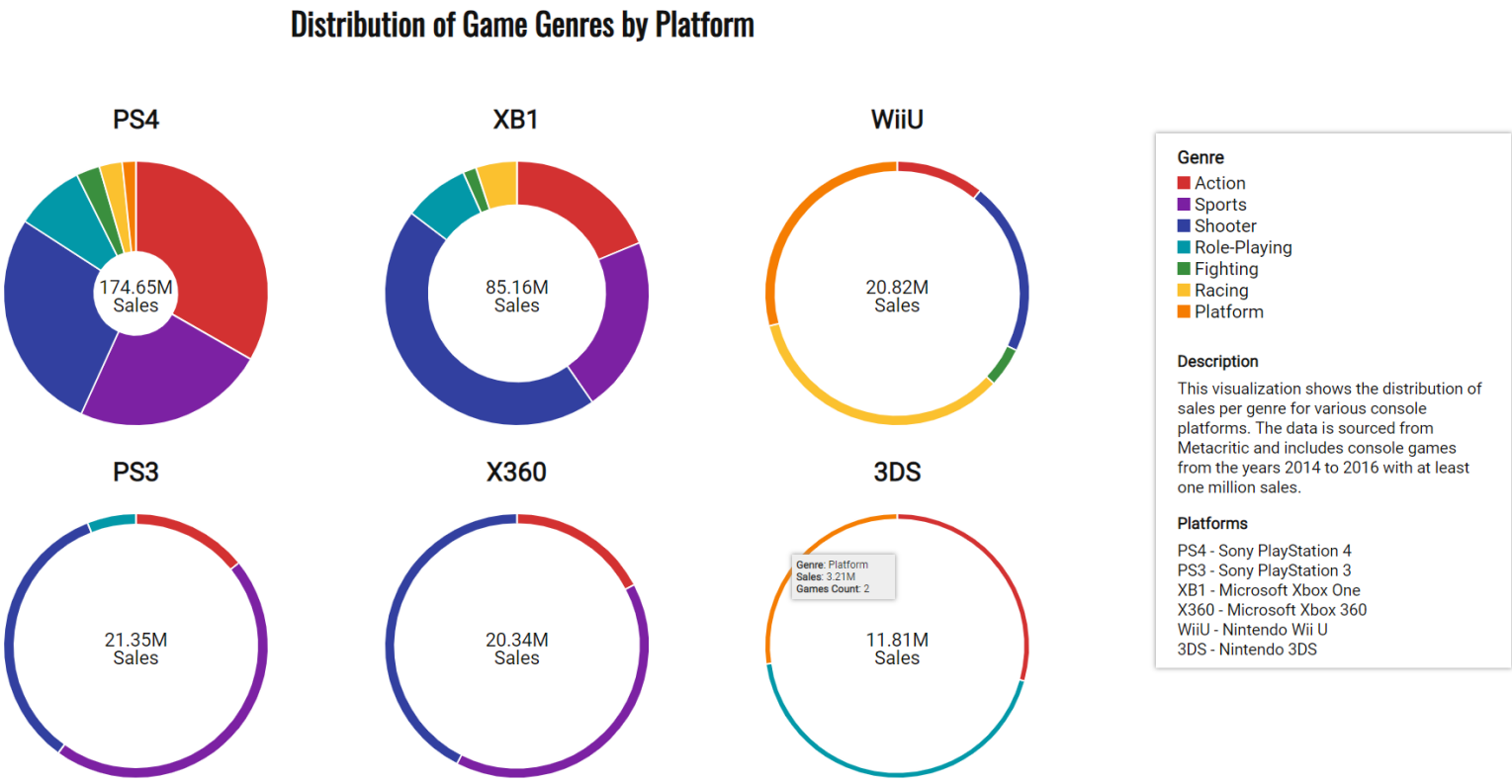


Many design concepts come from Figure 10 with small multiples and using donut charts. This visualization uses small multiples of donut charts representing each console platform. The thickness of each donut chart is determined by the total number of sales for the given platform. Each donut chart is divided into sectors with their size determined by the number of sales per genre. Furthermore, genre determines the color of each sector.

After learning about small multiples, I slightly modified my approach in creating this more legible PhotoShop sketch. I believe that using small multiples makes it much easier to read, compare, and interact with the data in the visualization. Another new idea I had was to use donuts instead of pie charts. By doing this, I could display the total number of sales by area. Additionally, I like this design because donuts look like disks for console games which improves the overall artistic theme. I decided to make use of this area to have text to show the total number of sales. The ordering of console platforms is categorized by having predecessor consoles directly below their newer versions. Although many elements are shared with some of my 10+10 elements, I believe adding small multiples and using donut charts vastly improves the design.

3.5 – Prototyping Variations

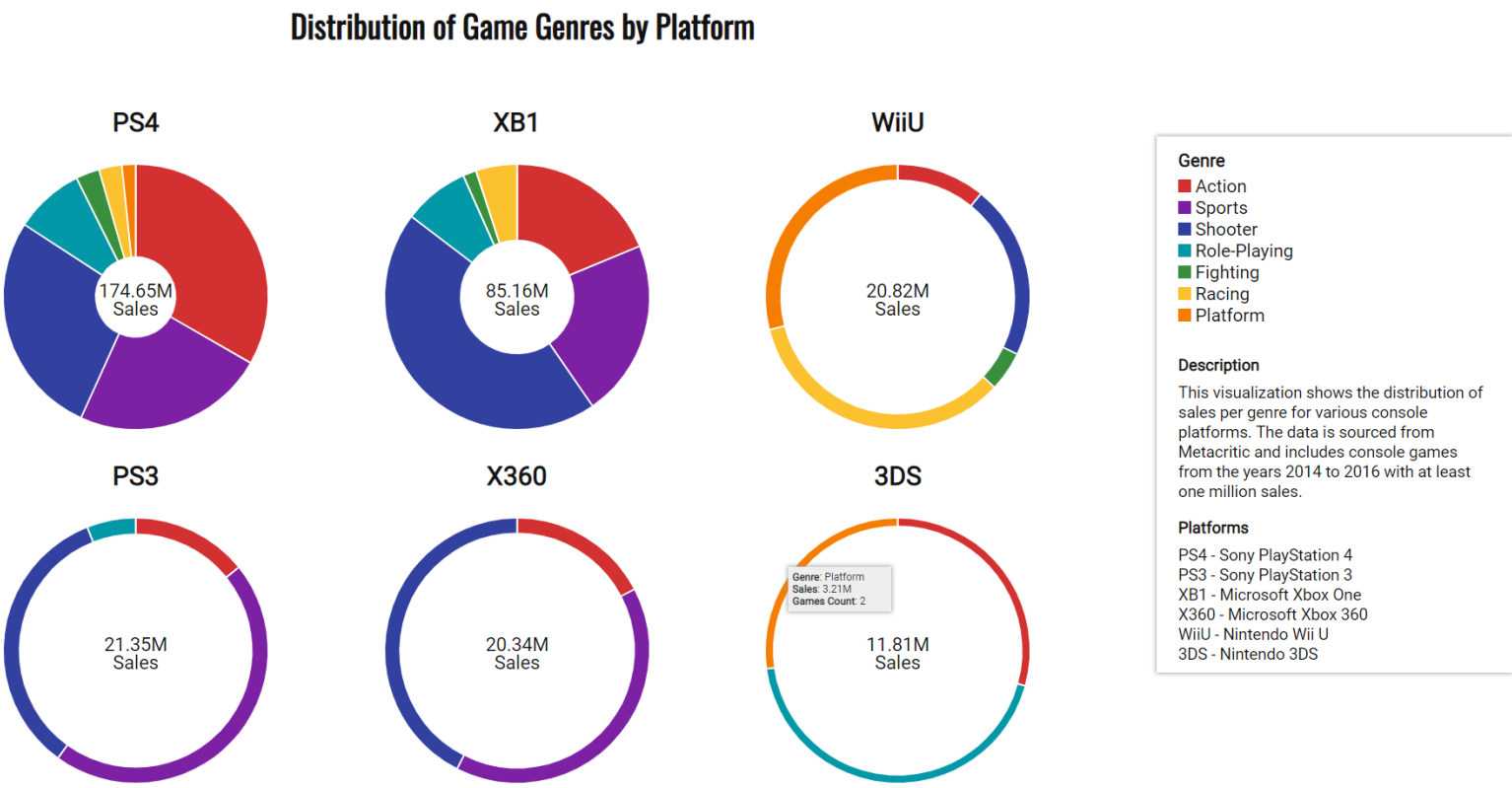
3.5.1 – Variation A



Link: https://pages.cpsc.ucalgary.ca/~sukhjot.sekhon/CPSC%20583/Project%20Variation%20A/

The general concept of this design was to recreate a prototype image from my design direction containing the base components as well as tooltips. Note that the area of the sectors is directly proportion to the number of sales. This highlighted some very apparent design flaws regarding the usability and legibility of the design due to thin sectors for some console platforms. Usability is impacted because the small sectors are difficult to interact with. Legibility is impacted because it is difficult to read the color for these small sectors which represent genre.

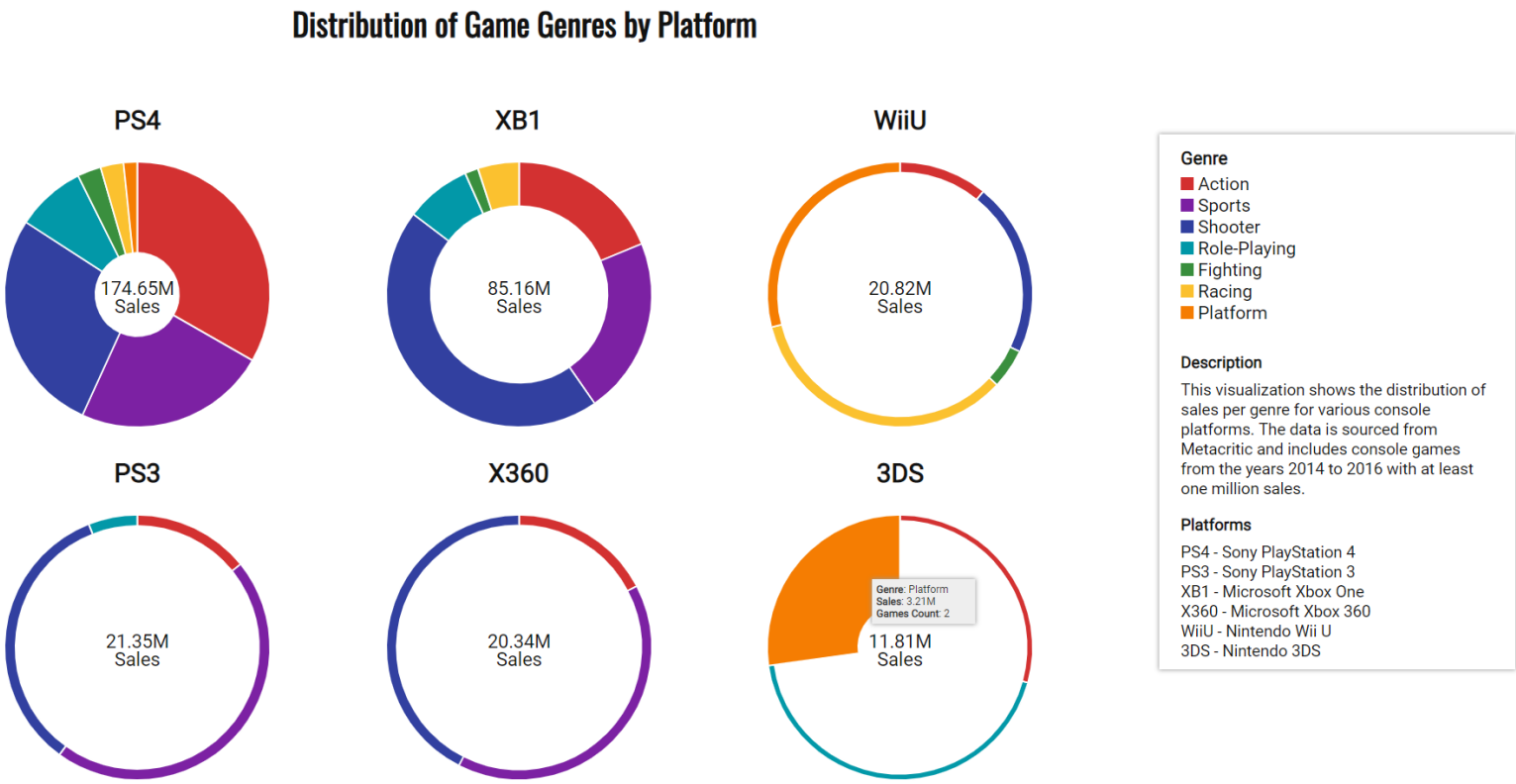
3.5.2 – Variation B



Link: https://pages.cpsc.ucalgary.ca/~sukhjot.sekhon/CPSC%20583/Project%20Variation%20B/

In this variation, I made a modification to address issues with the variation A by making the sectors thicker. Without getting into technical details, I used non-linear functions to make the size of smaller sectors bigger such as the exponential function. While the usability and legibility issues are improved, this means that the area of the pie sectors will no longer be directly proportional to the number of sales. I believe this improves on the design of variation B with its usability, but is slightly deceptive as area no longer correlates with sales.

3.5.3 – Variation C



Link: https://pages.cpsc.ucalgary.ca/~sukhjot.sekhon/CPSC%20583/Project%20Variation%20C/

This variation vastly improves on the design on variation A and variation B. I made sectors have sector be expandable to a fully extended one to improve its usability and legibility while retaining accuracy. The sector expands when hovering over the area of the sector which will allow for a much larger area to interact with via clicking or tooltips and have more legibility of color. Most importantly, the accuracy of the area of sectors being proportional to the number of sales holds true which is a vast improvement on variation B.

3.6 – Implementation Process

The main challenge I faced with this design is the large difference between the lowest selling platform to the highest selling. Initially, I did not expect this difference to be as significant, but after creating variation A, this immediately became my primary concern if I wanted to proceed with this design. Although when I created my first variation, I was hesitant on continuing with this design, I think I was able to find a good way to overcome these issues.

Variation A: I calculated the radius by computing a formula that could make the thickness of a donut chart's sectors correlate with total sales. This was found to be a radius of (totalSales / (maxSales - minSales) * (maxRadius - minRadius)).

Variation B: I explored non-linear functions such as log and exponents to scale the thicker sectors down, which effectively makes the thinner sectors thicker. I ended up using radius$^{1.1}$ which works because the value for PS4 is retains a lesser percentage of its original value compared to 3DS.

Variation C: I tried many different design ideas that allow the area to be more usable and legible. The idea I liked the most was expanding the interactive area and enlarging the sector when on interaction. This was accomplished by having a transparent version of a sector that is triggered to appear and transition when hovering.

3.7 – Final Static Design

I follow the design of variation C in my following work.

Secondary view:

- For interaction, my goal is to be able to click on sectors and load a secondary view which illustrates the sector in more details. Some additional information I would want to show includes title names and ratings since this is not shown on the primary view. I aim to have tooltips on the secondary view to show even more information such as the title, sales, and rating. Furthermore, color could be used to encode ratings (green to red) instead of genres, which will require a legend.

Since I have implemented some additional components such as tooltips, descriptions, and legends for my primary view when prototyping different variations, I will describe the decisions I've made.

- Tooltips: I've decided to make every sector of the donut chart have a tooltip. These tooltips show the genre, sales, and games count. Although the genre is shown in the legend, I believe this removes an additional step if someone wanted to observe a specific sector. My decision for adding total sales was that although people have approximation of the total sales, using values makes things more quantifiable. Finally, games count is used to show how many games exist for a given platform/genre combination which can be used to see average sales.

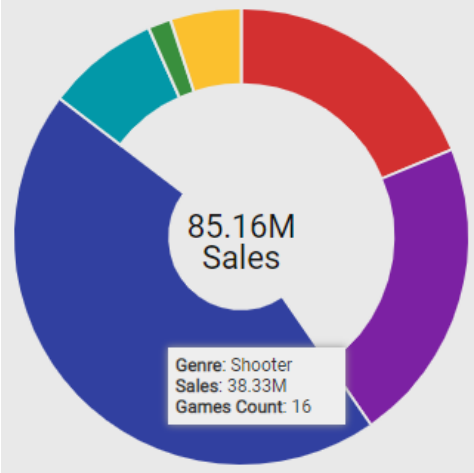
- Description: In the description, I share information on the dataset. This is important because the dataset is restricted in that not encompass every game created. Furthermore, I also added a section which shows the full names of console platforms with their abbreviated forms which are shown in the charts.

- Legend: The legend used is self-explanatory. Since each genre is encoded by color, a legend is necessary for making these links.

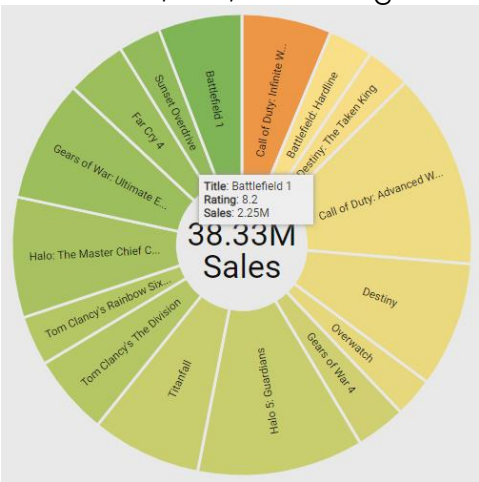
3.8 – Prototyping Interaction

Tooltips:

- The primary view has a tooltip appear when hovering over any sector. This sector shows genre, sales, and games count.



- The secondary view has a tooltip appear when hovering over any sector. This sector shows sales, title, and rating.



Navigating between Screens:

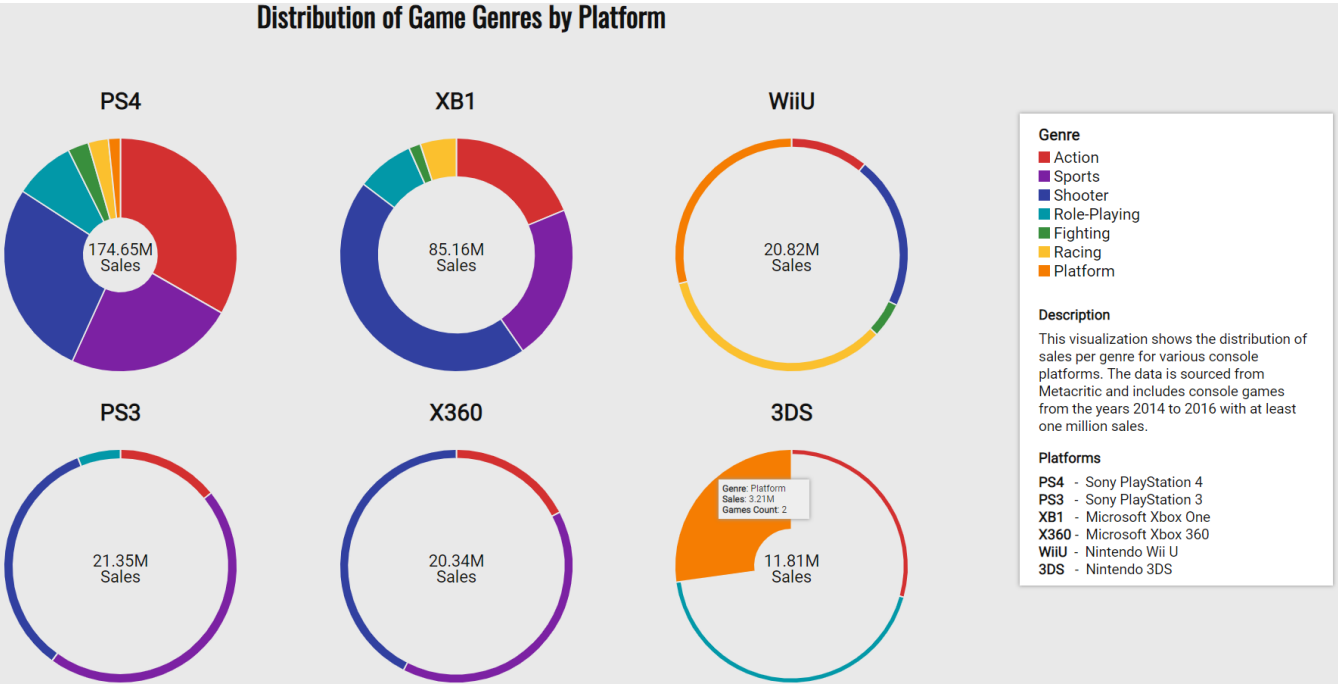
- Click on any sector to go to the corresponding secondary view. To go back to the primary view, any part of the screen can be clicked.

Expanding sector for improved interaction:

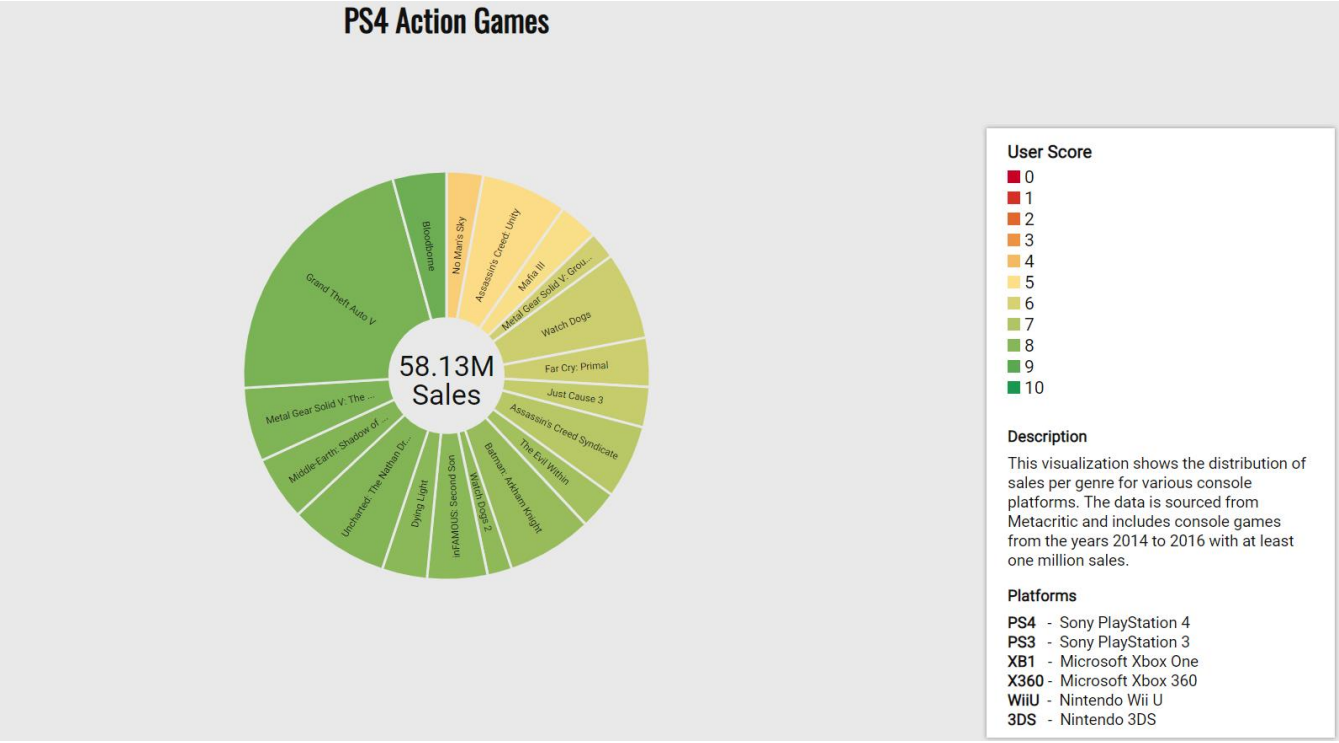
- For the primary view, a sector expands when hovering near it allowing for more area to be used for tooltips and navigation.

4 – Final Implementation Visualization

Primary View



Secondary View



Link: https://pages.cpsc.ucalgary.ca/~sukhjot.sekhon/CPSC%20583/Project%20Final/

The first image shows the view for the primary view while the second image is for the secondary scree. I will be breaking down the use-case scenarios for each of these screens:

Primary View:

- To get an overview for the distribution of genres per platform. This may be interesting for a viewer because it may be a good decision to buy a platform based on genre preference.
- Observe how the trends in video game genres have changed through time. This is possible because while older consoles are on the bottom row, their successors are on the top.
- To see the success of various platforms and genres as a function of their global sales count. This is easy to do since area of sectors is proportional to sales.

Secondary view

- View what games a specific console-genre combination has to offer. If a person is interested in buying a PS4 action game, they can use this as a catalog.
- Observe the success of various games as a function of both its sales and ratings.
- Inform the viewer on the ranking of games. This is easy to do because of the ordered chart as well as the intuitive coloring scheme.

4.1 – Process Reflections

Primary View:

- I will recap how my considerations for interaction impacted my final visualization as mentioned in sections 3.5 and 3.6. Visualizing the dataset in code made me realize the impact of the large difference between the lowest selling platform to the highest selling has on intractability. The reason this was an issue is because I wanted to have area be directly proportional to sales. Therefore, I had to devise a way to allow the small sectors to be assessible to the user while hopefully keeping proportionality intact. The design that I found to be the most appropriate is having expandable sectors to allow for more accessibility.

Secondary view:

- Initially, I did not have text for title names over sectors and this information was only displayed on tooltips. Later, I realized that the secondary view isn't particularly user friendly as someone may want to either see all title names at once or be searching for a specific one. Afterwards, I resized the donut chart to accommodate for the length of most title names. Since some title names were truncated due to their length, I kept the tooltip component to allow the full title name to be read.

- Although I think that having the donut chart's inner radius be altered such that sales are encoded by area, I wasn't sure if this is a good idea for the secondary view. I decided against doing this for two reasons. The first reason was that I would not be able to show title names in sectors since slices would generally be thinner. The second reason is that the benefit of having variable inner radius comes from comparing multiple donut charts. Since the secondary view only has one donut chart, there is nothing to compare this to on the same view.

Reflection:

- I believe spending more time considering interaction during the 10+10 design process would be more beneficial. In doing this, designs that have limited interaction capabilities or have limitations are more likely to be discarded. Additionally, by considering interaction, it is easier to distinguish information that is presented dynamically via interaction versus static elements.

5 – Discussion

Next steps with this design (with more time/resources):

- For the secondary view, the legend could be changed to a continuous scale since the sectors of the donut chart are colored based on a continuous scale. This would better reflect that the coloring is continuous to the user. Additionally, this would allow for a more compact design which I think would look aesthetically better.

- For labelling platforms, use a combination of the platform's logo (see section 3.4) as well as text. Logos stand out more than text and are more recognizable for those who are familiar with them. However, text should also be included for those that are less familiar with these consoles.

- Implement a slider on the bottom of the page so the user can see general trends over time. Additionally, a dataset with a broader scope could be used to show older platforms.

- Include filters for only viewing information based on a specific platform or genre. This allows for more customization which a user may be more interested in.

- Improve the overall theme, layout, and styling of the page. This could also be used to show additional information such as grouping consoles by platform together by background color like my image in section 3.4 for general design direction.

- Make it the transition from the secondary view to the primary view more intuitive. Although I believe most people would know navigate this, a button may be slightly more intuitive.

Alternative designs (advantages and disadvantages):

- For the secondary view, using a scatterplot may have been better in certain aspects. A benefit would be that scatterplots can present more information since I could encode sales with the y-axis, ratings with color, and the title with tooltips. The a-axis could be used as bins for different years or regions in which the title is sold. The reason why I believe this would be an improvement is because I think the secondary view doesn't show enough information. A drawback of doing this would be that the title names would only appear on tooltips rather than directly on objects.

- The primary view could also be replaced by a scatterplot. The reason why I chose against this was because my goal was to create a visualization that is immediately intuitive and is minimalistic. Additionally, I want the primary view to be used as a general overview while the secondary view is for showing additional information. The benefits of a scatterplot would be to encode more information as mentioned above. Although this would not have the drawback of not displaying title names, it goes against what I envisioned the purpose of the primary view to be.

Further learning:

- Since learning D3.js for this project has allowed me to create visualizations more effectively and efficiently, I could learn other JavaScript libraries. These could help me with processing data, animation, and the improve the overall quality of any future projects.

- I could improve my skills by learning concepts and principles of good UI design. I believe I will become better equip to design UI after taking an HCI class.

- My skills and sense for webpage styling is limited and this is an area I could spend more time learning. While this is not an immediate focus of mine, I believe a can learn this with more experience.

6 – Conclusion

Overall, I am satisfied with the final visualization I was able to produce. In the beginning of this semester, I wouldn't be confident in creating this visualization using D3.js. After learning the fundamentals of D3.js and exploring examples, I was able to create simple visualizations. As I progressed with this project, I was forced to learn new concepts which allowed me to create more elaborate visualizations. For instance, achieving expandable sectors was a challenging learning experience which strengthened my technical skills. My problem solving and decision-making skills were also tested, and I am happy with the decisions I've made. Although some paths I've taken were slightly misguided, I was able to correct these while keeping my primary goals in mind.