Market Trends in Gaming

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ABSTRACT
We have developed a visualization tool that aids game developers in the earliest stages of their projects. Because developers can often face difficulties when proposing new ideas to publishers, we have designed our application to clearly display relevant historical market data to more financially-cautious companies.

Keywords
D3.js; Javascript; Visualization; Video Game Development; Dot Chart; Reviews; Sales; Genres.

INTRODUCTION
One of the more important steps in the process of game design is drafting a document that explains a designer's ideas or innovations; these ideas must be presented to publishers. Because publishers' interests tend to lie in financial gain and stability, it is often the designer's onus to sell an idea to them (Moore, "Intellectual Property and the Prisoners Dilemma: A Game Theory Justification of Copyrights, Patents, and Trade Secrets"), and because publishers need good reasons to invest in a project, prospective developers must provide motivating factors that indicate a safe investment, such as competition with rival publishers, consumer interest, and safe selling points (Zhang, et al. "Been There, Done That: The Impact of Effort Investment on Goal Value and Consumer Motivation"). Visualizations can be powerful tools for proposing ideas to businesses (Zheng, "Data Visualization in Business Intelligence"), and we believe that our visualization can directly help designers' efforts by displaying relevant historical data to the parties interested.

PROJECT DEVELOPMENT
Without a doubt, the greatest setback that we faced while developing the project was the amount of time we had to work on it. We had previously spent a comfortable amount of time on an entirely different project before we felt that it was not developing in any meaningful direction. As such, we abandoned all progress on the original, leaving less than a month for us to work on this new project before our deadline.

Once we started, we found a dataset online containing critic and user scores, sales numbers, and release years for video games as recorded by the review aggregate site Metacritic (Kirubi, *Video Game Sales with Ratings*). We then set to work developing the visualization in an online environment using the JavaScript graphics library D3.js (Jain, "Data visualization with the D3.JS JavaScript library") in addition to HTML/CSS.

After reviewing different styles of visualizations, we settled on a dot plot to represent the data. This was ideal for medium-range datasets (Yankov, et al. "Dot Plots for Time Series Analysis") like the one we used and allowed us to clearly display outliers, clusters, and trends within the data.

We developed a user interface that allows users to choose which data to display. Upon selecting games within given genres and from given publishers, users can select the types of data that they are interested in, such as critical reception or sales numbers.

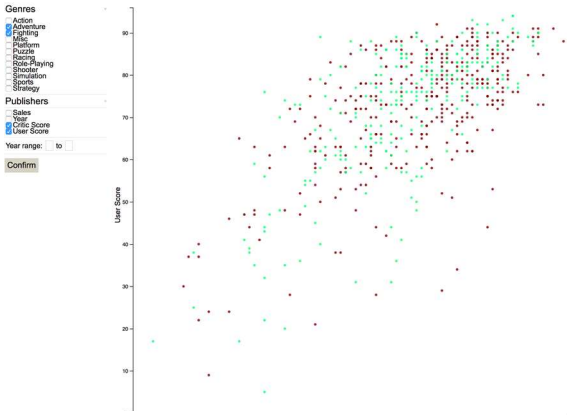

Figure 1. An example visualization comparing critic/user scores within the adventure and fighting genres

Once the user confirms their selections, each set of fields is passed to the relevant D3 functions in arrays which are parsed using traditional JavaScript and D3 data functions to eliminate the unwanted data from the data variable (Bao, et al, "Visual framework for big data in d3.js"). Once this is done, the object is finally drawn to the screen. Users can hover their mouse over individual points to display detailed data on the selected game.

RESULTS
Overall, we are pleased with the outcome of the project, considering our limited workforce and the time that we had to complete it. The data is useful and interesting, and the

application's accessibility provides broad usefulness for those interested. The color-coded data is easy to work with, and both it and the interface make immediate sense to users.

There are certainly issues with the application, some of which are a result of the data used. For example, it is likely that some points within the dataset are skewed as a result of "review bombing" on Metacritic. This term refers to a large group of users, organized or not, submitting negative scores for a game or games. The practice most often occurs with popular games, particularly entries in long-running franchises, or with games that faced controversy upon release (Kuchera, "The Anatomy of a Review Bombing Campaign."). Another skew that we noticed involves user ratings for some family-oriented games and for licensed products in beloved franchises. Many of these have fairly high user scores despite poor reception from critics, leading to uncharacteristically wide divides between audiences that the games are ostensibly aimed at and the critics reviewing them.

In a way, these outliers actually end up working for the purpose of the visualization, as they show what many users are looking for in their games, as well as what they don't like. Developers can therefore measure the worth of their proposed games and draw conclusions about how similar games will be received.

Unfortunately, we were not able to resolve every issue that we experienced along the way, nor were we able to implement every proposed function. For example, the project is not as interactable as we would like. We had hoped to implement a zooming function to clarify visualizations that involve particularly large value ranges. We also encountered an issue in which the tooltips that appear beside overlapping data points would not display. In addition, we had intended to provide the ability to select a range of years over which to display the data. Finally, we had hoped to implement a moving average line over the dot plots in order to aid users in comparing different sets of data.

CONCLUSION

The video game industry is a hugely complex one, with genres and franchises rising and falling on a near-annual basis. Because of this, we hope that we have been able to provide a useful tool to guide prospective developers through it all. As a whole, this application provides a clear representation of complex and sometimes controversial data for personal and professional applications. Had we had longer to work on it, we certainly would have been able to produce a more robust final product, but as it stands, we are certain that we can help people in the ways that we set out to help them.

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