Reordering minigames with personalized Recommendation System

Background & Problem Statement: Our project is based on the game results data from 166 players in the Elm City stories game. Our goal for this project is to apply analytics tools to help the game developer of Elm City Stories generate useful insights in understanding real-life behavior based on the user data and provide suggestions for further research setting. Our project and subsequent recommendation will limit to mini-games that examine players' skills such as refusal power and know sense etc.

Methodology: To gain useful insights on the game results, we aim to apply both data analytics and data visualization tools to perform exploratory data analysis on the sample data. As we did EDA, we observed low game-participation of players in the higher grade stories due to the inherent time-consuming nature of this sequential game and overall low average performance in knowledge sense minigame. Insufficient game input causes barriers for researchers to predict players' real-life behavior. Therefore, we propose a collaborative filtering recommendation system learned from the current sample to recommend mini-games that are most educational for each student based on the game performance shared with similar players as them. With this system, we aim to provide personalized game line in order to achieve a steeper learning curve instead of spending 16 hours completing the full game, and to enable researchers to collect insightful real-time data on behavioral information. Regarding how to evaluate players' learning extent for each minigame, we propose a feature of struggle level:

$$Struggle\ Level = 3 - \frac{Total\ score\ of\ each\ minigame}{\#\ Attempts\ of\ each\ minigame}$$

Evaluation: To build our recommendation system, we splitted data based on their grades in the game as in the nature of this analysis is predicting/ recommending future behaviors based on their game progress. We first hold out the 8th to 12th grades' records of the 5 players who completed the full game as the test set and we place the 7th grade's records of them as well as all the rest players' whole performance in minigames in the training set. With the prediction given by the training set in terms of which areas these players struggled at, we managed to recommend a set of prioritized minigames to the players in the test set that they can start from 7th grade based on these 5 players' 7th grade performance. The results of the test set present to be personalized, and we observed steep learning curves in priority sense and people sense as we compared the original performance and generated performance from our recommendation system.

Conclusion & Application: Based on the result of offline evaluation, we discovered that a personalized game design can be used to optimize a player's learning curve and help researchers to collect player's data more efficiently.

Reference

Blatsios, Spyridon & Ioannis, Refanidis. (2019). An adaptation and personalisation methodology for Serious Games design. 10.13140/RG.2.2.25266.45763.