

Develop Troop Strength Metric of Playing Strategic Video Game

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Abstract

The project displays on how to use clustering methods to help study Environmental Science when playing the strategic video games. The main focus is on Phase II where in the game, soldiers attack nearby weaker opponents. The objective of the game is to create kingdoms, produce resources (wood, stone) to build castles and then form an alliance to defeat enemies. Therefore; the main question is “how to build a powerful troop/castle”? First, we need to know the types of troops needed to build a castle. In phase II, there are up to 45 types of troop units which are mostly used for attacking and defending. There are seven characteristics for each troop unit which are Melee/Range Defense, Melee/Range Attack, Travel Speed, Looting Capacity, and Food Consumption.

The objective of this paper is to introduce an advanced multivariate statistical methodology for advancement through the Empire 4 Kingdoms strategic video game. A novel Troop Power Index (PI) is derived that captures the objective of developing a powerful troop army and expanding the size of one’s own kingdom. The Power Index applies specified weighting coefficients that consider how to build a powerful troop army which can both attack and defend well, have good looting capability and speedy travel capacity, and minimize food consumption. After the PI was established, the following were considered (1) summation/ weighting of the untransformed PI, (2) Z-Transformed PI, and (3) Non-Parametric transformed PI, in order to reduce the variance bias and the impact to outliers among the seven troop characteristics. Approaches (1) through (3) were compared to determine their unique characteristics in the distribution of relative PI ranks among the troops.

Next, supervised clustering based on power index (4 clusters) and unsupervised JMP hierarchical clustering were used (8 clusters) to select the top vital few troops from each cluster based on PI ranking. The Non-Parametric method was assessed to be the best model to optimize the troop units since most of the troop characteristics were highly skewed. The troop types considered fit to the Kingdom Expansion Strategy were reduced from 45 to 15, therefore, based on the Non-parametric Troop PI Ranking. In future work, Transfer Function Sensitivity Analysis may be explored within the Troop Constraints in order to further optimally select the troop units to meet the current Kingdom expansion strategy.

Keywords

Statistics, Multivariate, JMP, STEAMS, Environmental Science, Hierarchical Clustering

Biography

Logeshwari Chandramohan is a student at Wilcox High School. She is an avid Chess Player and In-line Skater, and her current research interests are well aligned with these passions. She is planning to conduct 3D-motion physiology experiments and/or leverage published meta-analyses in Sports Analytics to characterize risk-factors and prevention strategies for In-line skating injury. She also continues to pursue additional project work in the application of statistics and advanced analytics to improve playing performance in the strategy game Empire 4 Kingdoms.

Mason Chen Mason Chen is a gifted Student in Stanford University OHS. Chen is a certified professional of IBM SPSS Statistics, Modeler Data Miner, JMP STIPS, and IASSC Black Belt. He has published more than 50 conference proceedings papers since 2017 including ASA, ASQ, IEEE... Chen presented Chocolate Paper in 2018 JMP US DS and won the 1st-Place contributed paper award. Chen is currently concentrating on “Computational Biology” research in Sports Analytics and Human Immune fields.