Proposition of PageRank based Decision Support System to Detect Bad Players in the MOBA Game

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Abstract. The MOBA game service is the one of the most interested game genre today. In MOBA games, the collaboration of team members and team strategy are vital elements together with the individual player's control capability. Thus bad players showing abnormal plays or appearances in games with embedded malicious intentions are surfaced as an important issue for the service providers. Several systems had been presented to cope with such players but it still would be difficult to judge each player through such systems. In this paper, the PageRank based decision support system to find and judge bad players will be presented. The presented system will use the numbers of player's reporting, numbers of each player's being reported by other players, and numbers of game participation to generate the Judgment Points and Bad Player Marks of each player to build up the Bad Player Ranking which could be helpful to search bad players in the game.

Keywords: MOBA(Multiplayer Online Battle Arena), PageRank, Decision Support System

1 Introduction

The on-line game market has been growing continuously. Above the existing MMORPG (Massively Multiplayer Online Role-playing Game) genre and the Real-Time Simulation ones, the newly appeared MOBA (Multiplayer Online Battle Arena) games are now on the stage. Especially, the 'League of Legends' from Riot Games, Inc. [1] became the new leader in e-Sport by prevailing, the big market of North America, China and Korea. 32 millions of people around the world watched the League of Legends World Championship Season 3 via on-line streaming and TV including 8.5 millions of simultaneous viewers.

However, the big challenge to the rapidly grown MOBA games is the quality of the game degraded by bad players. Basically, the architecture of the MOBA game was designed to get victories through individual characters which have been grown on the team strategy and collaboration of participants. Thus players ruining the collaboration of team members or using vulgar terms should be regulated by limiting chances to join the game or imposing appropriate penalties. Service providers of such games

have been proposed several approaches to the regulation but still finding bad players in games and making right judgment on them remain as a difficult problem.

In this paper, the PageRank based decision support system to find bad players in MOBA games will be presented. The more important page, the basic idea of the PageRank System, is the page having more links to other sites than other pages because it was more important than other pages, and it was designed to generate Judgment Points and Bad Player Points of players that the Judgment Points of players having higher Bad Player Marks to be decreased, and the total Judgment Points of players would remain unchanged but the effectiveness of the judgment on other players based on the Judgment Points would be decreased in proportion to the number of reporting of bad players.

In this paper, the MOBA game will be introduced briefly, and the PageRank will also be introduced along with the decision support system derived therefrom.

2 MOBA Game

The genre of online game like MOBA is currently dominating the market of online game with the growth of DOTA (Defense of the Ancients) and LOL (League of Legends). Games of MOBA are called AOS (Aeon of Strife) or ART (Action Real Time Strategy) which are types of the game managing Real Time Strategy originated from the Aeon of Strife, the use-map in the Star Craft. Basic configuration the MOBA game was designed to destroy the core base of opponents by defeating opponent's players over the defenses consisted of soldiers called Minions and fortress towers by mobilizing various combination of selected 3~5 hero characters respectively. Fig. 1 shows typical formation of the map, small circles is the location of fortress towers. Neutral monsters are normally arranged inside the triangle placed in the middle of the map to help the growth of heroes [2].
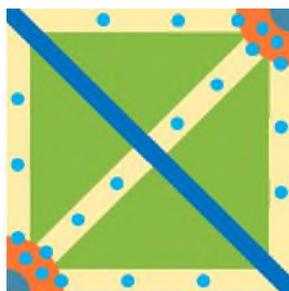

Fig. 1. Typical map of MOBA games

Hero characters selected by players have various properties and skills and are nourished by the level-up from growing and with combination of the items. Items can be purchased with moneys created by defeating opponent minions or opponents' heroes, neutral monsters. Along with this victory, the experience marks required for the level-up also increase. The experience marks or moneys also increase with the

incidents of providing aids to capture opponent heroes depending on the scheme of games and some games allow corresponding buffs for predetermined period of time when special neutral monster are captured. Experience marks or items are only applicable to each only game. There can be mutuality between hero characters but the critical key to the victory of the game will be the player's control capabilities and collaboration of team players. The advantage of the MOBA game would be the rapidity in getting the consequences compared to existing MMORPG games therefore players would not spare much on-line time to foster characters. Thus the player's proficiency of the game and control capability, and collaboration of team members will be the essential key to success instead of nourishing characters by playing longer times and contrary to MMORPG, player do not need to invest much time to gather moneys and items for they will be vanished when games are terminated. It is also different from RTS games required the production of various units to solve strategic problems because the MOBA games require only one character in playing the game. In MOBA games, heroes can be configured according to various story-telling corresponded with player's preferences thus players can select characters freely.

3 PageRank

The PageRank is the basic algorithm in the Google search engine developed by Larry Page and Sergey Brin as a part in their study searched the new search engine [3]. It is an algorithm based on the observation that pages which are more important would be linked with more sites so the pages linked with important pages may have more importance than the other pages. The PageRank assumes the model which queries and searches pages called 'Random Surfer' arbitrarily and the final rank of each page is derived from a certain convergence of all weighted linked pages to respective particular rank value. Each page has its own weight, and values which are the division of the weights by the number of links connected to each page are delivered. Equation (1) below is the expression for the page rank calculation.

$$(1)$$

Let *Bu* is the set of pages pointing to page *u*, *v* is element of *Bu*. *PR(u)* and *PR(v)* are rank scores of page *u* and *v*. *L(v)* is the number of links from *v*. Then rank score of page is determined by the set of links indicating the page and it is divided by the number of links from it and the divided values are added to each value of the linked pages.

4 Proposition System

In this paper, major features of the system are the 'Judgment Points' and the 'Bad Player Points'. The Judgment Points' are determined by the number of games played per each player and player's Bad Player Points and the Bad Player Points are determined who was reported as a bad player by the other player.

User's Bad Player Points is created by the Judgment Points of the players who reported user as bad player and affects user's Judgment Points. The Judgment Points are configured by the average number of reporting and the time of game playing of the player and player's report time. Total Judgment Points of a player can be obtained by the equation (2) below. The *Pt* denotes the number of game playing time of the player, and the *Nr* denotes the average number of game playing time per one report of all players, and the *BP* is the own Bad Player Points.

$$ (2) $$

The value of Bad Player Points is the sum of *JP* divide report time of players reported other players as Bad Player. Let *Ru* denotes the set of other players who reported the player as Bad Player then the value of Bad Player Points of the player can be obtained by the following equation (3). *JP(k)* denotes the value of *JP* divide report time of the other *k*th player who reported the player as Bad Player.

$$ (3) $$

The ranking of Bad Player can be determined by the value of Bad Player Points, and the player having higher ranking can be considered to have a bad career in the play of games. The value of Judgment Points of one player applicable to other players varies in accordance with the number of reporting and the value of Bad Points, thus it was presumed to support the reasonable decision making.

5 Conclusions

The decision support system to find and identify bad players in MOBA games is presented in this paper. The most concerned factor for normal players to get the victory in the MOBA game would be team strategy or team work along with personal skills. If such games ruined by bad players fail to attract further players to join in then the service providers would suffer a big loss. All the more, it would also be quite difficult to cope with every report generated over million times in a day. Thus it was assumed that the ranking system presented in this paper which exploits the value of Bad Player Points would be quite helpful to control bad players in such games. It was also presumed that the presented system can be applicable to other on-line games such as MMORPG.

References

1. Riot Games, Inc. http://www.riotgames.com.
2. Pobiedina, N., Neidhardt, J., Moreno, M. D. C. C., Grad-Gyenge, L., Werthner, H.: On Successful Team Formation: Statistical Analysis of a Multiplayer Online Game. 2013 IEEE 15th Conference on pp. 55-62. In Business Informatics (CBI) (2013)
3. Page, L., Brin, S., Motwani, R., Winograd, T.: The PageRank citation ranking: Bringing order to the web, (1999).