Entertainment Computing 25 (2018) 71–83

Contents lists available at ScienceDirect

Entertainment Computing

journal homepage: www.elsevier.com/locate/entcom

Analyzing player networks in Destiny

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ARTICLE INFO

Keywords:
Social network analysis
Game analytics
Multi-player
Destiny
Player network
Behavior analysis

ABSTRACT

Destiny is a hybrid online shooter sharing features with Massively Multi-Player Online Games and first-person shooters and is the to date the most expensive digital game produced. It has attracted millions of players to compete or collaborate within a persistent online environment. In multiplayer online games, the interaction between the players and the social community that forms in persistent games forms a crucial element in retaining and entertaining players. Social networks in games have thus been a focus of research, but the relationships between player behavior, performance, engagement and the networks forming as a result of interactions, are not well understood. In this paper, a large-scale study of social networks in hybrid online games/shooters is presented. In a network of over 3 million players, the connections formed via direct competitive play are explored and analyzed to answer five main research question focusing on the patterns of players who play with the same people and those who play with random groups, and how differences in this behavior influence performance and engagement metrics. Results show that players with stronger social relationships have a higher performance based on win/loss ratio and kill/death ratio, as well as a tendency to play more and longer.

1. Introduction

The social networks in persistent online games play a fundamental role in the user experience and retention of players, and building and maintaining communities in games form an important aspect of the design and maintenance of persistent games.

The networks forming between players in online games can be difficult to investigate without the right tracking of player interactions and behavior, and furthermore are relatively volatile in terms of constant change as the community in a game evolves. This means that insights gained from investigating these networks are usually short-lived in the commercial sense. However, in recent years it has become possible to explore the networks forming between players in online games, thanks to new tracking technologies and business models that have enabled the collection of big data-scale telemetry datasets about player behavior in games. This further augments the investigation of player networks by providing contextual data about the in-game behavior of the players in the networks, for example. In parallel with this development, the domain of game analytics has grown up to target the problem of dealing with behavioral, performance and process data from game development and game research, seeking to inform both game development and behavioral research [1,2]. The interest in using large-scale behavioral telemetry data to investigate player behavior is increasingly used to target design, business, and research issues in digital games. Nowadays, game analytics form a core element in the toolbox of game developers.

From a research perspective, social networks in online games form the basis for investigating the nature of human interaction and also provide a basis for behavioral experimentation. The networks between players in multi-player or massively multi-player games thus play a fundamental role, and several researchers have investigated such networks in a variety of different games from Real-Time Strategy (RTS) games to Massively Multiplayer Online Games (MMOGs) [3,4], for example to analyze group formation processes [5] or to investigate the robustness of multi-player games against player departure [6], as well as for outright churn prediction [7].

In this paper, the focus lies on a previously largely unexplored type of player network in online games: *Competitive Networks*; which form

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https://doi.org/10.1016/j.entcom.2017.12.001
Received 20 September 2016; Received in revised form 8 December 2017; Accepted 9 December 2017
Available online 12 December 2017

via competitive, team-based play. Specifically, these are the networks that form among players in team-based play, and are extending across either the friendly or the competitive team. Combined with behavioral telemetry about player activity, such networks permit the investigation of correlations between network behavior and player behavior and performance. Similar networks can be established in Multiplayer Online Battle Arenas (MOBAs) [6,8] and instanced battlegrounds in some MMOGs [9]. In this paper, different forms of competitive networks are described and their potential for player network analysis in the context of multi-player persistent online games is discussed. The basis for the investigation is the hybrid online shooter game *Destiny*. However, the behavioral features utilized in this investigation are generic to team-based online shooter games such as *CounterStrike* and *Call of Duty* and thus could also be potentially relevant to a number of major esports titles [10–12].

Destiny is a hybrid game title because it merges design elements from several different genres, including first-person shooters (FPS), MMOGs, MOBAs, and role-playing games (RPGs). While traditional multi-player online games are based on RPG or RTS elements, *Bungie*, the developer of *Destiny*, introduced a different kind of shared, persistent world game that incorporates RPG, MMOG, and MOBA elements into a FPS genre, and thus enables a wide variety of gameplay options, which is evident in the many game modes across Player-versus-Environment (PvE) and Player-versus-Player (PvP) in *Destiny*, with the latter gameplay mode being the focus of the current paper. Of direct relevance to player network analysis are the restricted communication options in the game, which do not permit open communication between players, unlike in mainstream MOBAs, MMOGs and FPS. Notably, *Destiny* lacks friend lists and text-based chat channels. Moreover, voice communication between members of a group is only possible for specific fireteams (consisting of 3 players) and is an opt-in feature which has only recently been enabled for random groups.

2. Research questions and contribution

2.1. Research questions

As the analysis of social structures in games becomes increasingly important, we want to investigate the player's interactions within *Destiny* through graph-based methods and analyze the impact of these interactions on elements such as performance and engagement. We focus on answering the following main research questions: (1) Do player relationships/interactions relate to the win/loss ratio in multi-player PvP matches? (2) Do player relationships/interactions relate to combat performance (measured by kill/death ratio)? (3) Do player relationships/interactions relate to combat performance (measured by time/match ratio)? (4) Do player relationships/interactions relate to engagement (measured by the number of matches played and total playtime)? (5) Does clan membership correlate with the performance and engagement of *Destiny* players?

2.2. Contribution

In this paper, social player networks are constructed based on data from almost 3.5 million players of the online hybrid shooter game *Destiny* and the relationship between the social tendencies of players correlated with their performance in the game. The networks are based on records from the Player-vs-Player component of *Destiny*, the *Crucible*, which acts as the hub for all competitive aspects in the game. In the *Crucible*, players compete across a variety of game modes in team-based competitive play. Players can choose to play with random groups or with friends. The networks utilized here are built directly from records of whom players choose to play with and against.

The networks are combined with performance telemetry data from *Destiny*. This makes it possible to use player networks in order to explore the impact of playing with random people or repeatedly with the same groups on the performance and engagement of the players. In five main analyses, we explore the correlation between the tendencies of the players to play with the same vs. random people and selected the following Performance and Engagement metrics: (a) win/loss ratios; (b) kill/death ratios; (c) the impact of player-run guilds/clans; (d) total time and number of matches played; and (e) time per match played.

The results show that players with stronger social relationships in *Destiny*, i.e. players with a tendency to play with the same people, and being a clan member, have a higher performance based on win/loss ratio and kill/death ratio, irrespective of the number of PvP matches played. Additionally, players with strong social relationships have a tendency to play more PvP matches than those with weaker social relationships. They also played for a longer time in total, but needed less time per match.

While *Destiny* is a hybrid online shooter game, the emphasis here lies on the PvP aspects of the game as these are most directly comparable to non-hybrid (non-MMO) online team-based shooters such as the major commercial titles *CounterStrike*, *Medal of Honor* and *Battlefield*. This facilitates the potential transferability of the presented methodology, and possibly also results. To the best knowledge of the authors, this is the first time that such competitive networks have been constructed in hybrid online shooter games or regular online shooter games.

3. Related work

The work presented here rests in two separate but related domains under the umbrella of games research: Behavioral Analytics (BA) and social network analysis (SNA) in games. Behavioral Analytics is a specific application of game analytics [1,13,14], and is focused on the analysis of player behavior, usually in real-life situations outside the lab environment and generally using behavioral telemetry as the source of detailed behavioral data about the users. In the context of games research, SNA is focused on the interaction between players and the associations forming between them during and around the playing activity [15,6,16,17].

3.1. Behavioral Analytics (BA)

With respect to BA, the use of telemetry to analyze various aspects of player behavior has been the subject of increasing attention in recent years, covering a variety of topics across design, development, monetization, prediction, behavioral research, psychology and user experience optimization [1,13,18], and using methods ranging from simple descriptive statistics to machine learning [2]. The central focus of the work in the domain is to describe, analyze, and explain player behavior. Given that the success of games is directly dependent on the players and the experience they gain from playing the game in question, the majority of the work in game analytics focuses on the users [1,13].

Examples include the use of behavioral data to analyze and visualize specific in-game segments in games [8] or to investigate specific processes such as player progression [18,19].

3.2. Social gaming

While behavioral analytics is most often focused on the analysis of the player, the players' behavior and their interaction with the game, the environment, and in-game elements; data relevant to interactions with other users is often left unattended. Especially in online games, the interaction with other players is a key element. One very early observation of the different interaction forms was presented by Bartle [20] in MUDs (Multiuser Dungeons). He presented a first taxonomy describing the interaction of players with other players within a game. In terms of social playing, he described on the one hand "Killers", who enjoy "imposing themselves upon others" and are engaged by beating or distressing other players. On the other hand, he observed