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Multi-agent simulations for the evaluation of Looting Systems design in MMOG and MOBA games

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ABSTRACT

Massively Multiplayer Online Games (MMOGs) are persistent worlds where a huge number of players interact with each other in order to improve their avatar's characteristics. Multiplayer Online Battle Arenas (MOBAs) - also known as Action Real-Time Strategy (ARTS) games - are video games in which each player controls a single character in one of two competing teams; goal of the game is to destroy the antagonist team. In both genres, players' characters typically exploit their special abilities, which contribute to the overall strategy of their faction or team. Social interactions among players are at the core of both these game types, and a careful design of the game social architecture is a key factor in determining the success of a specific product.

The attention of researchers and practitioners has, till now, focused mainly on several game features, while others have been considered secondary, possibly underestimating their importance in terms of the game overall quality. For instance, in MMOGs, loot items (a type of in-game reward) are not distributed evenly, and the competition for getting the best prize, often, is left in the hands of the players. To handle this issue, players have created resource allocation algorithms called Looting Systems (LS). Generally, the adoption of a specific LS is based on a gentlemen's agreement among the players, and the respect of its outcomes largely depends on mutual trust. Quite recently, ad hoc forms of LS have been introduced also into MOBAs.

This topic has received moderate attention by the scientific community, anyway, we sustain that a LS could influence the players' behaviour and, if mismanaged, possibly the survival of the whole community of players in a game. Hence, detecting and tracking the hidden social effects of apparently minor features could become a critical factor in the development of games genres which heavily depend on the quality of social interactions among players. To tackle this issue, we present a simulative study - based on Agent-Based Model (ABM) techniques - of the effects of the adoption of different LSs on heterogeneous player bases. The final goal of our study is to provide several guidelines and hints about the design of LSs to game designers working on MMOs or MOBAs.

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1. Introduction

Massively Multiplayer Online Role-Playing Games (MMORPGs), *Massively Multiplayer Online games* (MMOs) – also collectively called *Massively Multiplayer Online Games* (MMOGs) - and *Multiplayer Online Battle Arenas* (MOBAs) are environments where the players interact with each other – on an ongoing basis – in order to achieve personal and group goals.

Typically, MMOGs are characterized by an *online, persistent*, and *shared virtual world*. A *persistent virtual world* is a digital environment whose state evolves also due to the interactions among the players, but independently from the online presence of each of them. In game terms, e.g., the story underlying the game develops in time, due to what happens in-game, and this is independent from the fact that a player has logged in or not (see e.g., [63]). This game genre has gained a huge commercial success and diffusion mainly thanks to Blizzard's World of Warcraft (WoW) [85,87], a renowned, pioneer game that, in 2014, counted more than 10 million of paying subscribers [26,55,75,86]. Nowadays, tens of similar games have bud, and many among them have obtained a substantial success, raising the interest of both industry and research. Actually, a game genre that involves such large numbers of players, interacting on an ongoing basis for long time spans, raises intriguing social (see e.g., [16,63]), psychological (see e.g., [17,58,74,88,89]), and technological questions (see e.g., [64,91]). The design of these games aims at creating an experience appealing to different types of players [4,11,60,79] by providing a range of variations in the gameplay. Also, in a MMOG, one of the player's main aims is to "level up" her avatar by gaining some type of *experience points* (XPs) and by collecting "special" or "rare" items (e.g., weapons, potions, shields, etc.). The level growth is proportional to the cumulated quantity of XPs collected by the player, but the ownership of special/rare items often becomes a critical success factor for speeding up the whole process of growth and character development (i.e., having a powerful magical weapon allows for killing more dangerous monsters and becoming a more desirable teammate for the other players, hence the final effect is that of boosting your character "career" by harvesting a greater number of XPs in a shorter period of time). These goals can be achieved by completing *missions* (see Section 3), which require a certain number of players to cooperate in teams. At the end of each mission, a certain amount of XPs is distributed to each player in the team and a small number of rare items (also called *drops*) become available for the players to collect. Generally, the number and type of drops is such as not to satisfy every team member. Hence, some agreed-upon allocation algorithm should be used to solve the problem and avoid overheated discussions. In the vast majority of cases (a notable exception is, e.g., the game Guild Wars 2 [30]) the resolution of the allocation problem has been left in the hands of the players: no allocation system is provided by the game developer, probably because it has been considered a secondary game feature. Thus, in time, players have developed by themselves a set of refined allocation strategies [40], collectively designated as *Looting Systems* (LSs).

MOBAs, being born from the fusion of action games, role-playing games and real-time strategy games, share several characteristics with MMOGs, while their features diverge from several other points of view. MOBAs are online multiplayer environments able to attract huge numbers of players, eager to gain a high reputation among the community of players and to interact with each other. Nonetheless, the interaction - during each match – is limited to a small number of players (the members of two competing teams) and the emphasis on a "story" is quite limited; also, no *persistency* is strictly needed. In the same vein, the player is not represented by a character acting as her "avatar" in the game, but she simply controls – in a god-like manner – a character she picks among those she owns in a predefined set. Also, the maps representing the game world have a certain number of quite simple and fixed configurations, mainly aimed at supporting the clash among the competing teams. In this game genre, the goals of the players, beside winning the matches and scoring a good performance, is to increase their reputation and to widen the number and characteristics of the characters they control and can choose among when playing. No LSs have been largely adopted in MOBAs, until recently.

In the present work, we claim that the adoption of a specific LS is not necessarily *neutral* in respect to the player base, which intrinsically includes different types of players, pushed by different motivations [4,25], and using characters which are optimized to outperform under specific gameplay circumstances [51–53,62]. As a possible consequence, the use of one specific LSs may impact differently on different players' groups, possibly producing a negative perception of the game. Such an eventuality could cause, on the long run, haemorrhaging players. To prove our assumptions, we have set up several simulations, aimed at modelling players' behaviour when different LSs are in use. In particular, we have exploited Agent-Based Model (ABM) techniques (see e.g., [13]) to simulate the behaviour of a large number of players in a generic MMOG (i.e., an abstraction of the "typical" MMOG) and in a MOBA. These simulations and the related behavioural models have been refined in a certain number of steps [51–53] and finally they have been extended by including some real data derived from real players. Data for the MMOGs have been extracted from an existing dataset produced by logging players' activity on a WoW server [18], while the dataset we used for the MOBA model derives from both quantitative and qualitative data we have collected from players through interviews and questionnaires. In particular, we try to give a convincing answer and to stimulate reflections on the following topics (detailed in Section 4): to what extent the player's experience is affected by the presence of a certain LS? How much the LS influences the players' overall satisfaction within the game? Do different types of player perceive differently the same LS? May the LS contribute in disrupting the social bonds among players? Could effects of LSs similar to those present in MMOGs appear also in similar game genres, like MOBAs?

The remainder of this paper is structured as follows: in Section 2 we briefly go through the most relevant related works on Looting Systems and on Agent Based Modeling. In the following Section 3, we summarize the most prominent characteristics (including LSs) of MMOGs and MOBAs, in order to identify which among them could affect more the player experience from our specific perspective. The section also aims at recalling a popular classification of players [4], largely adopted in

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