A Taxonomy of Social Roles for Agents in Games

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A Taxonomy of Social Roles for Agents in Games

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Abstract. Social agents have been used in games often, for example, to create a social dimension (e.g. the inhabitants of a village) or to provide challenges to players (e.g. the opponents players face). These agents have an essential role in the players' experience, and, as such, their creation needs to carefully considered. In this paper we propose a taxonomy of social roles that agents can play in games as a step towards the formalization of the problem of the creation of social agents in games. We believe that this taxonomy can help researchers to reach some common ground on the subject and, therefore, promote common views of the research problems involved in the design and development of social agents for games. We discuss several open challenges in the creation of social agents for games and discuss some future directions of research that can be grounded on the analysis of the taxonomy. For instance, many of the social roles proposed are played by agents that do not have much agency or autonomy. Also, there is a large number of under-explored social roles in games at the moment. The taxonomy serves as inspiration to guide game design involving social interactions with game actors, promoting new kinds of gameplay built on the interactive space afforded by the social agents.

Keywords: Social agents · Game characters · Game design · Game AI

1 Introduction

Since the very beginning, games include entities with some level of agency that have the ability to act in the game world, sometimes even without the player's direct influence. These agents are commonly used in games to provide conflict as they help to define the gameplay dynamics and challenges that players face, for example, by incorporating characters that have resources that players need.

Moreover, these agents may have stronger social roles in the game as they are also elements that provide support to players, for instance, as characters that offer help and accompany the player through their journey. In this case, agents, more often referred to as non-player characters (NPC), are crucial to convey a social dimension to the game world that enhances its social immersion and believability. In games with more prominent stories agents can take

narrative roles and functions as well. The use of agents with social roles in games is not just a typical element but is also an added value with great impact on the players' experience. When endowed with intelligent social behaviours, such agents increase players' enjoyment in games [5] and better social agents in games are actually demanded by players [1]. In fact, some games are praised by the autonomous social agents that they present. Nonetheless, to create a good experience, players' expectations of sociality of game agents must be satisfied. To achieve that, their behaviour demands, many times, high fidelity and complex social mechanisms. This represents both a need and opportunity for the development of novel social mechanics in games, in particular, that use social AI.

The social dimensions of the game worlds that game agents populate are increasingly more complex, for example, involving multiple characters acting together with other AI characters and players, that need to understand and adapt to multiple situations. To cope with this, agents in games need more complex abilities, in particular, to have social needs and goals to be able to act socially. In turn, if social agents are able to display a wider range of behaviours, the available options to players are enhanced, as this increased range of behaviour results in bigger social interaction space afforded by the game. This promotes a higher feeling of agency in players and represents an opportunity for novel gameplay mechanics. Social agents can be used in games for several different reasons and purposes, and can play different roles in the game dynamics and experience. The abilities they need depend on the roles they play in the game.

In this paper, we start by discussing the dimensions of social interactions in games where social agents may be integrated, which can take place outside the game world, among players, or inside the game world both in terms of narrative and gameplay. This defines an overall frame of the problem of creating agents for games. Then, we focus our analysis in the gameplay roles that agents can play in games and propose a taxonomy as a step towards the formalization of the more concrete problem of the creation of social agents for gameplay in games. We aim at defining a wide map of social roles in games, so we included in the taxonomy common social roles in games, but also others that fit well in game interactions, even if they are not yet much explored by designers and researchers.

We believe that the discussion and the taxonomy can help researchers and designers to reflect about the problem of including social agents in games and the roles they may play, and reach some common ground on the subject and the research problems involved. For example, this common language can support the comparison of work on AI solutions for similar social roles. At the same time, the taxonomy can be a guide for the design of agents in games and identify areas under-explored by game researchers that may constitute good opportunities for future work.

2   Related Work

The research literature on taxonomies of social agents in games, or non-player characters (NPCs), is very scarce. In fact, the necessary characteristics to con-

sider a virtual character in a game as an NPC vary according to different authors. For instance, Bartle defined NPCs as inhabitants of virtual worlds that look like player characters [3], whereas Warpefelt considers them as NPCs if they seem rational and intentional [13]. Furthermore, Yildirim and Stene [16] questioned if NPCs could be considered as agents since most are reactive and temporally continuous, but only a few are really autonomous and goal-oriented. The wide variety of definitions are indeed subject to the use of the agents in the game, and the AI approach used.

The typology proposed by Bartle in 2004 identified several functional roles for NPCs heavily tailored to multi-user dungeons. Although useful to describe NPCs in terms of the function they provided, it comprised a reduced set of roles that does not reflect the large interactive space currently supported by games. Some descriptions of the roles of NPCs have been proposed in game design guidelines and patterns. In particular in studies that explore specific social roles, such as enemies [12] or companions [6], or that study the deployment of game characters in different modalities, such as robots in board games [10] and voice interaction in digital games [2]. However, these descriptions are not fully aligned with each other and are fragmented in the different research, hence, are less general.

More recently, by using an online survey, Warpefelt and Verhagen identified a mismatch between in what ways the respondents interpret NPC roles and which are available in Bartle's typology, and propose a new classification for NPCs [14]. The authors identified twelve categories grouped in four types (functions, adversary, friends, providers), each described by how it affects gameplay, their provided function, visual presentation, placement, and behaviour. The taxomony was validated in a exercise to map the roles and functions of NPC in ten games and in a further study impact of the categories proposed on the player's expectations during gameplay was found [15]. However, the proposed taxomony was fully centered on what players described in the survey, which resulted in a taxonomy limited to the roles that were prominent to players, and in the set of games used in the validation, and, therefore, did not capture the full extend of social roles in games. In fact, the authors refer that some functions were not matched to roles in the taxonomy. Moreover, the analysis was not framed in the social nature of the interactions as we intent in our proposal.

In some cases, the definition of the social roles relies on the NPCs impact on the narrative rather than on the gameplay. They usually follow narratological taxonomies, such as Propp's, based on the analysis of russian folktales [11], or Greima's actantial model [8], and his seminotic square [9]. But, although we recognize the importance of the narrative dimension of social agents in games, we aim at exploring the interaction space that social agents promote in terms of gameplay, that has been less studied.

3   Dimensions of Social Interaction in Games

Social interaction is part of the experience most games convey. It is natural that social agents have important roles to play in those games. Note, that we consider

as an agent, any game actor that has some level of embodiment (e.g. some kind of representation as an entity) and has explicit social interaction with a player or other agents. This, independently, of the level of true agency and complexity of the behaviour it displays. Social agents can use very simple internal mechanisms, even just following predefined scripts and reactive behaviour, or can use more complex mechanisms supporting advanced behaviours. Hence, the categories we present in the taxonomy do not represent necessarily agents with much autonomy in the current implementations, but afford, nevertheless, agency and autonomy.

To study the social roles agents can play in games we first discuss the nature of the social interaction experience that games promote. Social interactions in games can be addressed and analysed from different perspectives. On one hand, they are part of the gameplay dynamics, as several game actors interact to make the game move forward. These social interactions are not necessarily positive. Game actors can fight, steal, exchange resources, share information, coordinate actions, etc. The actions performed by game actors are also interpreted beyond the gameplay dynamics and may have specific meanings in the game fiction and narrative. In this perspective, the roles agents play are narrative roles, of characters in stories, such as protagonist, antagonist, etc. We can also consider the game as an artefact to support social interactions among players. In this sense, the social interactions are interpreted by the player in the real world.

The different perspectives of social interaction in games suggest different types of roles for the social agents depending on the dimensions of the experience that they influence. Agents in games may act in three distinct dimensions:

- The **Player dimension** that refers to the game actors in the real world rather than the game world. The interpretation of the social interactions at this level is framed outside the game world. **Players** are actors external to the game that, nevertheless, influence the course of the game (e.g. are performing actions through a controller). Players can be human or artificial. In this dimension, we also fit people (or agents) that are not taking actions in the game but may influence them, for example, by watching others play and discuss strategies or suggest actions, or engage in social interactions with players, for example, by encouraging and providing emotional support.
- The **Gameplay dimension** that encapsulates the game actors as **agents** capable of acting in, and perceiving, the game world. The social interactions in this dimension have functional dynamics that change the game's world state and move the game forward. This dimension frames social agents, and their interactions, as elements of the gameplay mechanics.
- The **Narrative dimension** that presents the **characters** taking part in the game's story and support the creation of fictional interpretations of the game world. The social interactions from this point of view sustain the fantasy conveyed by the game. It excludes agents that are not crucial for the fiction or story and may include characters that do not affect the gameplay.

A game actor may be projected into multiple dimensions if it takes part in the different dimensions of the game (see Fig. 1). For example, players often have an avatar in the game that represents them. The avatar is the agent that performs
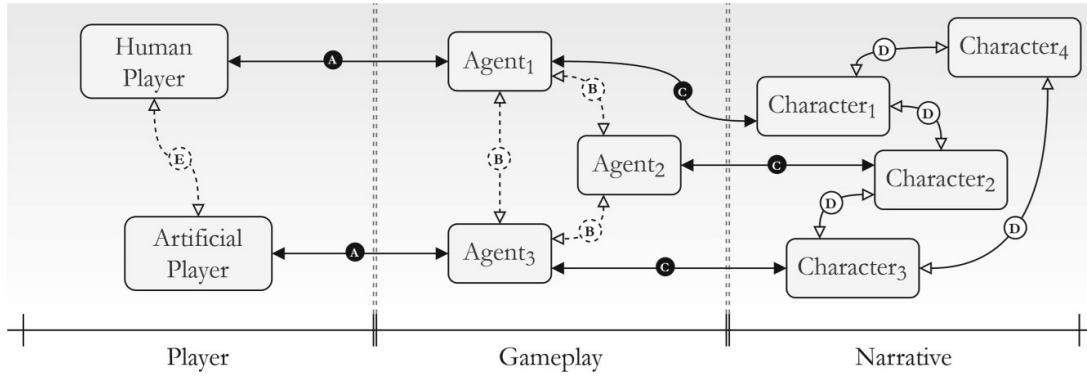
Fig. 1. A visual representation of the three dimensions of social interactions in games: Player, Gameplay and Narrative. Edges **A**, **B**, **C** and **D** represent the different kinds of interactions: player-agent, agent-agent, agent-character and character-character.

the actions in the game world for the player. Avatars may have some autonomy and make some decisions about the actions to perform or may strictly follow what is requested by players. Players may have different avatars in different phases of the game (e.g. In Thomas was Alone (Bithell Games, 2012)) or even have a direct choice on which avatar to take in each situation (e.g. Trine (Frozenbyte, 2009)). The avatar is often the vehicle to define the limits of players' actions and perceptions, as is also a mechanism to help players project themselves into the game world, supporting immersion. The avatar binds the way players and others see themselves in the game world. Nevertheless, games do not necessarily provide avatars to players. They may directly manipulate the objects in the game world. Also, they may have social interactions with the gameplay agents without having an embodiment in the game world.

Many agents in the game world are not controlled by players (e.g. are not avatars), these are frequently referred to Non-player Characters. They, typically, have both gameplay functions and narrative functions. The gameplay dimension captures the mechanics of the interactions that agents support (e.g. which actions they perform and how they respond to others). This defines the affordances of the social interaction space that players can explore in terms of gameplay. These interactions have, additionally, some interpretation in the narrative world. These are captured in the narrative dimension, where the agent is perceived as a character. For example, an agent may be the means by which players get a resource needed for gameplay (e.g. ammunition), and may represent a character that players can relate to and that shares stories about the game world.

In the case of a social robot playing a card game like Sueca [4], the agent takes the role of an artificial player in the player dimension. The game world is supported by physical items (e.g. the table and the cards) and there is no need for an avatar as the player directly manipulates the cards. Additionally, the game does not define a fiction that projects the agent in the narrative dimension. But, a social robot can also control an avatar or play a character in a narrative if the game supports such a setting (e.g. in tabletop Role-play Games [7]).

All dimensions are important to build a good experience, but games define them deeper according to the experience they try to provide. For example, the *feelings of fellowship* are more strongly conveyed by the social interactions in the **player dimension**, the *feelings of mastery* are conveyed by the **gameplay dimension**, and the *feelings of fantasy* are conveyed by the **narrative dimension**. Each dimension presents different challenges for social agents. For example, for an agent to perform well in a game and support the games' target experience, it will need to be able to be part of the players' community; to be able to offer challenging social interactions to players (e.g. that need coordination, or the use of persuasion); or to be able to play roles that enrich the fiction and the narrative, respectively. In fact, it is important to align the roles in the perspectives of the three dimensions to provide high-quality game experiences and promote players' immersion. For example, it is desirable that storytelling and gameplay are well integrated into a game, and for that, there should be a strong relation between the actions that agents perform in the game world and their narrative meaning.

The definition of the three dimensions helps us study and define the concrete elements social agents need for each dimension of a game's social experience. These promote distinct types of social exchanges framed in nested contexts. Many social interactions occur inside the game and are framed by the contexts that the game creates, but the social interactions extend outside the game world as well. There, the social context is wider and includes awareness of the contexts that the game creates.

- **In-game interactions**: all social interactions that occur within the game world. These can be of two types:
  - *In-character interactions*: are social interactions framed by the fiction and narrative of the game. These are character to character social interactions that are coherent with the fiction and the narrative established by the game. Characters' actions and drives should be consistent with the fantasy portrayed by the game and the character's narrative goals.
  - *Out-of-character interactions*: are social interactions that have the gameplay mechanics and dynamics as the core frame of reference. These are agent to agent interactions that are coherent with the gameplay rules. Agents are driven by the gameplay goals and their actions are not necessarily aligned with the game's narrative. For example, players may use their avatar to steal a powerful item from another agent to get a gameplay advantage (e.g. deal more damage), while the motivations of the character to steal are not supported in the narrative. The main concern in this example is to maximize performance and not keep the agent in-character. Another example is the case of dialogue interactions whose content is about gameplay mechanics rather than characters' speech.
- **Out-game interactions**: all social interactions that occur outside the game world. These can also be of two types:
  - *Interpersonal interactions*: are social interactions that involve actors that are not in the game world, e.g. take place between the players outside

the game. These are not conducted through the game world (e.g. are not performed through agents or objects in the game world and do not use in-game communication tools). These are "out-of-character" interactions as well and are not subject to the fictional narrative nor the gameplay rules. These interactions often extend beyond the gameplay session. E.g. players may keep discussing the game results for a while after finishing playing, or start discussing the strategy for an incoming match.

- **Cross-dimension interactions**: are social interactions that engage game actors across different dimensions, mixing and bridging the context of interaction. These can be player to agent social interactions, when players do not have avatars and directly request actions from agents (e.g. their soldiers in a squad). Can also be character to player interactions, when a character talks directly to the player, for example, to express frustrations about their decisions. In fact, all "out-of-character" social interactions involving game characters are inherently, cross-dimension interactions, and take the character out of the narrative context. In this case, the meaning of its actions is no longer only bounded by the narrative but is also based on the other dimensions.

4   Social Roles in Games

We will centre the rest of the discussion on the social roles that agents can take in terms of gameplay, and will not focus on narrative functions or player types. We aim at defining a "tool" to support the development and study of the gameplay aspects of social agents in games that have been less studied in game research.

Describing a game based on its agents and their relation promotes the emergence of prototypical relationships. To an extent, when deployed in games, such agents serve a functional purpose that typically can be described by their relationship with the surrounding, in particular, with other agents.

Each social role involves two parties and different types of exchanges, which may or not have their goals aligned with each other. When understanding the relationship between two agents in a game, the **Goal Alignment** of the multiple parties of the social roles is crucial. We divided the alignment of goals into three types:

- **Support** - when the goals of both parties directly support each other. For instance, in *The Lost Vikings* (Silicon & Synapse, 1993) the different agents controlled by the player share a common goal, and in *Bioshock Infinite* (Irrational Games, 2013) Booker and Elizabeth's goals support each other. These roles suggest some kind of cooperative relation.
- **Contest** - when the goals of one of the parties contest the goal of the counterpart. For instance, the ghosts in *Pac-Man* (Namco, 1980) have a goal (catch the player) that contest the player's goal (eat all dots); and in a game of chess, both players compete against each other thus each player individual goals contest the other's, suggesting some kind of competitive relation.

– **Neutral** - when the goals of one party involved do not directly support or contest the other's goal. For instance, in *Ryse: Son of Rome* (Crytek, 2013), the usage of background agents helps to establish a social environment even though the do not directly affect the player's progression.

Another characteristic used to distinguish social roles is their **Symmetry**. When a social role is **Symmetrical**, both parties assume similar stances towards each other. For instance, in *Pong* (Atari, 1972), both players are considered opponents of each other and, in *Pandemic* (Matt Leacock, 2013), the players must work together to succeed in the game, making them teammates. On the other hand, some social roles are **Asymmetrical** promoting distinct stances between their parties. For instance, in *League of Legends* (Riot Games, 2009) the shopkeeper assumes the role of a provider while the counterparts assume the role of a consumer, and, in *JackBox's party games* (JackBox Games, 2014), an agent assumes the role of the host while the remaining agents are participants.

Finally, the nature of the **Exchanged Elements** between the agents shapes the social roles as well. In particular, to distinguish multiple social roles, we rely on four types of elements that can be exchanged: **Information** (e.g. description of the game world, rules, mechanics and tactics), **Resources** (e.g. tools, items that directly influence the behavior of agents), **Goals** (e.g. mission and targets regarding the game system and economy), **Actions** (e.g. services or performances that require the manipulation of the game entities).

Based on the aforementioned characteristics, we identified several social roles for agents in games as well as the typical interactions found in games alongside examples of agents that assume each role. Regarding symmetrical roles, we identified two social roles with distinct goal alignments:

– **Teammate** - by taking this role, agents are committed to working together with each other. Teammates goals support one another and all succeed if the goals are achieved. To play as a teammate, agents need to be able to understand others' social context, shared goals and plans, and be able to execute the actions of the plan that typically require some kind of coordination. For instance, in *Overcooked* (Ghost Town Games, 2016), players must exchange resources and perform certain actions to successfully satisfy the game requests. In *Tom Clancy's Ghost Recon Wildlands* (Ubisoft, 2017), all members of the squad assume the role of teammate towards the other members. The same can be applied to scenarios that only involve two parts, typically referred to as companions (e.g. *The Last of Us* (Naughty Dog, 2013) and *Fallout 4* (Bethesda, 2015)) The role of teammate is also widely present in sports videogames, such as *FIFA* (Electronic Arts) and *NBA2K* (2K Games), and tabletop games, such as *Pandemic* (Matt Leacock, 2013).
– **Opponent** - by taking this role each party's goal directly contests the other's goals. As such, opponents attempt to obstruct the counterparts' progress while racing with them to achieve victory for themselves. Such as in the *Civilization* series (Sid Meier, 1991), where all agents in the game, players and AIs, attempt to conquest the world, thus forging contesting goals between them. Alike the teammate social role, the opponents are usually present in

sports and tabletop games where multiple teams exist and need to compete. Similarly, the interactions between opponents are subject to environmental characteristics but to successfully assume this role, agents need to understand the challenge they impersonate and be able to execute strategies to beat the others. By inhibiting the progression of the other, enemies deployed in videogames that have their own goals and present obstacles and conflict can also be considered opponents (e.g. arch-enemy, bosses, monsters). For instance, in *The Elder Scrolls V: Skyrim* (Bethesda Game Studios, 2011) the player faces several bosses villains that have their own goals that directly contest the player goals.

In the remaining roles, their asymmetric nature requires both parties to assume distinct stances towards one another. The analysis of the asymmetric social roles follow the goal alignment as well. In the case of *support* social roles, there are three possible cases:

- **Subordinate/Master** - is an agent that performs tasks for the players - also referred to as henchmen or minions. In this social role, the subordinate's goal supports the master's goal, and the game element exchanged are the actions delegated by the master to be performed by the subordinate. This involves a power relationship as one agent has control over the goals the other commits to. The use of pets and companions, such as, in *World of Warcraft* (Blizzard Entertainment, 2004) are a typical example of this social role. Also, in real-time strategy games, such as *Commmand and Conquer* (Electronic Arts, 1995) or *Starcraft* (Blizzard Entertainment, 1998), the military units assume this role. Typically in this social role, the social interactions are framed as orders/commands and acknowledgment/reports.
- **Ward/Protector** - by taking the role of a Ward, its counterpart assumes the role of a Protector. Usually, the protector has to guarantee the survival of the ward while facing other challenges. In this case, the ward promotes the emergence of a new goal based on the social role assumed. The interactions associated with this role typically are escorting and shielding an agent from danger and hazards (e.g. *Counter-Strike* (Valve Corporation, 2000)).
- **Tutor/Learner** - is an agent that indirectly contributes to the efforts players make towards achieving their goals. Tutors convey information to players about the game state and provide advice about gameplay actions and strategies. They can be specialized in certain areas of gameplay (e.g. economic, military, research, as in the Civilization game series). The information may be proactively suggested or only given when explicitly requested by players. They often introduce players to the game mechanics and support their learning about the game usually through tutorials. Although players are most often placed in the place of the learner, there a few examples that placed them as the tutor. For instance, in *Black and White* (Lionhead Studios, 2001), the player teaches the creatures how to behave.

There are several social agents in games that are neutral regarding the agent's goals. In these cases, the agents have their own goals in the game and cannot

be assumed that they will have a benevolent attitude towards others. They are, nevertheless, important to convey the gameplay experience and it is expected that players need to interact socially with these agents to explore and manipulate the game world. The neutral social roles are the following:

- **Provider/Consumer** in this social role, the provider grants access to some game elements, such as resources, information, services and tools, to the Consumer in exchange for some other elements after a successful interaction. This means that they, typically, need to make an effort to succeed in the interaction. This may be a simply commercial exchange (e.g. shopkeeper such as in League of Legends) or may require some kind of negotiation (e.g. the witnesses in *L.A. Noire* (Rockstar Games, 2011)). But the option to freely provide the resources after a simple contact is open as well, making the time spent in such interaction as the invested effort.
- **Relator/Audience** by taking this role one agent describes the gameplay action and may present an assessment of the gameplay results to other agents that compose the audience. Although the information they provide can be useful to help and guide players, the relator's goals do not support or contest the audience's goal. They present a shared view of the game state to all the agents in the game world, that can influence the gameplay decisions. However, they often serve the audience of the game (e.g. commenting on sports videogame), which includes players. In this sense, they have cross-dimension agent-player interactions, or may even be placed outside the game world, at the player dimension, (e.g. often in e-sports, an announcer communicates the players' achievements).
- **Host/Participant** - when assuming the role of a Host, the agent conducts the flow of the game and guarantees an interesting and fair gameplay experience for all participants. A host should not only enforce the game rules to all participants but, when applicable, should also indicate the participants' turns. The prototypical interactions from hosts to participants can be requests for action, such as in the Buzz video game series (Relentless Software, 2004), or establishing and guaranteeing that the game rules are followed by all participants, for example in Dungeons and Dragons role-playing games.
- **Background/Observer** - in this social role, the Background agents are used to bring social life to the game world that is being experienced by an Observer. These agents may react to other agents and engage in social interactions if requested but their goals are independent of one another. Background agents may depict and support understanding of the game's social world. They, often have a strong representation in the narrative dimension to help to enhance the social dimensions of the fictional world. Nevertheless, they are agents in the gameplay dimension as they may alter the gameplay actions players take. For instance, in the Assassins Creed franchise (Ubisoft, 2007), players can blend in the crowd effectively deeming than unrecognizable to other agents. Also, in games such as the Hitman series (IO Interactive, 2000), if an agent acts suspiciously, it will attract background agents' attention and compromise one's actions.

There are also scenarios in which the agents involve assume asymmetrical roles with contesting goals. We identified one social role where one party inhibits the progression of the other party but not vice-versa (contrary to the opponents).

– **Challenger/Contender** is an agent that provides challenges to contenders (e.g. a quest giver). These are similar to providers as they may provide rewards as well. But, their main role is to explicitly define goals for contenders to follow. As such, the challenger's goal is to contest the contender's goal. They may serve as "gatekeepers" that lock and unlock the game progression as they may have strong control over the goals that are open to others. This social role is played by agents that either are themselves impeding the contender's progression or create additional threats that demand additional actions by the contender. For instance, in Pokemon (Niantic, 1998), gym leaders are challengers that block the player's progression. Also, in Control (Remedy Entertainment, 2019), some agents in the game spawn other entities that are used to restrict the player's path.

The social roles agents assume can vary depending on the situation. A game agent may take more than one different social role at the same time. For example, an agent may be a teammate and adviser at the same time and may act as a subordinate or provider in other situations. Therefore, context is important. The same player can interact with the same agent in different situations and each is driven by different social roles. Both the agents and the players need to understand the relation between context and social roles.

5 Discussion

The proposed taxonomy intends to define the scope of social interactions that agents can take in terms of gameplay. This establishes the base for the future formalization of the goals, capabilities and responsibilities that such social agents need to perform a given role. This can constitute a template to guide the developers of the agents for games, as game design patterns, or to automatically generate social agents for games. In contrast with Bartle's [3] and Waperfelt's [14] typologies, our proposal offers a broader view of the functional roles that agents can take in the gameplay dimension. Also, by placing this dimension alongside the player and narrative ones, researchers and designers can distinguish the role of game actors according to three different perspectives. Thus, this approach enables a structured description of game actors according to all their facets and, ultimately, promotes a stronger understanding of their social roles in games.

The roles previously discussed have been used in games, but not all have been extensively explored and addressed by research. Therefore, the interaction capabilities of agents in such social roles are typically simple. This limits the interaction space available to players, which reduces their sense of freedom and autonomy in the game. At the same time it affects players' perceptions about the abilities of the agents as social actors and the quality of the social immersion in the game. There are open research questions to develop deeper social interactions with social agents in games. For instance, more research is needed to make social

agents playing well the role of teammates and be perceived as autonomous and trustworthy partners. Research is needed for opponents as well, for example, to make them able to present gameplay challenges to the players of social kind, involving lying, persuasion, and take into account social dynamics, such as in-group and out-group bias. The neutral agents can also gain relevance in the game experience if they display stronger autonomous social behaviour. They can show social motivations and goals, for example, to pursue a relationship with another agent, and they can be more selective about the support they give to players.

In general, there are big challenges for the creation of agents with good social behaviour in games, in particular, regarding the ability to understand social context and be able to adapt behaviour to the context and other game actors and players. Adaptation to the player's goals is one of the current research trend but adaptation to the social context also raised some attention. This may allow agents to change attitude towards players when new members join the team and provide means for agents to change social roles when adequate. Games are making more use of large open worlds, often procedurally generated (e.g. No Man's Sky (Hello Games, 2018)), but these large worlds need to be populated by many agents to avoid conveying feelings of emptiness. The challenge to procedurally generate large amounts of social agents that show diverse and coherent social behaviour and convey the feeling of organised social groups and populations that fit the generated worlds are much under-explored. Additionally, these social agents should bring gameplay value as well as enhancing the social dimension of the game world.

6   Conclusions

Social agents are commonly used in games and their use and complexity has grown in the past years. They create and sustain the social dimensions of the game and improve the social immersion of players to create a better gameplay. Social agents can be artificial players, be part of the gameplay dynamics and help to convey narrative meaning. In this paper, we introduced a taxonomy with the most common social roles that agents can take with a focus on their contributions to gameplay. From this taxonomy, we can formalize the roles in practical terms to be used for game design, game AI and user studies.

There are still many open opportunities for research of social agents in games, both related to their role in gameplay dynamics and related to their capability of social performance. It is important for the research of social agents in games to mutually share the different perspectives that have been explored in different communities, but also combining knowledge from other domains related to game AI in general, game design and interaction technology relevant for games. This paper presents and effort to support a common view of the research problem.

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