Social believablility in games

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ABSTRACT
The Social Believability in Games Workshop intends to be a point of interaction for researchers and game developers interested in different aspects of modeling, discussing, and developing believable social agents and Non-Player Characters (NPCs). This can include discussions around behavior based on social and behavioral science theories and models, social affordances when interacting with game worlds and more. The intention is to gather participants from a multitude of disciplines in order to create a broad spectrum of approaches to the area.

The workshop unites contributions from research on social ontology, social simulation, the social impact of believable agents, intelligent virtual agents, and other related areas and allows for discussion on the theories and models for NPC social behavior and social affordances in industry as well as between different academic disciplines to which may relate to the subject in a variety of ways. The expected outcome is a better understanding of the overlaps and differences both within and between these communities.

KEYWORDS
social believability, NPCs

INTRODUCTION
From the beginning of digital games, AI has been part of the main idea of games containing acting entities, which is to provide the player with "worthy" opponents (NPCs). The development of multiplayer games has increased the demands put on the NPCs as believable characters, especially if they are to cooperate with human players. However, the social aspect of intelligent behavior has been neglected compared to the development and use AI for e.g. route planning. In particular, the interplay between

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intelligent behavior that is task-related, the emotions that may be attached to the events in the game world and the social positioning and interaction of deliberating entities is underdeveloped. This workshop aims to address this deficiency by putting forward demonstrations of work in the integration of these three aspects of intelligent behavior, as well as models and theories that can be used for the emotional and social aspects, and for the integration between the three aspects.

IMMERSION

The word immersion has been used as a catch-phrase to describe the magic, alluring and deeply engaging qualities of games in ways that are not always entirely coherent. There is no real consensus on exactly what it is. Immersion has been compared to 'suspension of disbelief' (Murray, 1998) a term originally coined by Coleridge (1817), and could be described as the attitude a player needs to assume in order to become immersed in the game at all. Examples of research on immersion include studies aiming to break the immersion of players in order to understand what it is and how it works (Cheng and Cairns, 2005), interview studies measuring levels of immersion of players, indicating that there are different degrees of involvement or immersion ranging from engagement, engrossment, and finally total immersion (Brown and Cairns, 2004), and studies aimed at quantitatively measuring immersion (Jennett et al., 2008). Many of these sources not surprisingly also draw parallels between immersion and flow (Csikszentmihalyi, 1990), where immersion is often described as a flow-like state. Sweetser et al. also make this connection and further describe the sensation of being absorbed by a game as '[d]eep but effortless involvement, reduced concern for self and sense of time' (Sweetser et al. 2012, p.2) and that of 'player enjoyment' which coincides with Csikszentmihalyi's (1990) flow concept, a relation also mentioned in Salen and Zimmerman (2004). Immersion is also related to the challenge of gaming and the flow concept, where a balance in the difficulty of the challenge is needed in order to make the player enjoy the game. When immersion is established it also makes players more likely to overcome difficulties in the game (Cheng and Cairns, 2005). Without a unifying definition of immersion (and I do not intend to invent a definition), the following rather general description will be used: '[..]the degree of involvement or engagement one experiences with a game' (IJsselsteijn et al., 2007, p.3) in combination with Ermi and Mäyrä's (2007) distinctions between three different types of immersion:

- Sensory-based immersion – related to the audiovisual execution of games and the experience enabled through for instance a three-dimensional game world.
- Challenge-based immersion – based on achieving a satisfying balance between challenges and abilities, related to motor skills, mental skills such as strategic or logical thinking, and even problem-solving.
- Imaginative immersion – directed at capturing the imaginative aspects of being immersed in characters and story elements or the game, and also being immersed in the world.

The three types of immersion have much in common with Costykian's discussion on struggle that points out some of the aspects of games that game developers try to refine (Costykian, 2002). In games such as L.A Noire (Team Bondi, 2011) or Façade (Mateas and Stern, 2005) the emotional aspects of NPCs are part of creating the illusion of smart adversaries, contributing to imaginative immersion. In Skyrim (Bethesda Game Studios, 2011), The Witcher 2: Assassin of Kings (CD Projekt red, 2011) and Assassin's Creed 3 (Ubisoft Montreal, 2012) both the sensory and imaginative immersions are stimulated. Lastly, in RAGE (id Software, 2011) and Starcraft 2 (Blizzard, 2010) the opponents of

the game, the NPCs, are strategically competent, leading to a more interesting challenge for the player, and therefore are part of challenge-based immersion.

It is perhaps challenge-based immersion that most directly influences immersion and flow in games where skills and tactics are more pronounced. One strategy for not creating too steep a learning curve and also enabling the player to experience flow during a gaming session is to apply dynamic difficulty (DD), a technique used for adjusting the skill levels of the opponents to make every minute of gaming interesting with obstacles that are just hard enough to be both entertaining and rewarding to overcome.

Since immersion can be seen as a measurement of the absorbing qualities of games and there seem to be many different aspects that can threaten the immersive qualities of a game, such as unbelievable characters, the three levels of immersion by Ermi and Mäyrä (2007) could benefit from a more pronounced focus on the interaction with believable NPCs, leading to a need for a fourth category 'social immersion'. Social immersion, then, should be a compound of the requirements as identified by the Oz group (Loyall, 1997, pp. 15-26; Mateas, 1999) in combination with the traits found in the fractionation matrix (Carley and Newell, 1994). Further, social immersion should reflect how norms and rules are an integral part of the everyday interaction in groups of players. Consequently, the question is how to create social immersion and social believable NPCs.

NON-PLAYER CHARACTERS

Non-player characters (NPCs) are the ever-present inhabitants of online games so often visited by players. Games and game worlds in particular have to be populated to be interesting (Bartle, 2003) and one strategy is to create a computer-generated population of NPCs to make them come alive. NPCs typically play a role in the story of the world they populate, and their sole reason for being in that world is to create a value or a function for players. Amongst those functions or roles Bartle (2003, p.87) lists the following:

- Buy, sell and make stuff.
- Provide services.
- Guard places.
- Get killed for loot.
- Dispense quests (or clues for other NPCs' quests).
- Supply background information (history, lore, cultural attitudes).
- Do stuff for players.
- Make the place look busy.

This means that from one perspective the goal of games AI is to support game designers in providing players with a compelling game experience that supports interactivity and player choices and adds to replay ability (Bailey and Katchabaw, 2008). The current way in which people play games might indicate either that players do not easily become immersed in the games they play or that they play games differently today:

As more and more people actually finish fewer and fewer games, the opportunity to extend the life of games becomes important. (Consalvo, 2007, p. 62)

Interactivity has been singled out as one of the weakest aspects of current NPCs (Mateas and Stern, 2003), the conclusion must be that existing NPCs are too limited to replace the function and role of other players and that NPCs and games AI can have a positive influence on both the immersive properties of games and the replay ability of games.

Current State of NPCs

One thing that is important to keep in mind is that the traditional research concerning artificial intelligence has a different scope from that of the type of AI that is most common in digital games. In digital games AI is optimized for entertainment and increased immersion in the game world, not for the simulation of human performance or rationality (Bailey and Katchabaw, 2008, p.1). When NPCs are perceived to be smart, there is actually an AI programmer or a team of programmers who have identified what makes players perceive a NPC to be smart, and that is the functionality which the NPC will end up with. What it comes down to is representation and how NPCs are perceived. Good games AI-programming is about creating the illusion of a believable counterpart in games and much attention is paid to making them smart enough; indeed this is one of the reasons why NPCs have been evaluated from a black box perspective. In the chapter "Artificial Stupidity: The Art of Intentional Mistakes" (Rabin, 2002 pp. 41-48) Lidén points out some of the aspects of AI-programming craftsmanship, and what can be done to create smart enough game agents, where 'Everything should be made as simple as possible, but no simpler' (ibid p.41).

The most common techniques for creating NPC behavior rely on behavior trees, dialogue trees and scripting that creates static responses to any stimuli in the surrounding environment, making most NPCs finite state machines, similarly to those in (Bailey and Katchabaw, 2008), but exceptions with more dynamic NPC behavior exist, as can be seen in Fable (Big Blue Box, (2004) black and white (Lionhead Studios, 2001) and Façade (Mateas and Stern, 2005) and indeed many other interesting games such as Skyrim (Bethesda Game Studios, 2011) and L.A Noire (Team Bondi, 2011).

NPCs research

Game research has a growing interest in NPCs. In (Afonso and Prada, 2008) social relationships between NPCs are seen as the most important for improving the gaming experience of players. Merrick and Maher (2006) discuss the seemingly static representation and behavioral repertoire of NPCs in cases where the game world constantly changes (MMOGs), changes that should also be reflected in the NPCs in order to be believable, a view that is shared by Lankoski and Björk (2007). One view that is shared by all referenced sources in this section is that 'Believability is a basic requirement for non-player characters of videogames' (Gomez-Gauchía and Peinado, 2006, p.1).

Indeed there are game developers that develop different aspects of NPCs in new directions as well. L.A Noire (Team Bondi, 2011) is one example where the NPCs' facial expressions add both immersion and believability, and the behavioral repertoire of the NPCs in Skyrim (Bethesda Game Studios, 2011) is an example of complex NPC behavior as are the strategic elements of the NPCs in Rage (id Software, 2011). The question is which aspects of NPCs should be developed further and which should be prioritized?

According to Ochs et al., the emotional aspects are some of the most important in terms of preserving the immersive quality of a virtual world (2008).

The Multi-Agent Approach

One tradition in academia with a more pronounced research perspective aiming for more dynamic game agents (Barella et al., 2006) applied mixed strategies to create more complex agents as cost-efficiently as possible in terms of processing. Strategies for creating 'smart' or trustable characters (NPCs) in games, are seen in: finite state machines, fuzzy logic, decision trees, multi-agent systems (MAS), neural networks, case-based reasoning and other artificial intelligence (AI) strategies (Lee et al., 2008), where some of the techniques are already part of the building blocks of current NPCs, as seen in article 5. These strategies can all be implemented in different areas to create smart agents in games, but some of them are too expensive in terms of processing to be implemented in a game world containing a massive number of players, and some of them are outdated (Barella et al., 2006). Examples of implementations of multi-agent systems for games and dynamic NPCs are the JGOMAS system that is a multi-agent system and implementations of Belief Desire Intention (BDI) agents.

The JGOMAS (game-oriented multi-agent system based on Jade) is a multi-agent system (MAS) that rests on a hierarchy of different specialized internal and external agents. One of the internal agents, the manager, is a special agent responsible for coordination of the current game (game logic). External agents are the agents (NPCs) a player meets in the game and the roles that are used in this example are different types of troops such as: medics, soldiers and field ops. These roles are predefined and the action potential (actions the agents can perform) of these agents is programmed with a finite state machine (Barella et al., 2006).

BDI

Belief, Desire and Intention (BDI) strategies are another area of research that tries to develop a type of reasoning in agents that could add other traits to game agents than purely reflective actions. As recognized by Castronova (2006), Bartle (2003) and Davies et al., development of AI in games holds much promise for the future:

AI has been neglected as a development priority, and has evolved to work within the confines or limited processor allocation. This has resulted in AI based on efficient reactive techniques rather than complex reasoning systems. (Davies et al., 2005, p.1)

BDI is claimed to introduce variability in agents' behavior and involves memory and emotion as central parts of decision-making. As well as memory and emotions the BDI agent must have the ability to adapt and change plans. The BDI agent is characterized by its beliefs about the state of the environment and in the case of cooperation this is done by allocating tasks.
The aim of a normative multi-agent system is to provide the flexibility of reasoning mentioned in (Davies et al., 2005) and to solve the problem of autonomy in (Barella et al., 2006) but with a strategy that does not demand a special controller to coordinate all other agents. A conceptual model of an agent that does not need a special controller agent is the model that is described in article 4, the model social game agent.

NPCs and Emotions

Although there are indeed examples of models and implementations of more complex NPC behavior, such as the ones discussed in the NPC section, a major question is how to

evaluate believability. The 'motivated reinforcement learning' mentioned in (Merrick and Maher, 2006) evolves and adapts the behavior of NPCs, and in that sense contributes to their believability, but it is unclear how well it adapts to the context and the narrative of the game.

Other implementations more focused on emotional aspects use different theories for representing emotions, such as the OCC model by (Ortony et al., 1988) used in (Ochs et al., 2008), and the five-factor model used in (Afonso and Prada, 2008; Eladhari, 2010) and in the conceptual model of the MSGA (article 4). One question that appears in relation to the theories that represent the emotions in these implementations is why a particular theory was used, and the answer, at least in (MacNamee and Cunningham, 2003), is that the models are used in order to make the NPCs act in plausible ways; most models on human emotions are far too simple to realistically represent human emotions, but this simplicity is beneficial since an overly complex model would be too costly in terms of processing if implemented in a game. The reason for using the five-factor model in the MSGA was much the same, as the aim was to create believability and plausible reactions, not to model a human being.

ATTITUDES TOWARDS BELIEVABLE AGENTS

Based on a series of interviews and surveys with game developers and game designers (Johanson et al., 2012) we can conclude that certain aspects of games AI were lacking in most current NPC implementations. Whereas the A* algorithm seldom fails to provide NPCs with the navigational skills needed, some other aspects were seen as difficult to implement and concerns about 'the black hole of AI' were raised. This black hole implies that really smart and dynamic NPC behavior is still interpreted as 'just scripting', indicating that effort spent on over-complex behavior by game developers is not seen as such by players. When talking about emotions, the respondents cited L.A Noire (Team Bondi, 2011) in which emotions were implemented, but with the problem that NPCs are typically not aware of the context, making emotions hard to script.

Although multi-agent systems and BDI architectures add a new perspective on game agents or NPCs, they are not seen as a solution for real games, since they do not solve the problem of more believable characters. Further, even the MSGA has not so far provided the answer to how to create more responsive agents with plausible social behavior. The question is what believability is and how we can measure it.

Believable NPCs

What is believability, and what makes a believable NPC believable? This is perhaps one of the most important considerations as regards the conceptualization of character for games that exceeds the behavioral repertoire of current NPCs, since believability is currently lacking (Gomez-Gauchía and Peinado, 2006). One reflection about believable agents that is transferable to this section reads as follows:

> For many people, the phrase believable agent conjures up some notion of an agent that tells the truth, or an agent you can trust. But this is not what is meant at all. Believable is a term coming from the character arts. A believable character is one who seems lifelike, whose actions make sense, who allows you to suspend disbelief. This is not the same thing as realism. For example, Bugs Bunny is a believable character, but not a realistic character. (Mateas, 1999, pp. 5-6)

In our interpretation, one of the most important aspects of believability deals with actions situated in a context where NPCs are lifelike, 'whose actions make sense' in a certain

situation. There are indeed many suggestions about what makes an NPC seem lifelike and believable, and the Oz group at Carnegie Melon University have been working on the following set of requirements for believability (Loyall, 1997, pp. 15-26; Mateas, 1999):

- Personality – characters displaying any believability should have a rich personality that is reflected in all their actions, making them stand out as unique in all their actions. Further personality is about the specific and unique expressions and not the general.
- Emotion – a believable character should exhibit personality-specific responses to the emotions of others.
- Self-motivation – a measure of the character's own internal drives and desires that the character pursues whether or not others are interacting with them. They do not simply react to the activity of others.
- Change – a believable character should change and grow with time and in a manner that is motivated and consistent with their personality.
- Social relationships – a believable character should also engage in detailed interactions in manners consistent with that social relationship, a relationship that in turn changes as a result of the interaction.
- Consistency of expression – can be seen as one of the basic requirements for believability, which deals with the character's expression including facial expression, body posture, movement, voice intonation, etc. and needs to work in orchestration to make the character believable.
- The illusion of life – a collection of requirements dealing with a character's reaction to stimuli in the environment, pursuing multiple simultaneous goals and capabilities such as movement, perception, memory and language and including the following subcategories:
    - Appearance of goals – believable characters should seem to have goals that make them seem alive.
    - Concurrent pursuit of goals and parallel action – in order for characters to be perceived as believable they should be able to perform some actions in parallel while others are done concurrently with interwoven steps and parallel or overlapping action.
    - Reactive and responsive – a believable character should be both reactive and responsive, meaning that the character must react within the confines of people's expectations of believability.
    - Situated – a believable character should appear to be situated both in terms of the change of actions in a response to changes in their environment and as a response to the unfolding situation.
    - Resource-bounded — body and mind – believable characters should have limits in terms of what they are physically capable of and how much they can think about.
    - Exist in a social context - believable agents must also be situated in the culture, social conventions and other aspects of the world in which they are to exist.
    - Broadly capable – for a character to be perceived as 'alive' and believable it needs to be broadly capable, making it seem to act, think, sense, talk, listen, understand, have emotions, exist in dynamic worlds, etc.
- Well-integrated (capabilities and behaviors) – believable characters should be well-integrated, smoothly moving from one activity to the next, often overlap

portions of behaviors that are characterized by appropriate and distinct transitions between behaviors (Mateas, 1999, p.4).

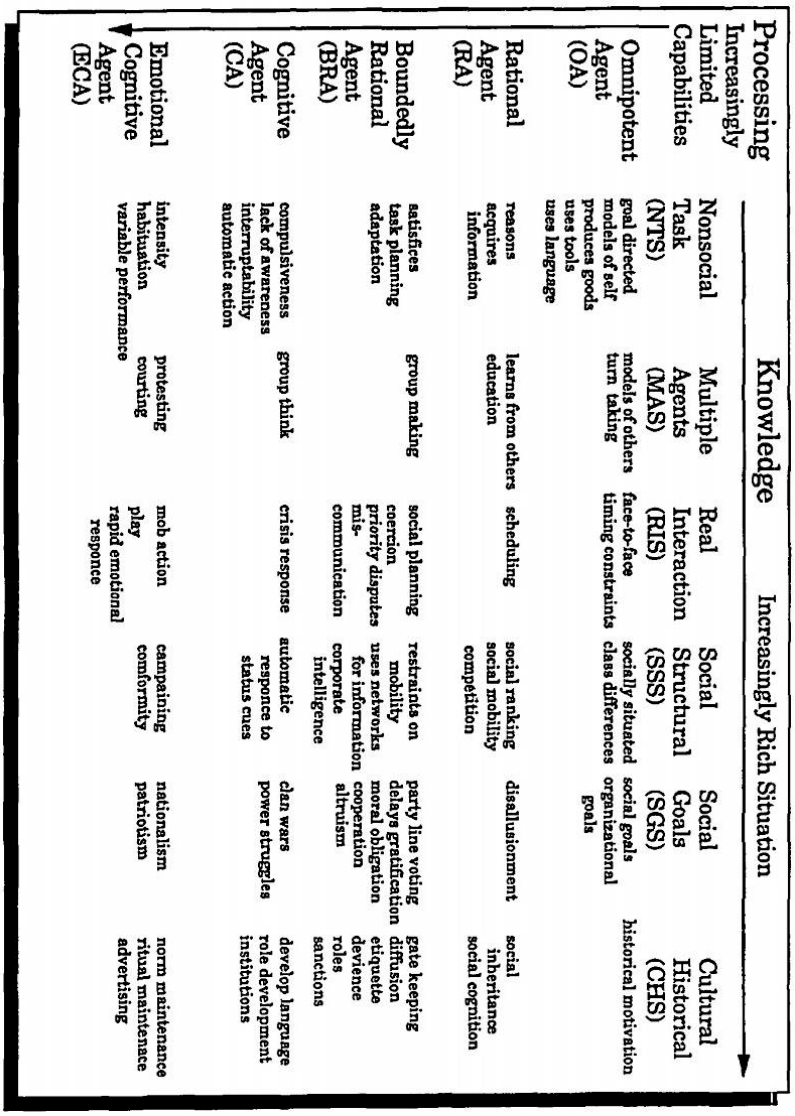

Figure 1 Social fractionation matrix (Carley and Newell 1994)

If we take a closer look at the Oz group's list of requirements for believability, we can see that there are many common traits compared with what other researchers have reported as important aspects of believability, and this coincides with Carley and Newell's (1994) fractionation matrix (Figure 1).

The work of Lankoski and Björk has many overlaps with the Oz group, particularly as regards the following traits: emotional attachment, contextual conversational responses, and goal-driven personal development, where the interpretation might differ slightly but indicates the necessity for emotions, character development/change and social aspects on an individual plane. Most other traits as identified by Lankoski and Björk (2007, p.1) fall under the category of the Oz Group's 'the illusion of life'.

One thing that stands out is that whereas the Oz group details the individual behavior of believable characters the social fractionation matrix has little to add to our understanding of believability in individual characters. The social fractionation matrix does however add

a lot to our understanding of the fine-grained details about the social believability of and interactions between characters, adding an important focus to the social dimension. Figure 2 depicts the relation between these sources, where the theories from the Oz – group (Loyall, 1997, pp. 15-26; Mateas, 1999) end up in the 'individual NPC' part of the figure, accompanied by the overlaps identified in Lankoski and Björk (2007). Lankoski and Björk also touch upon 'narrative', a subject that has also been studied in depth by Mateas and Stern (2003). It is obvious that these theories deal with different parts of Figure 2. Little attention, however, is paid to how the behavior of groups of NPCs influences immersion, indicating a gap that needs to be discussed further.

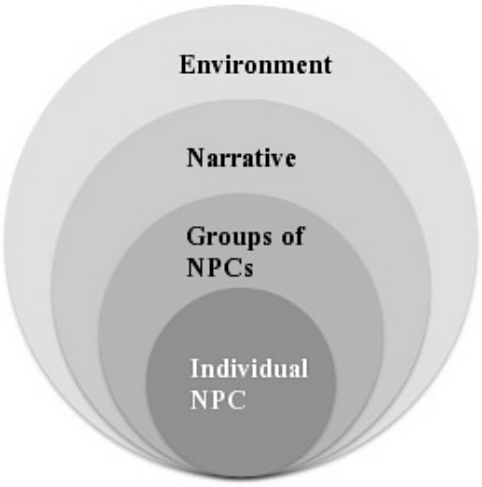

Figure 2 Social believable NPCs

Different research groups seem to have found some of the aspects mentioned in (Lankoski and Björk, 2007; Loyall 1997, p. 15-26; Mateas 1999) independently, and these should therefore be considered the basis for a believable character. Unfortunately, according to Bailey and Katchabaw (2008, p.1):

> *There have been few, if any, attempts to unify psychosocial behavior in NPCs so as to include emotions, personality, and individual social relationships.*

This would indeed indicate a gap and a possibility for further research into believable characters and why they are so important, and also how to combine these traits, as a continuation of the argument that:

> *Unbelievable characters and situations detract from the enjoyment of the narrative.* (Tanenbaum and Bizzocchi, 2009, p. 7)

A closer investigation of immersion, arguably the closest measure of how believability or the lack thereof influences the gaming experience of players, follows.

TOOLS FOR EVALUATING SOCIAL BELIEVABLE NPCS

There are different methods, ideas and tools for understanding, analyzing and discussing games, e.g. design patterns (Björk et al., 2003; Lankoski and Björk, 2007), that on a general level can be used for evaluation of certain aspects of games, but they do not provide the detail needed to cover the behavioral aspects of NPCs. A more in-depth study on the components and mechanics of computer games is provided by Järvinen (2009), but is still hard to apply as a tool for evaluation of games. The reason it is important to provide tools for these kinds of evaluations is that we do not want games that prevent us from being entertained, and in addition the evolution of games AI has some lost years to make up for.

Challenge in games is a major aspect that is as important as games being immersive. Suits (2009, p.38) describes challenge in the following way:

> *"Suppose I make it my purpose to get a small round object into a hole in the ground as efficiently as possible. Placing it in the hole with my hand would be a natural means to adopt. But surely, I would not take a stick with a piece of metal on one end of it, walk three or four hundred yards away from the hole, and then attempt to propel the ball into the hole with the stick."*

When Suits describes challenge, the playful qualities of games become obvious. Costykian describes the challenge of games slightly differently, focusing on the struggle that gives the game a meaning:

> *Part of the struggle lies in the opposition posed by monsters and NPCs; part of it in exploration of the world and the story; part of it in traps or puzzles posed in the game's physical world, or in social difficulties posed in the game's social realm.* (Costykian 2002, p.15)

In a sense the aspects of believability proposed in this section aim at capturing the essential element in Costykian's quote by measuring and developing the opposition through more believable monsters and NPCs, as well as addressing the challenge of games raised by Juul (2010). Since struggle and challenge are at stake, there should be ways of analyzing and balancing these aspects of games.

Prerequisites for analyzing socially plausible behavior

We have thus far discussed players, the social cooperation that is essential for groups of players, and the believability and plausible social behavior in NPCs. Although there are many tools and methods for analyzing games there are few tools available for measuring social believability, plausible social behavior or complexity in NPCs. The matrix by Carley and Newell (1994) can serve as seen in (Johansson et al. in press) to evaluate the behavior and complexity of existing NPCs. A follow-up study presented in (Warpefelt and Stråat, 2012) uses the same idea but on a more elaborate and instrumental level. In both studies, however, using Carley and Newell's matrix without alterations proved to be difficult. Further, these two studies indicated that most NPCs are well suited to performing the simplest actions (the non-social task column of the fractionation matrix (Carley and Newell, 1994), but that social action often failed.

If instead we take into account that players use rules and norms to create and maintain social groupings we can see how the framework can be extended. The work on requirements for believable characters (Loyall, 1997, pp. 15-26; Mateas, 1999) in combination with the work of Lankoski and Björk (2007) details the whole range of attributes singular agents need to exhibit in order to seem believable. Carley and Newell's fractionation matrix (1994) in combination with the indications on how players use rules and norms sums up the social climate that is a prerequisite for individual agents to exhibit socially plausible behavior.

We look forward to the workshop to discuss what other prerequisites can be of interest and also how to measure believability form different presepectives.

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