

# Cognitive Intervention and Reconciliation: NPC Believability in Single-Player RPGs

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## POPULAR ABSTRACT

Characters in single role-playing games are often lacking plausibility. This is especially the case with Non Player Characters (NPCs) in single-player role-playing games. It doesn't take long for game players to sense that NPC behaviors are limited and improbable. Computer scientists working on Artificial Intelligence have recognized the importance of believable characters. However, studies of NPC believability in single-player RPGs have been relatively rare since the definition of believability has different meanings in different fields of studies. In this article, a new definition of NPC believability is suggested. This definition is based on theoretical frames, which offer diverse definitions of believability. Several suggestions on making believable NPC are addressed.

## 1. INTRODUCTION

In single-player RPG (Role Playing Game)s, all characters in the game world are controlled by a computer (NPC: Non Player Character) except a player's character (avatar). These characters are actors and actresses of a fictional fantasy world where a game character will explore for given missions. NPCs, however, are often not believable. For example, the owner of a pizza store in the video game *Grand Theft Auto: San Andreas* (Rockstar Games, 2004), is acceptable as long as the game player stays in the prescript behavior patterns, which include ordering and paying for a pizza. When game play diverges from the expected behavior patterns, such as accosting the owner of the pizza store without provocation (or stealing his money), he doesn't exhibit any reasonable behaviors. Some single-player RPGs like "The Elder Scrolls IV: Oblivion (Bethesda Softworks, 2006)" are populated with more intelligent NPCs that reside in a game world with their own daily schedule, but they are still far from being believable. At first glance, NPCs in single-player RPGs seem to do what they are supposed to do, but game players easily find that their behavior patterns are very simple and limited.

A simplistic prescript behavior of NPCs may actually prevent gamers from feeling fully immersed in the RPG experience (Cutumisu et al., 2006). Although NPCs in single-player RPGs where there is only one character controlled by human player, may look like player characters, their behaviors clearly mark them as artificial and limited. Because they look like player characters but act like machines, NPCs are usually not believable participants in the role-playing game world.

In single-player RPGs, casting appealing and believable characters parallels the importance of characters in fiction. Some research indicated that lack of believability on NPC design could result in less meaningful game experience (see Afonso and Prada,

2009). Perceived believability is expected to increase players' feeling of immersion (Watson, 2002, van Doorn and de Vries, 2006, Bhatt, 2004) and their enjoyment (Brown and Cairns, 2004). Creating more believable NPCs is likely to result in better role-playing game experiences.

Recently, video game research have focused more on topics around player characters (e.g., Lankoski, 2011, Trepte and Reinecke, 2010), but studies around NPCs, such as a definition have been rare in social science context.

In this article, a synthesis of literatures related to perception of NPC believability and theoretical frames to understand the phenomenon are provided. In order to define NPC believability under single-player RPG situation, definitions and concepts of believability in different areas were reviewed as fundamentals of understanding NPC believability. With this ground, the perception of believable NPCs is examined in light of related theoretical frames to understand how and why people respond to NPCs in believable ways. Our focus is providing a new definition for believable NPCs with various theoretical frames based on our understanding of believability in related areas. Then, qualities as building blocks to build believable NPCs are scrutinized and grouped into five categories. Summary of findings and some practical tips are provided in the end. For better understanding of perceiving NPCs believably in RPGs, the scope of this study will be confined with topics around NPCs.

## 2. LITERATURE REVIEW

### 2.1 Non Player Character

A term NPC describes all of the game characters that game players cannot control. Considering its importance in single-player RPGs, however, NPCs don't have enough attention from the academe. NPCs are the characters that help, guide, and communicate with players to accomplish the goals of the game without being controlled by players.

In most RPGs, game players take on a main character role (protagonist) by choosing an avatar, while various NPCs take the supporting roles that interact with the player's character (PC). The quality of this interaction directly affects game players' evaluation of the game (e.g., Afonso and Prada, 2009). However, Jørgensen argued that giving the protagonist role to another character (NPC) would be interesting technique regarding game narratives since it would reduce the burden of player character in the story progression (2010). A research claimed that believable NPCs would make video game narrative more realistic (Riedl et

al., 2006). Game players' game experience is closely related to the perceived realism on NPCs. Whether being protagonists or taking supporting roles, NPCs are important actors/actress in the game narratives.

The experience of interacting with NPCs, however, is not like that with human being (e.g. Shechtman and Horowitz, 2003). People used more words and spent more time when they were interacting with human beings than with computer program. They believed that their computer-generated opponents were "predictable, easy to defeat, and boring to play against"(Sweetser et al., 2003). Similarly, West (1998) observed that gamers would rather play with/against entities that were believed alive. People prefer playing with other human beings, or at least with NPCs that render enough social cues.

Despite the fact that people prefer to playing with human-beings rather than computer generated characters, NPCs still play very important roles in our game experiences. According to Schreiner (2002), there are three reasons why we couldn't do away with NPCs. First, every player wants to be the master of his or her game. They don't want to take a utility role, which will be monotonous and tedious. This is consistent with the Zubek and Khoo's finding about fascinations of game coming from defeating NPCs (Zubek and Khoo, 2001). Second, some characters with higher power to control game environment should be played by NPC as well as lower level characters that are taking utility jobs. In a simulation game such as SimCity, it is OK for NPCs to take utility roles, but gamers will lose their taste immediately if they realize that their partners are playing with higher power. NPCs need to take care of power conflict among gamers in some network-based games. Third, NPCs hold important roles of game in terms of story line. There are some games that do not need a strong story line, such as Tetris and puzzle games. In single-player RPGs, however, game players will only wonder around the game environment seeking a key or hint without help of NPCs.

In spite of their importance in game experience, the current NPCs have failed to meet game players' expectation only providing shallow and unfulfilling game experience. Baillie-De Byl argued that creating a cheating NPCs would be more important than elaborate AI system (2004). Reeves and Nass also stressed the importance of subjective perceptions rather than objective reality (1996). In the same token, game players recognize NPCs as very unintelligent, not based on the intelligence they perceive, but based on the aptitude.

## 2.2 Believability

The definition of believability has been studied in many areas such as workplace gossip (Berkos, 2003), cigarette warning labels (Beltramini, 1982), and alcohol warning labels (Andrews et al., 1991). Similarly, source credibility has been studied in connection with believability from communication and journalism research (e.g. Ewing, 1940, Hovland et al., 1953, Brehm and Lipsher, 1959, Pastore and Horowitz, 1955). Some recent research with robot considered credibility as equivalent to believability (e.g., Fogg and Tseng, 1999). However, NPC believability is not necessarily related to truthfulness or credibility. Mateas pointed out that a believable computer agent may NOT be trustworthy and may possibly not tell the truth (1997). Rather, characters are "artistic abstractions of people, whose behavior, motivations, and internal life have been simplified and exaggerated in just such a

way as to engage the audience in the artist's vision" (Mateas, 2002).

In a very similar way, people experience the "likeness" of the character with a real person who may exist in the real world when people encounter a computer character in a game like single-player RPG.

The concept of believability is rooted in its relation to the arts (literature, theater, film, radio drama, etc.). Many film theories have argued that film causes cognitive illusion (e.g. Arnheim, 1957). According to Currie, the early film theorists' arguments regarding cinematic realism can be categorized in one of three degrees: transparency, likeness, and illusionism. He argued that the realism people experience when they watch a film can be "likeness" doctrine, which claims the experience of watching a movie is like the experience of perceiving the real world (Currie, 1995).

Bates described believability as "the illusion of life, thus permitting the audience's suspension of disbelief" in his study of the role of emotion on believable characters (1994). The origin of the expression "suspension of the disbelief" can be found in a Samuel T. Coleridge's autobiography, *Biographia Literaria*. Coleridge used the expression to describe the relation between reader and literature. Many definitions of believability share this common ground of cognitive illusion on life-forms (e.g. Bates, 1994). In other words, people come to believe that the characters they are interacting with are real.

The phenomenon of willing suspension of disbelief arises when fictional or virtual characters, events, or worlds contradict what the audience knows to be real. People willingly suspend this disbelief for the pleasure of the story. Suspending disbelief does not mean that viewers/readers believe everything they see or read; rather, it means that they don't reject the story because they disbelieve what they perceive. This explains how a fabricated story enables people to believe unrealistic things for the enjoyment of reading. However, the usefulness of Coleridge's concept is still in debate (e.g. Walton, 1978, Radford and Weston, 1975). Carroll, for example, pointed out its underlying premise as false arguing people cannot control what they believe (Carroll, 1990). Recently, Lankoski is empathic to this critique in his study of computer games (2011).

The concept of believability was first described and used by traditional cartoon animators who speculated about how they achieved the believability in the characters they drew. Charles M. Jones, a master of animation, who directed many Warner Brothers animated characters, such as Bugs Bunny, Daffy Duck, Elmer Fudd and Porky Pig, stressed the importance of believability in animated character design bringing a character to life (1989). Animators at Disney have tried to illustrate their characters as living entities that can think and act by their own volition to create the illusion of life (Thomas and Johnson, 1981). The goal of these early animators was to create the illusion of life, facilitating viewers' willing suspension of disbelief. Computer scientists and artificial intelligence researchers might borrow the practices of these early animators to make computer characters more believable (see Bates, 1994). However, the interactive characteristic of computer characters poses additional challenges. Unlike watching TV cartoon animations, the interaction between users and computer character is bidirectional.

Most of studies on computer agent have focused on its intelligent ability based on the belief that the more intelligent an agent is, the better it is. However, there has been skepticism on the appropriateness of the intelligence as the most representative attribute of the agent (Lidén, 2003). Especially the embodiment of such an intelligent agents requires strong visual representation in order to provide more vivid feedback to users (Johnson et al., 2000).

Many researchers in various related fields have begun to recognize the importance of creating believable synthetic characters in virtual worlds (e.g., Aylett, 1999, Szilas, 2003, Mateas, 1997), computer games (e.g., Bhatt, 2004, Mac Namee and Cunningham, 2001), interactive drama (e.g. Mateas, 1997), and embodied agents (e.g., Ortony, 2002, Lester et al., 1997, Nijholt, Lester and Stone, 1997). In an interactive drama, for example, players can participate in a story in a virtual world that is populated with computer-controlled characters. Weizenbaum was able to create a virtual psychotherapist agent called ELIZA using natural language (1966). He reported that some subjects were hard to believe that it is not human being arguing illusion of understanding was easy, but no empirical data with subjects was provided.

Regardless of their disciplines, researchers seem to agree with the importance of creating believable characters. When it comes to a question of what makes a computer character believable, a series of human qualities ranging from physical characteristics to psychological traits has been proposed as key factors. For instance, the Oz Project at Carnegie Mellon University identified a set of requirements for believable characters including personality, emotion, self-motivation, change, social relationships, and the illusion of life (Loyall, 1997).

Some researchers focus more on one or a few specific core qualities to provide practical design guidance. Freeman coined the term *emotioneering*, which is a set of techniques that can be used to create different emotions in computer characters (Freeman, 2003). He suggested some practical tips for making NPCs with emotional depth, such as hiding a secret/shame, regret, etc. On the other hand, Isbister suggested using a psychological principle such as stereotypes to design better game characters. She argued that a character with a baby face would be perceived more warmer and trustworthy but less reliable. (2006). Some have tried to measure believability of NPCs. Lankoski and Björk (2007) evaluated the level of believability with Claudette Perrick, an NPC in the game *The Elder Scrolls IV: Oblivion*. They used a list of descriptions called *Gameplay design patterns* (Björk and Holopainen, 2005, Björk et al., 2003), which are mutually related and reoccur frequently in the design of a gameplay. However, gameplay design patterns were used only to identify potential believability failure points in character design. No direct measurement of character believability was attempted.

## 2.3 Qualities of Believable NPCs

Many studies in the related fields address the importance of creating believable agents. The qualities, as well as meaning of their believability, vary by the field of study. A comprehensive literature survey can help to combine and categorized diverse believability paradigms. In this paper, we investigated many believability qualities of computer generated character in many related fields, such as computer science and communication, and

grouped them into several categories that have similar concepts. The analysis of believability qualities produced five key believability categories: appearance & behavior, personality, goals, emotions, and social relations.

### 2.3.1 Appearance & Behavior

Computer scientist Hayes-Roth and colleagues described the appearance of an animated character as “the encoding of each characters’ identifying demographic information – age, weight, gender, socioeconomic background and culture in the chosen embodiment of the character, as well as the representation of this embodiment” (Hayes-Roth et al., 2002). According to the definition, appearance not only includes static, visible attributes, but also animated gestures and nonverbal behaviors (e.g. Hayes-Roth and Doyle, 1998). Appearance and behavior category include visually perceivable qualities at a glance.

(Table 1 goes here)

According to Hayes-Roth and Doyle, behavior animation is the core quality of believability of an animated character. In defining seven requirements of believable behaviors in animated characters, they specified that behaviors have to be diverse to offer many possible scenarios but normative to appear life-like, ambient enough to invite players’ attention without distraction, and unique enough to distinguish one animated character from all others (1998). Bates also confirmed that appearance of reactivity is one of essential demands for believability in interactive character design (1994). In the study of constructing comprehensibility as an essential factor of a believable agent, Sengers pointed out that the agent’s comprehensibility came from “thinking out the connections between behaviors and displaying them to the users” (1999). Also the behavior patterns of computer characters should be complex enough to avoid creating an impression of simplicity.

Overall, the appearance and behavior category describes all the qualities that are exposed to human visual sensory input that communicate the information, such as gender, age, ethnicity, height, socioeconomic status, etc. When people look at a computer character, they make guesses on not only what kind of a character it is but also how they can interact with it based on the context and information perceived by their sensory inputs. Studies based on believability triggered by a character’s appearance and behavior patterns suggest that the representations of computer agent appearance and behaviors mimic life. In the same context, consistency of expression and appearance of goals (Loyall, 1997) and lack of ambiguity in expression (Lester et al., 1997) were also proposed as key techniques for increasing the believability in agents.

Any qualities in the character appearance and behavior category shouldn’t imply that having a human appearance is a necessary condition to perceive it as believable (Loyall, 1997). Mateas suggested that non-human computer agents also could be useful because of lower expectation compared to anthropomorphic agents. However, lower expectation doesn’t come entirely from the non-humanness of agents. The decrement of expectations is also related to low level of fidelity and realism on the agent regardless of whether it is human-like or not. Similarly, comic artist Scott McCloud (1994) noted that the more visually realistic a comic character is, the harder it is for people to think of the character as being like themselves. In other words, a smiley face could be anyone, including the player, but a photorealistic Arnold Schwarzenegger is clearly not the player.

As research suggests, qualities in the character appearance and behavior category can be representations of other believability qualities. For example, personality can be achieved by the visual design of appearance. All perceivable visual and audio information is closely related to the other key qualities of believability. It is critical to design the appearance of computer characters based on their roles in the context where they are. Qualities in the appearance and behavior category are usually perceived first, and players establish a kind of expectation based on the information from it. Even in a case where there are only limited amounts of visual information, human beings are capable of constructing a kind of an image of the character based on the available information. Hayes-Roth, Maldonado, and Moraes confirmed the importance of appearance in character design saying “(appearance) affects the character’s effectiveness and credibility at performing its assigned role, and directs the patterns of interaction. Even before the character speaks a single word, even before the page is completely loaded, the visitor has already processed the subliminal cues embedded in the character’s representation, such as the relative status and occupation of the interactors, and formed a model of what pattern the ensuing interaction will follow” (2002). The character appearance is not a mere representation of characters’ visual information, such as demographic information. Rather, it is an image of characters reflecting other character qualities.

Similarly, Wardrip-Fruin (2009) argued that giving very expressive appearance without connecting to its underlying models could result in a wrong impression of the characters. He introduced two opposite effects (The Eliza effect and The Tale-Spin effect), which were lessons from the past interactive drama projects. The Eliza effects refers to a computer agency (character), which creates wrong (much more complicated) surface impressions than the actual internal system logics while the Tale-Spin effect occurs when characters (characters) fail to deliver the precise complexity of the internal system thus creating over-simplified surface impressions. Wardrip-Fruin proposed an approach achieved by *The Sims* in which character expression is engaging as well as a good reflection of the underlying system. In character design, the principle of consistency is a prerequisite for fidelity.

### 2.3.2 Personality

Personality has been one of the most important aspects of believability for cartoon animators. Thomas and Johnson (1981) described importance of the personality as “For a character to be that real, he must have a personality, and, preferably, an interesting one”. More recently, personality has been suggested as one of the most critical factors in creating believable agents (Bates et al., 1994, Allbeck and Badler, 2002, Romano and Wong, 2004, Reilly, 1997).

(Table 2 goes here)

The Oz project at Carnegie Mellon University was the first attempt to develop a believable agent in an interactive story environment. In the project, computer scientist Loyall (1997) defined personality as “all of the particular details – especially details of behavior, thought and emotion – that together define the individual”. Similarly Hayes-Roth et al defined personality as a group of psychological characteristics that differentiate one entity from others (Hayes-Roth et al., 1997). Rousseau and Hayes-Roth proposed a computer agent model in which actions were driven by its personality and mood rather than its goal to produce a more dramatically believable and interesting character (1997). Mateas, another researcher of the Oz project, defined personality as the thing that inspired every single behavior of a character from very

simple behavior, such as talking, to very cognitive activity, such as reasoning (1997). To him, personality is “something unique and specific”(1997). Mateas discussed other qualities of believability, such as emotion and change, but he argues they must be consistent with the personality of the character.

Personality defines uniqueness and peculiar qualities of computer characters that distinguish themselves from other computer characters. Some qualities of personality are closely related to psychological traits. Goldberg proposed the big five personality traits (agreeableness, extraversion, neuroticism, conscientiousness and openness to experience) through empirical study of the human personality (1993). Among other psychological traits, Isbister (2006) claimed that extroversion and agreeableness are the first qualities human beings investigated when they met strangers for their survival.

Some computer scientists have tried to construct personality on synthetic computer characters by giving a unique combination of the parameters that constitute basic personality traits as Goldberg suggested (Bates, 1992, Rousseau and Hayes-Roth, 1997). Rizzo et al designed goal-based personalities (Rizzo et al., 1999). Isbister and Nass demonstrated the importance of consistency of personality in interactive characters (Isbister and Nass, 2000). Lankoski et al stressed the importance of personality in computer game characters (Lankoski et al., 2003).

Regardless of its importance, however, personality category doesn’t include any implemental qualities. Rather, it indicates the direction of realization constructed by other executable qualities, which exist in subordinate hierarchy of NPC believability. With nonverbal behavior and animation, Seif El-Nasr et al. also confirmed that personality could be delivered by other means (ex. Body type) (2009).

### 2.3.3 Goals

Hinting at thought processes through visual, nonverbal means was not easy to implement for early animators. They knew expressing the thought process of cartoon characters was important, but they didn’t know how to reveal it. According to Thomas and Johnston (1981), it was the animation of a dog that looked into the camera and snorted that gave them the idea of making cartoon characters appear to think.

(Table 3 goes here)

Loyall (1997) insisted that a self-motivated character should not only appear to think, but also have to show emotion of its own volition. “Pluto snorting was not what was powerful; it was that he was doing it of his own accord, instead of in reaction to some external stimulus” (Loyall, 1997). Similarly, character intentionality (goal) is “...the way in which the choice of actions and behaviors that a character makes appears natural (and possibly rational) to external observers” (Riedl and Young, 2005). Goals directly affect all other qualities of NPC believability. For instance, the outfit of an NPC should be designed carefully with a consideration of its role. If it is a kind of tutoring character that teaches how to cook, it may be more natural for players to expect the agent to wear a high chef’s hat and white uniform. Like personality, goal is a precursor to other NPC believability traits; it helps to define appearance, emotion, and behavior (Bates, 1994, Rizzo et al., 1999, Hayes-Roth et al., 2002).

### 2.3.4 Emotions

Emotion has been another key quality for believable agents (Loyall, 1997, Hayes-Roth and Doyle, 1998, Hayes-Roth et al.,

2002, Bates et al., 1994, Romano and Wong, 2004, Reilly and Bates, 1995).

(Table 4 goes here)

For the early animators like Thomas and Johnson, the portrayal of emotions “has given the Disney characters the illusion of life” (1981). They especially focused on several considerations to convey the emotional state of cartoon characters: clear definition of their emotional state, revealing their thought process through emotions, and use of time to emphasize the emotion. Bates (1994) adapted Thomas and Johnson’s principles of revealing cartoon character emotions and applied them to the design of the emotion of ‘Woggles’ (self-animating creatures in a simulated world that was a small portion of the Oz project). In order to define their emotional states clearly, Woggles only had one or two primary emotions with appropriate intensities. Also Woggles’ emotions were mapped to specific behaviors with specific personality to reveal their thought process. One emotion could be mapped to two different behaviors based on the personality of characters. However, Bates didn’t use animation techniques (for example, exaggerating) to emphasize Woggles’ emotions. He explained the value of character emotion as “... helps us know that characters really care about what happens in the world, that they truly have desires” (1994). Emotion signals an NPC’s aliveness, creating the illusion of life.

Ortony re-categorized the conditions in which emotions can be generated, and he suggested five positive and negative conditions for believable agents (2002). He pointed out the importance of consistency between internal responses (emotions) and external responses (behaviors) in believable emotional agents. Mateas (1997) argued that the emotions of a believable NPC should be expressed in unique ways (akin to and supporting the uniqueness of personality) confirming Ortony’s point. Wooldridge and Jennings cited emotion as a key component of believable agents that makes them appear to respond to human emotions in appropriate and consistent ways (1995). Similarly, Waern (2011) studied the romantic gameplay in a single-player RPG, *Dragon Age* and found that the emotion of player and character could get blurred through out game play. Lankoski (2012) explained emotion game players experienced in the course of game play related to goals of game characters. He insisted that some video characters could be frightening because they threaten a player’s goals by fictionally threatening his/her character.

The emotion category doesn’t prescribe what kinds of emotions believable NPCs have to possess. Rather all of the research regarding a character’s emotion suggests that it is important for believable NPCs to clearly exhibit emotions of their own. The emotion category requires believable NPCs to reveal their emotions as an outcome of unseen internal processes. At the same time, they should respond to players’ emotions correctly in a given context. The explicitness of emotion needs to be clear enough that players can distinguish each emotion at a glance. The expression of an NPC’s emotional state should be neither ambiguous in meanings nor weak in strength. Emotional states should be revealed through multiple channels such as facial expression, gestures, etc. In some cases, for example, it may be hard to notice emotions only by looking at the facial expression of an NPC either because the face is too small or the face may be looking away. Body language and motion can help convey character emotion.

However, it is not easy to show a right expression of a right emotional state at the right time. Unlike cartoon characters that

can express their emotional states based on pre-scripted linear narratives, NPCs’ expressions of emotional states are hard to plan in advance because their emotional responses are chosen and altered by human beings’ interaction. NPC design should include a range of possible emotional states anticipating specific circumstances, and each actual emotional state of a computer agent should be appropriate for the circumstance under which it is enacted so that players do not experience cognitive dissonance.

### 2.3.5 Social Relations

The early animators didn’t recognize characters’ social relationships at first because different animators drew each character in a cartoon. When one animator drew all the characters in a scene, the importance of character relations was recognized. Thomas and Johnston (1981) wrote:

“...the Bambi and Thumper sequence had something that the Pluto and Donald sections did not have. That was a character relationship with strong beginnings in the story department. ...With this as a springboard, the animator continued developing this relationship, which only could have been done by one person handling both characters and completely controlling every single bit of action, timing, and cutting. ...This new way of working with character relationships encompassed the whole range of relations between two or more characters—from the broadest to the most delicate. It involved expression scenes that often registered the most secret thoughts and inner emotions of the characters, which as they became more subtle were also more revealing”.

(Table 5 goes here)

Studies on believable agents insist that social relations among computer characters influences interaction patterns among them and are influenced by the interaction in turn (Bates, 1994, Thomas and Johnson, 1981, Mateas, 1997). Some studies described a social aspect to the interaction between computer characters and players (e.g. Hayes-Roth and Doyle, 1998, Hayes-Roth et al., 2002). Loyall insisted that social relations among characters should be designed carefully with detailed behaviors and interactions to reveal the relationships among characters (1997). Hayes-Roth, Maldonado and Moraes argued that the context of the interaction is even more important than the actual content itself (2002). According to them, cultural differences, the tempo of turn taking in conversation, initiatives of the conversation, etc. can be more important to create believable agents than social relations between characters, especially in a one-to-one interaction environment with only the player and a single character. A NPC that appears to have a social relationship with other NPCs helps players willingly suspend their disbelief and conceive of the character as real. Of course, social relationships between NPCs cannot exist in environments limited to one-to-one interaction between the player and an isolated NPC. Most interactions with pedagogical agents, for example, only occur directly between the agent and human player. In their study with human subjects, Afonso and Prada (2009) created a RPG with two different versions: one with no social interaction among NPCs and other with social relation. They found that gamers preferred a RPG with socializing NPCs much more than a RPG with NPCs that didn’t socialize each other.

The social relationship between an NPC and human players also can affect the perception of believability. Nass et al. find that people feel more attraction and trust with a computer character that has the same ethnic background as the users than with one that has a different ethnic background (2000). The more users

feel a social connection with computer characters, the more the believable character will seem. In role-playing game environments that have multiple NPCs and avatars, the social relations among NPCs should enhance yet not overwhelm or otherwise interfere with the interaction between players and NPCs. Both NPC-NPC and NPC-player social relations should seem natural. Isbister (2006) emphasized the importance of a character's modalities, such as body and face as social equipment to reveal the context of the interaction.

Many of the above believability qualities were also reported in other contexts as well. Lankoski, for example, listed many of NPC believability qualities as source of believable conflict between player characters and non player characters (2007). Our intention is to provide review of empirical qualities of believability assuming that the interaction with NPCs might not be directly related to any specific scenario since all the above qualities are inter-related.

### 3. NPC BELIEVABILITY

#### 3.1 Automatic Reaction To Social Cues

One aspect of NPC believability lies in the fact that people respond to characters that hold some social cues. When people encounter NPCs in games, for example, they respond to them in a very similar way as they do with other people in the real world. The response to the NPCs is very automatic and natural even though people know they are not real. Social Response to Communication Technology perspective (also known as the 'media equation') explains this automatic reaction with human nature: people react very similarly to social cues from humans and social cues from characters acting like a human (e.g., Nass et al., 1996, Nass et al., 1998, Nass and Moon, 2000). For example, people are even polite to computers. When asked to evaluate the performance of a computer, people tended to give more positive feedback about its performance when the same computer asked for the evaluation (Reeves and Nass, 1996). When another computer asked to evaluate the same computer's performance, people gave less positive responses, perhaps because they were not as concerned about hurting the original computer's feelings.

The automatic reaction to social cues is closely related to people's cognition of something's existence. Social science researchers have developed definitions and measurement constructs of presence (e.g., Lombard et al., 2000, Barfield et al., 1995). Creating a sense of presence has a core goal of mediated communication systems such as virtual reality, video games, and linear mass media. For example, Schroeder (2002) described presence as a medium's capability of evoking the feeling that a human user is physically present in a virtual environment. Heeter suggested three dimensions of presence as a feeling of being there in her study of virtual reality: personal presence (I am there), social presence (you are here), and environmental presence (the virtual environment exists) (1992).

Slater et al. (1995) stated that presence depended partly on the two matches: a match between sensory input and proprioceptor, a match with sensory input with internal representation. Presence shares common ground with NPC believability: Matched experience. However, presence is different with NPC believability in that it depends upon intentional cognitive involvement, while other dimensions are perceptual rather than judgmental. NPC believability takes care of the cognitive aspect of presence and

makes the perception of it smooth and automatic. NPC believability is associated with *willing suspension of disbelief*, which is not automatic, while belief, for example, is automatic (Reeves and Nass, 1996).

Nowak and Biocca investigated differences in how people respond to different entities (agents, controlled by a computer, and avatars, controlled by person) as well as different levels of anthropomorphic visual representation (high-anthropomorphic, low-anthropomorphic, and no image) with three different forms of presence (telepresence or a sense of being there, copresence, or a sense of being with, and social presence, a sense of interpersonal interaction) (2003). They found that whether the entity is an agent or avatar didn't influence the feeling of presence in general. An entity represented by an image results in a stronger experience of presence than entities with no image. This result supports the notion that, by default, people tend to assume any entity is human when sparse information is provided. There is an underlying assumption that someone else is "like me" unless information contradicts that assumption.

In his study of game players' empathic reaction to computer character, Lankoski also confirmed the automatic aspect of social interaction with game characters. He argued that understanding human beings and game characters shared the same ground: mimicry and empathy and the process of mimicry was involuntary and automatic (Lankoski, 2011). Similarly, Waern (2011) argued that game players could experience so-called "bleed" effect (where the distinct boundary between players and characters is blurred) with their characters in computerized games in her study of engagement in romance based on the investigation of blogs and comments from game communities.

#### 3.2 Perceptual Realism Judgment

At the same time, people seem to evaluate the likeness of entities they encounter in both the real and virtual world. By evaluating the level of realism they perceive, humans seem to construct an expectation about an entity they are interacting with. Japanese robotist Mori introduced the concept of an "uncanny valley" in human reactions to anthropomorphic robots (1970). According to Mori, as the realistic human likeness of a robot is increased, human attraction to and familiarity with the robot will be increased, but only up to a certain point. After this point, attraction is replaced by fear, unease, or revulsion created by a robot that appears to be, but is not quite, human-like. Eventually, in theory, as the human likeness level keeps increasing, the human perception of the robot will rebound and response to the robot will approach the level of attraction to a healthy person. The area where attraction plummets and is replaced by unease is called the 'uncanny valley.'

However, some research contested Mori's claims arguing realistic human appearance was not mandatory condition for the uncanny valley phenomenon. In their study with sequences of morphed face images, Seyama and Nagayama confirmed that the uncanny valley emerged only when there were abnormalities in the face images, such as unbalanced big eye size (2007). Also, the predictions of Mori's uncanny valley was tested in an experiment where a human and his robotic android (Bartneck et al., 2009). They found that there was no difference of the likability between a human and his highly realistic robotic android.

In a case in which an extremely anthropomorphic robot successfully fools our judgmental senses (passing the Turing test (Turing, 1950)), it reaches its highest realism. However, making highly "realistic" entities is not recommended as a goal of creating synthetic characters. Game designer and journalist Clive Thompson (2004) argued that the "Uncanny Valley can make games less engrossing." When people experience a moment of reckoning regarding the identity of an entity they interact with, the level of likability crashes (uncanny valley) and its realism will be reevaluated again based on the new identity. The recent fMRI result of human brain also confirmed the existence of the uncanny valley (Saygin et al., 2012).

### 3.3 Cognitive Intervention and Reconciliation

The two aspects (automatic reaction and perceptual judgment) of NPC believability are not only interrelated, but also contradict each other. According to the automatic social reaction aspect, human beings tend to respond to a character as a living form even if it doesn't show much perceptual features. On the other hand, they have very accurate senses for realism judgment. However, these two principles cannot explain a very important aspect of NPC believability: matched expectation. For instance, the two human natures cannot explain the reason why a character with very simple features is often more believable than a character showing many perceptual features. Nowak and Biocca (2003), for example, confirmed that subjects in low-anthropomorphic conditions experience higher telepresence than those in other conditions (high-anthropomorphic and no image condition). Human beings recognize and differentiate objects in a mediated environment differently based on the spatial cues coming from the objects, and different visual cues trigger different images of the objects. Human beings seem to have a system of those images in hierarchical structures.

Schemata is a kind of cognitive network of related thoughts (Slavin, 1988). Similarly, Mandler described a schema as a unique and harmonious representation (1984). Each individual has many unique schemata depending on his or her experience and cognitive ability. The concept of schema has been used by cognitive scientists and psychologists to study how humans interpret and remember information they encounter in daily life in relation to their previously developed schemata (Duis, 1996, Bartlett, 1932, Ausubel, 1967, Armbruster, 1986). Psychologists Rumelhart and Norman identified three possible effects of new information on people's existing knowledge structure: accretion, restructuring, and tuning (1978). Accretion occurs when new information fits well into the existing schema. The schema structure remains unchanged as the new information is added. Restructuring happens when a pre-existing schema can't explain new information, and people have to change their schema to accommodate the new information. Tuning effect describes a situation when people use new, somewhat contradictory information to tune or modify an existing schema.

The theory of schema explains how the human brain perceives, interprets, and constructs knowledge of the world. The basic idea is that people remember new information by relating this information to the pre-existing information (schemata). Thus, they use schemata to make sense of the world. Schemata make it possible for human beings to make predictions about their next behaviors. Schemata are not conscious. How human beings store and process information occurs at a subconscious level. However, hints at the schemata people have accumulated through their daily

lives can be revealed in various attitudes and behaviors such as stereotypes, social roles, etc. When new information doesn't fit into the existing schemata, the new information may not be comprehended correctly or cannot be comprehended at all. People seem to develop, accumulate, and modify schemata throughout their lives, and these schemata prepare them to respond to various life events well. The schemata may be used when they see similar objects in pictures or encounter strange characters in a virtual world. It is expected that people will recognize depiction/representation (objects in mediated communication) in comparatively the same way that they recognize real objects - by relating the representation's visual features to their recognition capacity (schema).

Similarly, the theory of Natural Generativity explains human beings' natural and automatic object recognition capacity in a mediated environment (Schier, 1986, Wollheim and Collection, 1987, Sartwell, 1991). The theory of Natural Generativity assumes that human beings naturally use the same capacity that they use to visually recognize objects in the real world in order to recognize objects in pictures. For instance, if people can recognize cars in the real world, they should be able to recognize cars in pictures in general.

People have an instinctive ability to locate some spatial features (likeness) between objects in film and those in reality, and those spatial features will trigger their capacity to recognize those objects in a film. In other words, people have an automatic and instinctive way of exploiting their visual capacity to recognize an apple in a picture by locating some features in comparison with an apple in reality. Visual cues and features trigger this capacity, and the more people locate spatial features in objects between a picture and reality, the more realistic the object in the picture will be. Currie (1995) argued that the realism people experience when they watch a film illustrates "likeness" doctrine, which claims the experience of watching a movie is like the experience of perceiving the real world. He calls this kind of realism "perceptual realism," trying to explain viewers' capacity to recognize depictions of objects in a film.

The theory of parasocial interaction argues that human being responds to representations of humans in the media in very similar ways to their typical social relationship. Since Horton and Wohl (1956) first introduced it, the concept of parasocial interaction has been studied in the context of mass communication (e.g., McQuail et al., 1972, Levy, 1979). Recently, Giles (2002) proposed a model that accommodates from typical social interaction (ex, face-to-face interaction) to parasocial interaction (ex, cartoon characters). In his model of parasocial interaction for future research, he argued that the cognitive aspect of parasocial interaction "consists mainly of making judgments about the media figure (person) based on knowledge of that person" (Giles, 2002). According to his new model, the phenomenon of parasocial interaction can occur on the base of the important aspect of NPC believability: matched expectation.

Theories presented above provided common ground for both automatic responses to social cues and perceptual realism. Uncertainty Reduction Theory occurs in a scenario in which people interact with other human beings, and people use a schema in the course of conversation with other human beings. Even in cases in which they encounter highly anthropomorphic entities, people still use a schema in order to interact with them. Schema can also be the reason why the level of realism abruptly increases

right after the uncanny valley in Mori's speculation to a degree that is higher than before the valley. The uncanny valley signifies the moment when people change a schema of the object they interact with, and the representation of the object is enough to believe the object as its new schema.

### 3.4 NPC Believability

Combining all the aspects of NPC believability presented above, we propose a definition of NPC believability as "*the size and nature of the cognitive gap between the character players experience and the character they expect.*"

When players' expectations (schema) match their experience, a character is believable. Mismatch between players' expectation and their experience can be positive or negative. The negative mismatch occurs when players' experience falls short of their expectation. The larger the gap, the more likely it is to interfere with suspension of disbelief. People don't feel any surprise (not believable) when they experience either much less than what they expected or what they experience doesn't match with what they expected. On the contrary, the positive mismatch occurs when either players experience exceeds their expectation. When players experience qualities of NPCs a way beyond their expectation, players need to apply a new schema to understand the character feeling surprise (unbelievable or so believable).

Experience management is an important part of NPC believability, but casting first impression is critical since it will decide the level and the direction of your expectation (schema). The relative and proportional nature of the NPC believability between expectation and experience is confirmed with other research (e.g. Magerko, 2007).

Our definition includes two instinctive but contradictory human natures: 1) human beings tend to respond socially to a minimal cue of life, 2) but human beings also are very accurate when they evaluate the realism of an entity. In other words, people respond to computer characters in two conflicting ways (automatic reaction to social cues and perceptual realism judgment). People combine these two instincts cognitively (cognitive intervention and reconciliation) to feel believable. NPC believability is human beings' willingness to overcome the cognitive gap between their expectation and experience.

### 3.5 Combining all Together

Uncertainty Reduction Theory (URT) explains how human beings interact with strangers based on their schema. Berger and Calabrese (1975) developed URT to explain a role of communication in forming new interpersonal relationships. They borrowed the concept of uncertainty from information science where it was used to describe data transmission between machines (Shannon and Weaver, 1963). According to the URT, uncertainty is unpleasant, and people try to avoid or reduce it when they encounter strangers. Berger and Calabrese proposed three stages of interactions when people encounter strangers: an entry phase, a personal phase, and an exit phase. During the entry phase, people share very basic information, such as sex, age, socioeconomic status, etc. In the personal phase, more personal information will be shared, including attitudes, beliefs, values, etc. During the exit phase, people decide whether they want to continue to have a relationship with the stranger. The three interaction steps may apply to the interaction with a strange computer-generated character as well. When people form impressions of others, they construct mental models of new people based on people they already know (Gordon, 1986). Users

of a low bandwidth communication system tend to assume that the distant others are more like them because they don't have enough information to contradict the assumption, whereas users of a higher bandwidth system can perceive more detail and recognize more differences between themselves and the distant others. High bandwidth reveals differences, whereas low bandwidth carries little information resulting in greater reliance on default schemas (Walther, 1996). People "fill in the blanks" and assume similarly to themselves. Isbister argued that people respond to computer characters in a very similar way as they do to face-to-face communication as the URT expects (2006). She recognized the importance of psychological principles such as *agreeableness*, *dominance*, and *personality* in a relation with computer characters. The judgment on computer characters based on the psychological principles occurs quickly, automatically, and accurately.

People first try to apply one of their existing schemata to interpret a character or situation they encounter, and modify or create a new one only if familiar schemata are a poor fit. The NPC believability is intertwined with three sequentially related factors: automatic response to social cues, the level of realism, and schema. First, people basically respond to non-human entities and human beings in a very similar way as the automatic response to social cues explains. They first search the characters to locate some spatial feature, which will trigger their capacity to recognize the characters (schema). Then they quickly evaluate the level of realism of the characters based on the schema obtained. If the characters' features (our perceptual experience) are realistic enough to satisfy our expectation generated by the schema, then they perceive the characters as believable. The level of realism represented by visual cues will decide which schema to trigger, and the schema will be used in evaluating the level of realism in turn. NPC believability rests partly in subconscious processes (fast and automatic) and partly conscious processes (slow, reiterative and cognitively heavy). Based on this cognitive foundation, game players are able to experience "bleed" effect falling in love with NPCs in RPGs (Waern, 2011).

## 4. CONCLUSION: DESIGNING BELIEVABLE NPC

The theoretical communication frameworks add new insights and reasoning behind the design and study of believable NPCs. Applying the frameworks one could posit:

- 1) Players' first reaction to an NPC will be to apply an existing schema to understand what to expect and how to interact with the NPC (schema theory).
- 2) If no existing schema fits the situation, players will be forced to construct a new schema. Even so, the new schema will probably be constructed from existing schemas.
- 3) Players are likely to assume the NPC is like them, unless available information contradicts that assumption. When no information is available, we fill in the blanks. When contradictory information is available, we adapt our schema. Doing so takes cognitive effort and can draw someone out of suspension of disbelief.
- 4) Players will react to NPCs who look like player avatars and to NPCs who look like signs. We tend to be very forgiving of forms, assigning the benefit of anthropomorphism even to rocks and disembodied text.

- 5) More detail is not always better. Low detail lets the player fill in the blank. The more an NPC looks but does not act like a player avatar, the more cognitive friction will result.
- 6) People are uncomfortable with ambiguity and uncertainty. They are not sure which schema to call upon. Drawing upon familiar schemas requires less brainpower to understand.

NPC believability is a result of both cognitive and unconscious activities of human beings. Game players perceive believability of NPCs in very subjective ways. The qualities that have been insisted to create believable agents were examined and categorized into five different categories; appearance, personality, goals, emotions, and social relations. However, these believability qualities are not necessary conditions for character believability. Humans require very few cues in order to react socially to a computer (Reeves and Nass, 1996). Also, researchers found that the social presence could be triggered by only minimum intelligence (Biocca et al., 2001). Individual NPC believability quality is not independent: they are inter-related to each other. This is why two different qualities in a NPC don't guarantee doubled-believability. Often, NPC believability can be established mainly by one or few distinct individual qualities. In many cases, perceived NPC believability is less than mathematical sum of each individual believability quality. In other words, an individual believability quality may have a negative effect on the overall NPC believability if it is in conflict with another main principle such as goal or personality. This finding is consistent with what Currie described about human capacity:

“it might be a disjunctive capacity: being able to recognize an F might consist in associating a certain list of features  $a_1, a_2, \dots, a_n$  with the concept of an F in such a way that detection of the presence of any one of the  $a_i$ 's in an object is sufficient to enable you to recognize that object as an F” (1995).

Moreover the five qualities may not be a sufficient condition for evoking believability because players experience it subjectively. Even though a NPC satisfies many of the NPC believability requirements, there is no guarantee that it will be perceived as believable (Bates, 1994, Baillie-De Byl, 2004, Bhatt, 2004). Even an NPC will be perceived as less believable when a game player interacts with it over time or with repeated play.

Time is an important factor in NPC believability building. Certain believability qualities can be perceived faster with less ambiguity than other qualities. For example, the appearance of a computer character is easy to perceive and doesn't require much time or cognitive processing compared to perceiving personality or experiencing social relations. It is not clear how much each individual category contributes to the overall believability of NPCs over time yet. When the interaction between players and NPCs is very short, appearance probably should have a bigger impact on overall believability. Other categories (such as personality) can make more contribution to the overall NPC believability as the interaction unfolds over time.

In a larger scope, the causal relationship between NPC believability and the quality of gameplay will be interesting, even though it was not studied in this research. Good RPGs include many factors including NPC believability. However, it is not clear how it is related to general game evaluation. If there are other factors affecting the game assessment, what are they? Especially

in a single-player RPG, NPC believability may be more important than other factors due to the nature of the game. Studies on factors that affect RPG evaluation not only from experts' perception, but also causal game players' perception, will be important in terms of providing guidance to character designers.

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**Table 1. Character Qualities Related to Appearance and Behavior**

<i>Quality</i>	<i>Author</i>	<i>Context</i>
Nonverbal Behavior	El-Nasr et al., 2009	Believable Characters
Appearance, Identity, Manner of gesture, Manner of speak, Content of speech	Hayes-Roth, Maldonado & Moraes 2002	10 key qualities in animate characters
Behavioral cues	Sengers 1999	Comprehensive agents (comprehensibility)
Behavior	Hayes-Roth and Doyle 1998	7 behavioral requirements of believability in animate characters
Situated Liveness, Controlled visual impact, Complex behavior pattern	Lester and Stone 1997	Three believability criteria in Animated pedagogical agents
Consistency in expression, appearance of goals	Loyall 1997	Requirements of believable agents
Language	Loyall and Bates 1997	Requirements of believable agents
Lack of ambiguity in expression	Letster et al 1997	Deictic believability in animated pedagogical agent
Appearance of reactivity	Bates, 1994	Believable agents

**Table 2. Character Qualities Related to Personality**

<i>Quality</i>	<i>Author</i>	<i>Context</i>
Personality	El-Nasr et al., 2009 Isbister 2006 Drennan 2004 Romano, Wong 2004 Lankoski, Heliö, & Ekman 2003 Allbeck and Badler 2002 Isbister and Nass 2000 Mateas 1997 Loyall 1997 Rousseau and Hayes-Roth 1997 Reilly 1997 Reilly and Bates 1995 Bates, Loyall, Reilly, Castelfranchi, and Wemer 1994	Believable Characters Better Game Characters Believable conversational NPC Believability of virtual character Characters in computer games Representing agent Interactive characters Requirement of believability Requirement of character believability Believable synthetic actors Believable social agent Believable social agents Architecture for Autonomous agents
Persona	Hayes-Roth and Doyle 1998	Believable animate character
Identity	Hayes-Roth, Maldonado and Moraes 2002	10 key Believable qualities in animate characters
Back story	Hayes-Roth, Maldonado and Moraes 2002	10 key Believable qualities in animate characters
Goal based personality	Rizzo et al 1999	Personality and social behavior in believable agent

**Table 3. Character Qualities Related to Goal**

<i>Quality</i>	<i>Author</i>	<i>Context</i>
Goals	Lankoski 2012 Bates 1994	Computer games and emotions Believable agents
Self-motivation	Loyall 1997 Mates 1997	Requirement of character believability Requirement of believability
Role, Role dynamics	Hayes-Roth, Maldonado and Moraes 2002	10 key Believable qualities in animate characters
Goal preference	Rizzo et al 1999	Personality and social behavior in believable agent
Intentionality	Riedl and Young 2005	Character believability

**Table 4. Character Qualities Related to Emotion**

<i>Quality</i>	<i>Author</i>	<i>Context</i>
Emotion(s)	Lankoski 2012	Computer games and emotions
	Isbister 2006	Better Game Characters
	Drennan 2004	Believable conversational NPC
	Romano and Wong 2004	Believability of virtual character
	Ortony 2002	Believable emotional agent
	Loyall 1997	Requirement of character believability
	Mateas 1997	Requirement of believability
	Reilly and Bates 1995	Believable social agents
	Wooldridge and Jennings 1995	Believable agents in the context of intelligent agents
	Bates, Loyall, Reilly, Castelfranchi, Wemer 1994	Believable agent
Bates 1994	Emotions in believable agents	
Waern 2010	Emotions in romantic gameplay	
Empathy	Hayes-Roth and Doyle, 1998	Believable animate character
Emotional dynamics	Hayes-Roth, Maldonado and Moraes, 2002	10 key Believable qualities in animate characters
Emotional reaction	Rizzo et al, 1999	Personality and social behavior in believable agent
Emotional reactivity	Bates 1994	Suggested as believability demands on an interactive character

**Table 5. Character Qualities Related to Social Relations**

<i>Quality</i>	<i>Author</i>	<i>Context</i>
Social-relationship	Isbister 2006	Better Game Characters
	Loyall 1997	Requirement of character believability
	Mateas 1997	Requirement of believability
Situated Social competence	Bates 1994	Believable agents
Social relation	Hayes-Roth and Doyle 1998	Believable animate character
Social interaction patterns	Hayes-Roth, Maldonado and Moraes 2002	10 key Believable qualities in animate characters
Social Interaction	Afonso and Prada 2009	Improving the social believability of NPCs