Narrative Presence in Intelligent Learning Environments

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Abstract

Recent years have seen an emerging interest in narrative-centered learning, ushering in a wave of research on adaptive story-based systems for education and training. Among the aims of current narrative-centered learning work is the creation of environments that draw students into the story while simultaneously satisfying pedagogical goals in an enjoyable, motivating, and effective manner. In this paper, we seek to characterize this interaction by introducing the notion of narrative presence and grounding the discussion in research on presence conducted in the human factors and virtual reality communities. Contributing factors to narrative presence are discussed in the context of CRYSTAL ISLAND, a testbed narrative-centered learning environment. Methods for subjective and objective evaluation of narrative presence are introduced and reviewed. Finally, the design implications of narrative presence for interactive narrative-centered learning environments are considered.

Introduction

Narrative is a unifying lens through which humans view the world around them. Stories provide contextual structure and meaning to knowledge, understanding, and experience. This connection has fostered interest in computational models of narrative for generation (Meehan, 1977; Lebowitz, 1985; Riedl, 2004) and interaction (Wehyrauch, 1997; Cavazza et al., 2002; Mateas and Stern, 2005; Riedl et al., 2003). In particular, interactive narrative has been incorporated into systems designed for education (Aylett et al., 2005; Mott et al., 2006) and training (Swartout et al., 2001; Magerko et al., 2005; Riedl and Stern, 2006). These narrative-centered learning environments (NLEs) seek to provide adaptive, effective pedagogy that is both motivating and meaningful. NLEs have been devised for a variety of domains, including military soft-skills training (Riedl and Stern, 2006), anti-bullying education (Aylett et al., 2005), and science learning in the domain of microbiology (Mott and Lester, 2006b).

Narrative-centered learning environments offer significant potential for enhancing students' learning experiences. Stories are unique in providing the ability to draw audiences into plots and settings, thereby opening perceptual, emotional, and motivational opportunities for learning. Establishing concrete connections between narrative context and pedagogical subject matter has been said to support the assimilation of new ideas in young learners (Wells, 1986). Narratives can facilitate students' semantically encoding new information and making commitments to long-term memory in the form of episodic memories (Ormrod, 2004). Furthermore, fantasy contexts in educational games have been shown to provide motivational benefits for learning (Parker and Lepper, 1992). By promoting cognitive activities such as suspension of disbelief and story involvement, narrative can potentially reinforce learning objectives and ingrain subject matter. Although it is important to remain mindful of potential disadvantages like seductive details (Harp and Mayer, 1998), a dynamically generated narrative that draws students into the evolving plot may be pedagogically effective.

The experience of being an integral constituent of a narrative, rather than an external observer, yields significant perceptual differences for an audience (Kelso et al., 1993). Interactive NLEs elicit fundamentally different experiences than those found in traditional educational settings. It is therefore useful to develop a vocabulary to characterize this central component of the interaction. To this end, we propose the notion of *narrative presence*, informally the sense of being in or a part of the story. This terminology is based on work in the human factors and virtual reality communities that seeks to describe interactions with virtual environments. Establishing such a construct is useful for understanding and discussing the differences between narrative-centered learning environments and conventional educational software. Further, narrative presence points to techniques for evaluating interactive narrative experiences and it informs the design of narrative-centered learning environments.

This paper introduces and discusses the notion of narrative presence. The relationship between presence and narrative presence is discussed, followed by an introduction to CRYSTAL ISLAND, a narrative-centered learning environment, in which we will explore and illustrate narrative presence. Next a variety of factors hypothesized to contribute to narrative presence are presented. Techniques for subjective and objective measurement of narrative presence are discussed, as are narrative presence evaluation metrics. Finally,

implications are drawn for the design and adaptation of narrative-centered learning environments, including a brief discussion of future work.

Narrative Presence

Presence relates to quality of experience (Gaggioli *et. al*., 2003). Although there has been substantial debate on formal definitions, there is a general consensus that *presence* describes a user's sense of "being there" when interacting with a mediated environment (Schubert *et al*., 1999; IJsselsteijn *et al*., 2000; Insko, 2003). Presence has been alternatively defined as "the perceptual illusion of nonmediation" (Lombard and Ditton, 1997), as well as "the subjective experience of being in one place or environment, even when one is physically situated in another" (Witmer and Singer, 1998). It is distinguished from related concepts such as immersion and involvement. *Immersion* refers to the extent and nature of technology-provided sensory stimuli; it is often associated with the pervasiveness and fidelity of visual, audial, olfactory, and tactile inputs (Schubert *et al*., 1999). *Involvement* refers to the degree of attention and meaning devoted to some set of stimuli (Witmer and Singer, 1998). Numerous additional conceptualizations of presence have also been discussed; they can be divided into two types: *physical presence*, the sense of being physically located in a mediated space, and *social presence*, the sense of co-location and social interaction with a virtual or remote partner (Lombard and Ditton, 1997; Ijsselsteijn *et al*., 2003).

Drawing from these ideas, narrative presence can be understood as an affective-cognitive construct that characterizes an audience's perceived relationship with a story. Narrative presence encompasses feelings of participation, embodiment, or disembodied observation in a story world. It reflects experiences where fiction readers, movie audiences, or videogame players report feelings of being transported into a story (Gerrig, 1993). In contrast to the traditional definitions of presence above, narrative presence is concerned with the cognitive and affective processes influenced by the content and presentation of a narrative. Narrative presence does not necessarily seek the removal or invisibility of mediation. More central are the perceived reality of the story and the experience of plausible cognitive and emotional reactions.

Classic presence research largely focuses on issues of interface, whereas narrative presence emphasizes an experience's meaning, the "deep structure for the virtual world," the cinema rather than the celluloid (Bates, 1992). Such a shift has long been advocated, predating much of the modern research in interactive narrative. Past work has largely focused on computational theories supporting the development of individual narrative components, e.g., character believability (Reilly, 1996), drama management (Weyhrauch, 1997), and story generation (Riedl, 2004).

There has been relatively little work on establishing a framework for evaluating interactive narrative (Roberts and Isbell, 2007). By providing a construct for discussing, characterizing, and measuring interactions with narrative generators, narrative presence offers a promising basis for framing evaluation questions. Interactive narrative provides significant opportunities for users to experience narrative presence, and narrative presence raises important issues for the design of interactive narrative.

CRYSTAL ISLAND

We are exploring narrative presence in CRYSTAL ISLAND, a testbed learning environment for middle school students featuring a science mystery in the domain of microbiology and genetics. The mystery is set on a recently discovered volcanic island where a research station has been established to study the unique flora and fauna. The user plays the role of a visiting scientist who is attempting to discover the origins of an unidentified illness at the research station. The story begins by introducing the student to the island and the members of the research team for which her father serves as the lead scientist. As members of the research team fall ill, it is her task to discover the cause of the outbreak. She is free to explore the world to collect physical evidence and interact with other characters. Through the course of her adventure she must gather enough evidence to correctly choose among candidate diagnoses including botulism, cholera, salmonellosis, and tick paralysis, as well as to identify the source of the disease to solve the mystery.

Factors in Narrative Presence

Presence and narrative presence are complex, multidimensional constructs composed of numerous factors (IJsselsteijn *et al*., 2003). It has been argued that a variety of elements contribute to presence. One analysis suggests that there are four instrumental components: control factors, sensory factors, distraction factors, and realism factors (Witmer and Singer, 1998). In contrast, an alternate factor analysis has suggested that there are eight contributors: spatial presence, involvement, realness, immersion quality, drama, interface awareness, exploration, and predictability (Schubert *et al*., 1999). Both of these analyses heavily weight media factors and deemphasize user characteristics as potential influencers of presence. A broader, aggregate factorization has more recently been suggested. It includes the extent and fidelity of sensory information; the mapping between actions and effects; content factors including characters, objects, and events; and user characteristics including perceptual and cognitive abilities (IJsselsteijn *et al*., 2000).

Narrative presence is associated with intrinsic processes that depend on the perception of a narrative. It has been suggested that an audience is predisposed to accepting a story as reality (Gerrig, 1998). It is therefore the responsibility of the author to avoid interfering with that perception. Below we discuss factors that potentially contribute to a user's sense of narrative presence, including

factors that enhance narrative presence, and factors that must be maintained so as not to diminish narrative presence. Three groups of factors can be distinguished: narrative-centric, user-centric, and interpersonal factors. We discuss each of these in turn, including their realization in CRYSTAL ISLAND.

Narrative-Centric Factors

Four narrative-centric factors are hypothesized to influence narrative presence.

- *Consistency*. Elements of setting, plot, and characters must be consistent in order to maintain a narrative's believability. Breaks in consistency disrupt users' perception of the story, disengaging them from the experience and violating the illusion of reality. For example, in CRYSTAL ISLAND, students interact with fellow scientists and members of the research expedition in a tropical island environment. Utilizing mass transportation to navigate the remote island, or encountering a team member who is ill one moment and healthy another, conflicts with the students' established expectations for the story and setting. After setting an audience's expectations, it is necessary to remain consistent with those expectations to prevent disrupting narrative presence.

- *Plot coherence*. Events comprising a narrative's plot should occur in a logical, causal order, or be explainable through rational means. Plot events should also have relevance to the eventual outcome of the story (Riedl, 2004). An incoherent plot may distract, confuse, or bore an audience. Conversely, a plot whose events only serve to advance the central storyline may be overly simplistic and predictable, not permitting side stories or small, peripheral events to enrich the central narrative. Narrative presence requires that a plot remain coherent, but not become too shallow or oversimplified.

- *Drama*. A narrative should include the setup, conflict, and resolution necessary to produce an engaging, interesting plot. A typical dramatic structure is Freytag's pyramid, composed of an introduction, rising action, climax, falling action, and resolution (1863). Providing an appealing narrative potentially enhances an audience's interest and involvement, thereby catalyzing cognitive processes bearing on narrative presence. CRYSTAL ISLAND utilizes a mystery premise to provide drama, conflict, and purpose to the narrative.

- *Predictability*. Characters, objects, and events must occur and react with some level of predictability to reinforce audience expectations and mimic real world cause and effect. In anticipating coming events during a narrative, an audience acts as problem solvers (Gerrig and Bernardo, 1994); ignoring predictability can alienate an audience and discourages involvement in the story. Additionally, audiences have strong expectation-based models of how the storyworld operates. Interactions should not conflict with these models in order to avoid negative transfer, which occurs when learning in a particular episode interferes with learning in another episode (Ormrod, 2004). This is relevant in CRYSTAL ISLAND, where navigation and mystery solving are central components of the experience. Removing elements of predictability would substantially impede the student's ability to perform activities and draw conclusions necessary for solving the mystery and satisfying pedagogical goals.

User-Centric Factors

Cognitive and affective elements of individual users likely contribute to narrative presence, such as affect, motivation, efficacy, and control each contribute to narrative presence.

- *Affect*. Narratives that stimulate an audience's emotions may increase the sense of presence in the story. Affect is intricately woven into all human activity, and the fidelity of emotional experiences in narrative environments should be accounted for in judgments of user presence. For instance, feelings of boredom may indicate disengagement from the narrative and a loss of presence, while feelings of surprise, fear, anger, or excitement may indicate strong involvement and suspended disbelief in the unfolding narrative. In CRYSTAL ISLAND we have begun to investigate inductive modeling of user affect to accurately inform narrative directive control of user emotional experience (Lee *et al.*, 2007).

- *Motivation*. Narrative provides many opportunities for intrinsic motivation. Inherently interesting narratives encourage active involvement and progression through the duration of a story. Intrinsic motivation, motivation stemming from internal processes, can be classified into four types: challenge, control, curiosity, and fantasy (Malone and Lepper, 1987). In particular, narrative provides opportunities for curiosity and fantasy, evoking cognitive and affective reactions strongly related to narrative presence. Intrinsic motivators are crucial in NLEs, where motivation is necessary to progress through pedagogical objectives. Additionally, "task difficulty" or challenge is a factor contributing to one's sense of presence (Sheridan, 1992). CRYSTAL ISLAND's mystery structure and exotic setting play to these motivational factors, consequently promoting narrative involvement and presence, as well as enhancing learning.

- *Efficacy*. Self-efficacy refers to one's beliefs in her ability to perform (Bandura, 1997). Efficacy is useful for predicting a variety of student traits, including persistence and level of effort. Such qualities can be utilized to characterize student engagement and involvement. For instance, students with low efficacy for a given problem are more likely to be disengaged with the narrative learning task and may become bored or frustrated, leading to breaks in presence. Thus, diagnosing student efficacy at runtime (McQuiggan and Lester, 2006) may be informative for characterizing student presence in narrative-centered learning. In CRYSTAL ISLAND we are particularly interested in students' beliefs in their abilities to solve science problems.

- *Control*. Providing a robust sense of control, freedom, and cause and effect significantly enhances a user's perception of presence in a virtual environment (Witmer and Singer, 1998). Similarly, providing an audience with a sense of control over an unfolding narrative contributes to narrative presence. By offering control and freedom over the story world and events, the audience transitions from passive observer to active participant, promoting a sense of being a part of the narrative. In interactive narrative, user actions are perceived as affecting the direction of the unfolding story. In contrast to non-interactive, linear media, interactive narrative environments such as CRYSTAL ISLAND are well suited for fostering a sense of control that evokes narrative presence.

Interpersonal Factors

Interpersonal factors such as identification, narrative load, character believability, empathy, and involvement influence interactions between the user and key story elements.

- *Identification*. Narrative contexts and characters that are relevant and identifiable to audiences are likely to provoke audience interest and enhance narrative presence. Stories that appeal to an audience's interests may be more attractive and introduce opportunities for stronger emotional reactions than stories with little relevance for the audience. There is evidence correlating fantasy contexts and motivation (Parker and Lepper, 1992), as well as high-interest contexts and reading comprehension (Asher, 1980). These relationships suggest that providing relevant, identifiable narrative elements potentially increases involvement. CRYSTAL ISLAND's lush, island environment is populated with various research team members, each with a distinct personality and appearance. These are intended to provide opportunities for social and material identification, thereby supporting narrative presence.
- *Narrative Load*. Different narratives entail different requirements for suspension of disbelief. A plot may be highly fantastical or firmly grounded in reality. Events advancing the plot may require significant leaps of imagination or occur in incremental, plausible bits. Analogous to cognitive load, which is the demand placed on an individual's working memory capacity (Sweller, 1988), different narratives evoke different *narrative loads*. Similarly, audiences have varying capacities for narrative load; some may eagerly accept wildly fantastical stories, whereas others may only enjoy realistic, plausible ones. Carefully coupling narrative load and individual differences for narrative load is necessary to provide appropriate stories that promote narrative presence.
- *Character Believability*. Characters frequently drive narrative. Their actions and predicaments can evoke emotional responses from an audience, their efforts can introduce conflict into a story, and their appearance can encourage feelings of identification and socialization.

Naturally, characters can play an important role in evoking narrative presence. However, to effectively drive a story, characters must be believable (Reilly, 1996). Believable characters should have plausible intentions and personalities (Riedl, 2004), as well as emotionally driven communicative skills (Loyall and Bates, 1997). Providing convincing characters with complexity and depth establishes an element of believability crucial to a sense of narrative presence.

- *Empathy*. Empathy, a key component of social interaction, is defined as a "psychological process that makes a person have feelings that are more congruent with another's situation than with his own situation" (Hoffman, 2000). The ability of characters to exhibit realistic empathy towards the user and other characters may affect sensations of narrative presence. Likewise, when users behave empathetically towards characters, it suggests that they identify with the characters in the unfolding story as if they were in fact themselves.
- *Involvement*. Through resolving conflict, the student becomes involved in the story in order to seek its conclusion. Active involvement and attention toward plot advancement contribute to narrative presence. In interactive narrative-centered learning, students play an integral role in both the story and learning process via actions that affect the direction of the narrative and the learning episode. Participation surrounds the student with story elements and draws them into the narrative. In CRYSTAL ISLAND students play the role of the lead scientist's child and direct their character's actions to generate and test hypotheses in an effort to solve the mystery and save the ailing team members. This activity requires effort and involvement, thereby promoting narrative presence.

It is currently not known how each of these factors contributes to narrative presence and to what extent. There is little consensus as to which conditions or factors are necessary or sufficient for the perception of presence, in interactive narrative or more specifically, narrative-centered learning environments. However, it seems that the significant variation or absence of any of these interacting factors may influence, or entirely break, a sense of narrative presence. Each of the factors should be empirically investigated to better understand its relationship with narrative presence.

Diagnosing Presence

Because of the perceptual and multidimensional nature of narrative presence, evaluation is challenging. Presence assessment has garnered considerable attention in the virtual reality community. Established measurement techniques can be classified along multiple dimensions, such as subjective evaluation and objective corroborative evaluation (IJsselsteijn *et al.*, 2000), or static evaluation and real-time evaluation. Each of the associated techniques has its associated strengths and weaknesses (Insko, 2003). In establishing effective measures for

presence, of primary concern are techniques' *reliability*, *validity*, *sensitivity*, and *objectivity* (Meehan *et al.* 2002).

It has been argued that presence is a discrete (in fact, a binary) concept: one either experiences presence or does not. In this view, degree of presence is not associated with the strength of presence at a given moment, but rather the frequency of positive "presence instances" over some time interval (Lombard and Ditton, 1997). We argue for an alternative conception of narrative presence that is based on a continuous model, and propose evaluation methods that are intended to address it.

Techniques developed in the virtual reality community to measure presence can be employed (perhaps in adapted form) to measures of narrative presence. We discuss relevant static and real-time techniques from the human factors and virtual reality communities, relate them to narrative presence, and discuss other diagnostic techniques leveraging knowledge from artificial intelligence and interactive narrative.

Static Evaluation

Static evaluations of presence are typically realized as post-interaction questionnaires requesting self-reports of perceived presence. In particular, Witmer and Singer's *presence questionnaire* (PQ) and *immersive tendencies questionnaire* (ITQ) have found wide acceptance in the presence research community (Witmer and Singer, 1998. The IQ seeks to measure an individual's propensity for factors related to presence, e.g., involvement, focus, and game experience. The PQ assesses a user's degree of experienced presence on a 7-point Likert scale and examines the influence of control, sensory, distraction, and realism factors on that experience. Sample questions from the PQ include, "How much were you able to control events?" and, "How much did your experiences in the virtual environment seem consistent with your real-world experiences?" Although narrative presence emphasizes several different factors than traditional presence, many of the underlying concepts used to form the PQ and ITQ may prove useful in devising effective instruments for its evaluation. While static evaluation instruments are closely coupled to users' perceptions of presence, the fact that they are used in a *post-hoc* manner, i.e., after the user experience has concluded rather than during the experience, limits their utility in assessing both traditional and narrative presence.

Real-Time Evaluation

Presence measures that provide minimally intrusive feedback throughout an interaction offer important benefits over static instruments. Consequently, subjective and objective techniques have been used to assess presence in real-time. The most commonly used subjective, continuous method is the handheld slider, which is intended to be a minimally distracting instrument to support continuous self-reports of presence (IJsselsteijn *et al.,* 2000). However, because sliders by necessity force users to divide their attention between the interaction and the act of self-reporting, the use of sliders likely diminishes presence.

Objective, corroborative techniques have also been used for real-time presence assessment. Among these are behavioral measures and physiological measures. Behavioral assessments compare observed, involuntary user responses with expected real world behaviors. Responses suggesting high levels of presence include postural actions such as swaying or ducking, and facial expressions indicating strong emotional reactions (Insko, 2003). Physiological measures such as changes in heart rate, skin temperature, and skin conductance have also been used to assess presence (Meehan *et al.,* 2002). Unfortunately, behavioral and physiological measures evaluate presence indirectly. Real-time objective assessments detect separate phenomena and are then tested for corroboration with subjective presence reports.

An additional technique for real-time presence diagnosis counts users' "breaks in presence" (Slater and Steed, 2000). The technique requires participants to report moments that they perceive a "transition from virtual to real," a noticeable shift from high to low presence. Subsequently, a probabilistic Markov Chain model is employed to model the transitions and establish an "equilibrium probability" of presence for the entire experience. This measure can then be correlated with questionnaire-based reports. Notably, there is also evidence that breaks in presence can be detected through physiological responses (Slater *et al.,* 2006). The technique is attractive because it utilizes presence reports without further disengaging the user from the interaction, but its usefulness in narrative-centered learning environments has not been investigated.

Integration of Presence Measures

As noted above, static and real-time presence measures offer complementary strengths and weaknesses. Presence questionnaires gauge perceptions of presence but lack the ability to measure presence during the course of an interaction. Alternatively, real-time corroborative measures provide temporally granular assessment, but only indirectly. Ideally, one would wish to use questionnaire style inquiries in real-time, but this approach does not appear to be feasible; frequent system requests for presence reports would significantly affect (and unfortunately diminish) presence.

However, interactive narrative environments provide opportunities for integrating static, subjective techniques with real-time corroborative techniques. While measurement systems may not be able to directly elicit presence self-reports in real time, narrative environments provide dialogue opportunities that can surreptitiously draw out indicators of narrative presence. Carefully designed dialogues may provide opportunities for users to more naturally self-report on factors bearing on narrative presence, e.g., affect, involvement, and identification. Ideally, the dialogues would be constructed so as not to

negatively affect presence, while still extracting relevant factors without the user's awareness. For example, during the course of a dialogue in CRYSTAL ISLAND, a non-player character may ask the student questions such as, "Do you really believe Bryce is sick?" or, "I don't feel bad that Audrey fell ill. Do you?" It may be possible to naturally embed these types of questions into conversations without disengaging the user, and the user's responses can be recorded and analyzed as indicators of narrative presence.

Inducing Models of Presence

One can distinguish two fundamental approaches to modeling presence: analytical and empirical. In the *analytical* approach, models of presence can be constructed by analyzing the findings of the presence literature. Authoring such models requires undertaking the difficult task of identifying observable characteristics that best predict presence. However, because there is still much discussion surrounding the myriad factors that contribute to one's sense of presence, a universal model of presence seems to be well beyond our grasp at the current juncture.

An alternative to analytically devised presence models utilizes an *empirical* approach. Because presence is fundamentally an affective-cognitive construct stemming from user appraisal of surrounding environmental conditions, models of presence should account for both environmental information (narrative state, character behavior, task structure, learning state, etc.) and user information (affective state, level of involvement, etc.). The empirical approach further calls for observing "presence in action." Acquiring such observations allows induced models to accurately predict user presence by monitoring the same environmental conditions collected in presence observations. Similar inductive approaches have been successfully used to generate models of empathy (McQuiggan and Lester 2007), self-efficacy (McQuiggan and Lester, 2006), and user affect (Lee *et al*., 2007).

Implications and Future Work

Designing Narrative for Presence

The design of narrative-centered learning environments should be informed by considerations of narrative presence. Understanding the processes that characterize a student's interaction with an NLE is important for developing systems that promote effective, motivated learning. When designing an NLE, there are a multitude of design decisions regarding plot, characters, setting, and the nature of interactivity. Each of these decisions affects the eventual sense of narrative presence experienced during students' interaction with the NLE.

The design of CRYSTAL ISLAND is being guided by considerations of narrative presence. CRYSTAL ISLAND will benefit from the introduction of more believable, identifiable characters. Additionally, an enriched plot should inspire enhanced emotional and empathetic reactions in students, promoting senses of narrative presence.

Adapting Narrative for Presence

Using diagnostic techniques and induced presence models, it may be possible to use narrative presence to guide planning in interactive narrative systems. The constraints imposed by narrative presence affect the potential search space for narrative generation. Ideally, models could provide measures of current and projected narrative presence, guiding search heuristics for effective narrative branching and planning. Constraining factors such as consistency and coherence could be used to prune a planner's search space, allowing computational resources to be directed to more fruitful areas of the space. Similarly, factors such as character believability, narrative load, and involvement could be used to inform heuristics for more efficient exploration. By explicitly using models of students' narrative presence, as well as considering the factors that influence narrative presence, novel planning techniques could be developed that improve narrative generation.

Similar notions can be used to guide director actions in interactive narrative in order to adapt stories to user actions while promoting high levels of narrative presence. Induced models of narrative presence could potentially influence a director agent's decision-making process, providing direction that results in highly involving stories. We intend to explore the feasibility of these ideas in CRYSTAL ISLAND. In particular, exploring the integration of induced models of narrative presence with CRYSTAL ISLAND's decision-theoretic director agent (U-Director) (Mott and Lester, 2006a) could provide interesting insights into the techniques underlying drama management in interactive narrative environments.

Narrative Presence and Learning

The relationship between narrative presence and learning should be empirically investigated. Experimental results could provide interesting insights into the learning process, such as optimal ranges of presence levels for effective learning. Pedagogical planners could use this type of information, together with induced models of narrative presence, to guide narrative direction and achieve specific educational objectives. For example, director agents in narrative-centered learning environments such as CRYSTAL ISLAND might vary expected levels of narrative presence and dynamically adjusting storyworld events to promote learning.

Conclusion

Narrative presence is an affective-cognitive construct that represents a users' sense of being in or being a part of a story. Similar to the construct of presence that has been investigated in the virtual reality and human factors communities; narrative presence characterizes an

audience's perceived relationship to an interactive narrative with an emphasis on participatory experience. Three groups of factors bear on narrative presence: narrative-centric factors (consistency, plot coherence, drama, and predictability), user-centric factors (affect, motivation, efficacy, and control), and interpersonal factors (identification, narrative load, character believability, empathy, and involvement). We have argued that the design of interactive narrative environments should be informed by considerations of narrative presence. While diagnosing narrative presence poses serious challenges, it appears that interactive narrative environments offer opportunities for integrating static, subjective techniques with real-time corroborative techniques. If reliable methods for gauging narrative presence emerge, perhaps they can serve as the basis for an evaluation framework for interactive narrative.

Acknowledgements

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