Mixing Story and Simulation in Interactive Narrative

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Abstract

Simulation is a common feature in computer entertainment. However, in computer games simulation and story are often kept distinct by interleaving interactive play and cut scenes. We describe a technique for an interactive narrative system that more closely integrates simulation and storyline. The technique uses a combination of semi-autonomous character agents and high-level story direction. The storyline is decomposed into directives to character agents to achieve particular world states. Otherwise, character agents are allowed to behave autonomously. When the player's actions create inconsistency between the simulation state and storyline, the storyline is dynamically adapted and repaired to resolve any inconsistencies.

Storytelling vs. Simulation

Simulation has been, and continues to be, an important part of computer entertainment. Computer games such as *The Sims* and *SimCity* are simulations in the strictest sense. The initial parameters, a model of state change, and legal player moves are the forces that drive the user's experience. Real-time strategy games are simulations of combat and have been used effectively for entertainment and for military training. First- and third-person action/adventure games also rely on simulation to a lesser extent. Each mission can be considered a simulation of physics, weapon effects, opponent movements, etc. One difference between action/adventure games and other games such as *The Sims* or *SimCity* is the use of story to constrain the player's experience to a particular narrative path.

The most common role of story in computer games is to provide "glue" between missions. Modern computer games consist of interleaved periods of interactive play and cut scenes – short non-interactive scenes that transition from one mission to the next, providing the player with goals and motivation for the next segment of game play. In this mode of alternating between game play and cut scenes, story elements and simulation are kept strictly separate. This is due to the trade-off between control and coherence (Riedl, Saretto, and Young 2003). On one hand, the player wants control to make decisions for the player's character. On the other hand, game designers want the player to experience a coherent narrative progression.

Interactive Narrative is an approach to interactive entertainment that enables the player to make decisions that directly affect the direction and/or outcome of the narrative experience being delivered by the computer system. We are building an Interactive Narrative System for training and entertainment that mixes story and simulation. But why use simulation? After all, it has been demonstrated that Interactive Narratives can be constructed out of branching story sequences such as those used by the Choose-Your-Own-Adventure style books. The reason is that simulation provides a realistic, continuous, life-like modality for interaction that can result in a more immersive and compelling experience for players than simple branching stories. The realism of simulation is also beneficial to educational games that provide a realistic learning experience, in addition to a coherent narrative progression.

Related Work

The concept of *emergent narrative* (Aylett 2000) was coined in recognition of the fact that a user's experience in any reactive system or simulation can be described in narrative terms. How to ensure that a user's narrative experience has the desired qualities (e.g. dramatic, educational, etc.) is the focus on many research efforts into Interactive Narrative. Weyhrauch (1997) describes a

Figure 1: Screenshot of player (central avatar) confronting a non-player character (right).

system that searches for sequences of plot points and system interventions to create a compelling experience. IDA (Magerko 2005) uses a human authored story to direct autonomous characters. Mimesis (Riedl, Saretto, & Young 2003; Young et al. 2004) uses a generative planning approach to create and manage interactive stories. In Mimesis, a story plan consists of primitive character actions that are executed verbatim by non-autonomous characters. The Façade system (Mateas and Stern 2004) uses a reactive planner to assemble a story dynamically from pre-authored mini-scenes called beats. Cavazza, Charles, and Mead (2002) use autonomous characters that can plan in an approach that is most like a simulation.

Mixed Simulation Control

Mixed simulation control refers to a technique in which the player's emerging experience is "controlled" by a combination of simulation and prescribed storyline. System-controlled story-world characters – also called non-player characters (NPCs) – are controlled by semi-autonomous agents. The semi-autonomous agents are built on top of the ABL (Mateas and Stern 2004) behavior language, which affords reactivity and believability. The agents simulate the presence of other people in a virtual world. While social simulation is sufficient for a narrative-like experience to emerge (Aylett 2000), we wish for the player's experience to be structured to conform to a particular plot (or one of a set of related, alternative plots). Without some degree of high-level plot guidance there is no guarantee that the player's experience will be well-structured, interesting, or possess any desired qualities such as dramatic arc or educational objectives.

To constrain the player's experience to one of a set of related, alternative plots, we incorporate an automated story director into the architecture (Riedl 2005). The automated story director generates or is given a high-level plot outline that the system should attempt to coerce the player's experience to conform to. The plot structure includes directives to be performed by the NPCs in order to drive the story forward. There is an inherent balance that must be struck between simulation and story, however. On one hand, NPCs need to be able to react to the unpredictability of the player and to express their personas. On the other hand, the story director requires that NPCs perform actions that satisfy the need for a particular sequence of occurrences. Key to making this work is the realization that, with sufficient reactivity on the part of the NPCs, there are typically only a few high-level acts that that the player can perform that actually significantly impact the ability of the story director to carry out the desired plot. The high-level actions performed by the player that make the desired plot impossible to carry forward are those that directly conflict with the causal relationships between plot elements (Riedl, Saretto, and Young 2003).

When the player performs a high-level act that conflicts with the causal relationships encoded in the plot, the story director adapts it using a re-planning technique similar to that described in (Riedl, Saretto, and Young 2003; Young et al. 2004). This approach results in a new storyline in which inconsistencies are factored out but is still as similar as possible to the previous storyline. The assumption here is that the original storyline was the one that best suited the system's purposes whether entertainment or educational.

When the player performs acts that are unexpected but do *not* create conflicts with the storyline, the NPCs are allowed to handle the situation autonomously. Future work involves devising techniques for constraining the autonomy of NPCs so that their local, reactive behavior choices do not inadvertently interfere with current or future plot points. This must be done without impacting the believability of the NPCs achieved through their autonomy.

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