Supporting Human Creative Story Authoring with a Synthetic Audience

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ABSTRACT
Human creativity plays an important role in the production of many of the media products that permeate our society. However, non-expert creators are often limited by a lack of technical ability, as opposed to creative ability. This is especially true for story authoring. We present an approach to supporting creativity using synthetic audience – an intelligent agent that acts as (a) a surrogate story recipient and (b) critic capable of providing constructive feedback. We describe initial efforts based on computational modeling of cognitive processes and creativity.

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Creativity support, Story authoring, Audience modeling

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INTRODUCTION

Human creativity plays an important role in the production of many of the media products that permeate our society, such as novels, movies, and art. However, there are often distinct differences between experts and non-experts. We postulate that these differences are not necessarily due to creative ability, but due to expertise of technical skills. For example, writing a story requires character development, causal relationships, and an appropriate exposition and resolution of the plot [4].

The prevalence on the Internet of storytelling rings, fan-fiction, and machinima suggests that there is a high degree of interest among non-experts in creating and sharing story-based content. Anecdotally, story authoring is a complicated skill. That a community will value a story is not a foregone conclusion of its creation. Here we assume our target user is interested in authoring stories that are structured for mainstream consumption [4]. Therefore, the development of tools that support authors in creating purposeful content plays an important role in enabling the creativity of non-experts, especially when creation is prohibitively costly, difficult, or time-consuming.

We posit that artificial intelligence systems that are aware of the human user's creative intentions and that are knowledgeable about the artistic domain can effectively work with non-expert human authors to increase the value of their creative artifacts. In this paper, we describe work and preliminary results toward using artificial intelligence to create a *synthetic audience*. A synthetic audience is an agent that, to some degree, replicates the response – cognitive, affective, etc. – of humans that receive created media artifacts, such as stories, movies, machinima, and art. Further, in the interest of helping human creators of artifacts, a synthetic audience can be utilized as part of a strategy for providing feedback to the human creator at the time of creation.

We refer to our approach to creativity support as a *computer-as-audience* strategy; one of many other proposed strategies for computational creativity support, such as computer-as-nanny, computer-as-pen-pal, computer-as-coach, and computer-as-colleague [3]. Other strategies may also exist. In the next section, we describe a computer-as-audience agent for story authoring support.

SYNTHETIC AUDIENCE MODEL

A synthetic audience agent must perform three tasks: (1) Track a model of the narrative as it is being authored and construct a representation of the story-in-progress from the perspective of a "reader;" (2) compute responses by searching the representation for patterns that suggest potential audience confusion or lack of comprehension; (3) provide feedback to the author about these responses in a constructive and coherent manner.

Tracking the Narrative

A synthetic audience agent needs to be able to acquire and represent narrative in a computational form. Our system uses QUEST [1] to represent the story-in-progress. QUEST is a psychological model of question-answering, designed to emulate the question-answering performance of humans regarding open-class questions about narrative content. The model represents stories as directed graphs, where events, states, and goals are nodes, while links represent causality, consequence, and relations between events and goals.

Acquisition of the model is based on computational processes inspired by human narrative comprehension. Reading employs many cognitive processes; therefore, our model of audience draws on psychological principles. Graesser et al. [2] describe how readers draw inferences in

a narrative text. Inferencing tasks are divided into *on-line* (during comprehension) and *off-line* (generated later). As an example, determining the causal antecedent of an event is an on-line inference, while identifying the causal consequence of an event occurs off-line. In the short term, we plan to reproduce the following types of inferences computationally:

- **Superordinate Goals** – The overarching goal motivating a particular action.
- **Causal Antecedents** – The preceding events or actions that caused the current action.
- **Causal Consequences** – The anticipated next events that occur as a result of the current action.

Many of these processes are forms of explanation [7]. In a preliminary study we explored the role of explanation in narrative comprehension. Participants read short stories one line at a time and described their thoughts as part after each line as part of a think-aloud protocol. Results suggest that readers form multiple explanations for character actions and attempt to justify possible character inconsistencies.

For both on-line and off-line inferences, a human audience – the recipient of the story – seeks to form an explanation. Our *synthetic* audience will function similarly, developing hypothetical explanations for each of those inference types as the story progresses. In the longer term, we will attempt to expand the set of inferences that our synthetic audience will be capable of making and additionally address emotional responses.

When a human author enters a new narrative element, it is added to the QUEST structure. In order to determine the new element's place in the causal order and goal hierarchy of the narrative, we convert the QUEST structure into a partially ordered plan representation. We then use a narrative planning algorithm [6] to create explanations of how the new element links to the existing narrative. If the new element links to existing elements in the causal structure of the plan, then we can infer that those elements are also causally linked in QUEST.

We use one of two methods to identify the new element's superordinate goal, depending on the existing QUEST structure. If there is an unfulfilled character goal in the narrative, we hypothesize that this goal could be a superordinate goal for the new element. If no such goals exist, the agent compares the existing narrative QUEST structure to a case library of QUEST story fragments using a case-based reasoning technique and extracts the most superordinate goal in the retrieved case. We use the planning algorithm to backward chain from the hypothesized goal. If a plan can be found, then we infer that the hypothesis was correct and update the QUEST structure accordingly.

Generating a Response

Our synthetic audience can be viewed as a computer-aided critiquing system. Oh et al. [5] describe a model for computer-aided critique that uses five stages: **construct**, **parse**, **check**, **critique**, and **maintain**. In that regard our work can be viewed as *story authoring as design*. The synthetic audience fills the role of the "check."

In the "check" phase of critique, a system seeks out elements of the design that may be problematic by comparing its representation to a set of pre-defined rules. For our rules, we have a set of patterns that we expect will correlate to confusion or incomprehension in a human audience. For example, breaks in the causal chains in the representation, noted by missing links in the QUEST story structures, suggest that questions about the narrative cannot be properly answered [1], resulting in confusion.

Providing Feedback

The timing and modality of feedback are important factors for computer-aided critiquing systems [5]. We believe that a key consideration for feedback is a thorough understanding of creative activity. Writing can be viewed as a design activity, consisting of a cycle of engagement and reflection [8]. A synthetic audience agent must be mindful of the cycle of design and creative flow. Future work will determine exactly when and how to provide feedback that is construction instead of disruptive.

CONCLUSIONS

At this time, we are developing a synthetic audience that can respond to elements of human-authored stories in a manner similar to a human audience. We believe that our computer-as-audience approach will facilitate creativity of non-expert storytellers by assisting with the production of something new, surprising, and valuable.

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