

Computational Creativity in Narrative Generation: Utility and Novelty Based on Models of Story Comprehension

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Narrative is one of the fundamental modes of creative expression. Creativity plays a central role in the effective design of film, novels, oral stories, computer games and most other narrative media. Beyond the creation of narratives intended to entertain, narrative is used as a powerful mode of communication in a range of other contexts. Narrative and its creative design plays a role in education and training, the communication of scientific ideas, characterizations of business practices, communicating cultural heritage and other contexts. There is growing awareness of the foundational role of narrative in our understanding of not only fictional worlds but also the real world around us.

While it is clear that the process of generating a narrative is systematic, and sometimes formulaic, the challenge of generating an *interesting* narrative is at the brink of our scientific and scholarly understanding. That is, there is an insufficient explicit understanding of the means by which creativity shapes the design of a narrative artifact that has an interesting plot, an illuminating point, and a pacing of emotions that is captivating. We do know that much of the research on creativity shares a common notion of its nature: An artifact that is at once fulfilling a specific notion of *utility* while doing so in a way that is *novel or unexpected*. Computational approaches to creativity have often focused on methods for encoding the creation process as search through a design space. Rules or heuristics are used to encode notions of creativity by directing search through the design space in ways that focus the search on creative solutions or by modifying the search space to create designs that are unexpected or novel. Structural constraints on the space ensure that solutions found within it all meet the utility criteria, while directed search or careful re-definition of the space give rise to solutions that satisfy the novelty constraint.

Recent approaches to the generation of narrative have employed similar search techniques. While these methods have shown initial successes, most are essentially focused *inward*, that is, they reason about a narrative's structure rather than how it will be experienced by its readers or viewers. Narrative is a communicative medium and much of its structure is composed by story tellers to change the mental state of those who experience it. A narrative is considered creative due directly to inferences made regarding its structure by viewers. A system seeking to build a creative narrative can exploit psychological models of narrative comprehension to produce stories that are both coherent and surprising.

We are currently initiating research to develop new, cognitively informed computational models of creativity in the context of the generation of cinematic narrative, narrative that is told within 3 dimensional (3D) virtual environments. Motivated by narrative theoretic models of narrative structure and psychological models of narrative comprehension, we are developing techniques for creating stories and the cinematic techniques needed to convey them to users. These techniques will use these models to search for narratives that are at once coherent and surprising, satisfying these two constraints to generate *creative narratives*. The full version of the paper will describe initial ideas towards developing 1) a computational model of story generation that builds stories by integrating abstract and partial representations of story schemas with story plans produced by our previously developed story planning approaches, 2) virtual cinematography models adapted from models of natural language discourse generation to control the 3D virtual camera in order to convey the actions of an unfolding narrative to a user, 3) a computational model of inferences that arise during narrative comprehension, integrating cognitive models of comprehension with story and discourse creation and, 4) a system that integrates these three parts to search for cinematic narratives that are both coherent and surprising.

The work we will describe in the full paper directly addresses several of the focus areas of the workshop. The work seeks to build a new type of intelligent system for generating creative cinematic narratives based on models of human cognition and the role of creativity in comprehension of stories. The project is inherently cross-disciplinary, drawing on elements of AI, cognitive psychology and film theory. Finally, the project provides a novel perspective on creativity that places a significant part of the definition for a creative artifact on an explicit model of the comprehension by a user of the artifact's structure.