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Computational Model of Focalization in Narrative Planning

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Introduction

While the generation of stories by computers has been studied by Artificial Intelligence (AI) researchers for decades, there has been little research on the issue of focalization. However, the demands for computational models of focalization have been increasing. As an effort to use focalization in interactive storytelling, MacIntyre and Bolter (2003) present a system that shows different aspects of a single plot, viewed from characters that the user selects. The results from their self-testing suggest that stories narrated from different orders of perspectives would yield different experiences to the viewers. The use of focalization is not limited to entertainment purposes. For instance, in educational systems employing narrative as a tool, exposing the learners to stories told from various perspectives may promote their balanced thinking. In order to meet these needs, this paper describes an approach to generating perspectives in narrative using an AI planning technique.

Story Generation Based on AI Planning Techniques

In the planning approach to story generation (Riedl and Young, 2004) a story is represented as a plan describing the actions of the story's characters. In our approach a plan is composed of a series of plan steps and their temporal and causal relationships where each plan step corresponds to an event. To represent the knowledge of an agent in a given domain, a set of operators is defined as a *plan library*. Each operator in a plan library, as shown in Figure 1, has its unique name, a set of preconditions and effects, and a set of variables that shall be instantiated in the planning process. The preconditions of an action (i.e., an instantiated operator) represent just those conditions that must hold for the action to be able to happen while the set of effects denotes just those conditions that change by the action's successful execution. When a planning problem (i.e. the initial state and goal state of the story) and plan operators are provided as input to a planning system, the planner searches for a sequence of actions that satisfies the goal state starting from the initial state.

Field	Data	Description
Name	trade	
Parameters	?agent1, ?agent2, ?object1, ?object2	
Preconditions	(has ?agent1 ?object1)	?agent1 has ?object1
	(has ?agent2 ?object2)	?agent2 has ?object2
Effects	(has ?agent1 ?object2)	?agent1 has ?object2
	(has ?agent2 ?object1)	?agent2 has ?object1
	¬(has ?agent1 ?object1)	?agent1 does not have ?object1
	¬(has ?agent2 ?object2)	?agent2 does not have ?object2

Figure 1. A plan operator example

Conventional planning-based story generation approaches are divided into two categories: autonomous agent approaches and author-centric approaches. The autonomous agent approach creates a story by the interaction between autonomous agents where each agent acts as a character in the story, given specific goals to achieve. The author-centric approach uses a global planning process to construct the actions of all characters in a story over the story's entire duration. The autonomous approach is preferred when the story stresses the believability of a character; the author-centered approach is appropriate for a story focusing on its dramatic situation.

To date, these planning-based story generation systems implicitly employ external focalization: a story is narrated from the perspective of the system, which can access any objects and events over time. Moreover, they assume that plan libraries are shared among characters and the system, excluding the possibility of telling a story from a character's point of view distinct from other characters' points of views. To address this problem, the next section explains focalization in the perspective of planning, in particular when plan libraries employed by characters are not identical. For a further discussion of other computational models of focalization, please refer to (Lönneker-Rodman, this volume).

Focalization in Terms of Planning

Rimmon-Kenan (2002) defines *the focalizer* as the person *who sees* in a story and *the focalized* as the objects that are perceived by the focalizer. He divides the types of focalization into external focalization and internal focalization depending on whether the focalizer is a character in the story or not. These types of focalization can be explained in a system that creates a plan library for each character and assumes that the system occupies the omniscient position. With a story plan given, external focalization is achieved when the system narrates the story, and the story is internally focalized when the series of events of the story is narrated using a plan library that a character uses. Rimmon-Kenan (2002) further characterizes the aspects of focalization in terms of perception, psychology, and ideology: the perceptual facet involves what the focalizer perceives such as seeing, hearing, and smelling; the psychological facets need privileged access to the cognitive and emotive status of the focalized; the ideological facets deal with a character's conceptual views of the world. The perceptual facet can be computationally controlled by determining which events of a story are exposed to an agent who performs the role of the focalizer. The system can also tune the psychological facet of focalization depending on how much cognitive and emotive information is considered when encoding preconditions and effects of plan operators. The focalization would be more dynamic if the system allows an agent to have incorrect plan operators as her knowledge. Then, a story plan produced for an agent using its plan library may not be reasonably explained by another agent where they disagree on critical causal relationships that link one event with other events in the story.

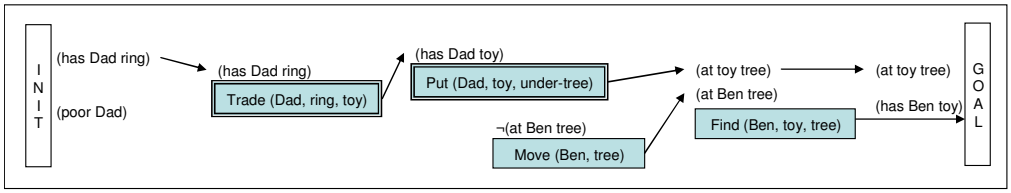

Figure 2. A story describes a father's getting a Christmas present for his son Ben. Boxes surrounded by duplicate line are unknown actions to Ben.

The plan in Figure 2 illustrates a story of a father's getting a toy for his seven-year old son Ben as a Christmas gift. In the diagram, time proceeds from the left to the right. Boxes represent actions, with preconditions above. An arrow shows a causal relationship which represents that the action at the starting point establishes the precondition of the action at the end point. Actions surrounded by duplicate-lines, e.g., *trade* and *put*, indicate that they are unknown to Ben. The plan in Figure 2 is constructed to achieve the goal (i.e., Ben's having a toy) from the given initial state (i.e., the father is poor and he has a ring). The plan can be described as following: "A poor father traded his wedding ring for the toy that his son Ben wants to have. He then put the toy under their Christmas tree. The next day Ben walked to the tree and found the toy that his father left."

On the other hand, Figure 3 depicts the story told from the Ben's point of view when he found the toy. Ben, having a plan library lacking in the plan operator *trade* and knowing that his father was not afford to buy the toy, fills in the missing part of the story by inferring Santa Clause as the agent of leaving the toy.

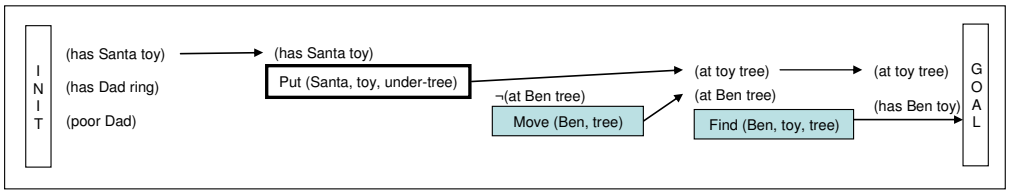

Figure 3. A story of getting a Christmas present viewed by Ben. His inferred action is represented a white box surrounded by a thick solid line.

We classify focalization from the discrepancy in two characters' plan libraries into six categories as listed in Figure 4: case 1 and 2 describe their use of different operators; case 3 and 4 describe their use of different preconditions for the same operator; case 5 and 6 describe their use of different effects for the same operator. The cause of Ben's inferred story differing from the actual story falls in the case 1 in Figure 4, formalizing their use of different plan operators when regarding Ben as the character B and his father as the character A.

Case 1: $\alpha \in L_A$ and $\alpha \notin L_B$
An operator (α) in the character A's library (L_A) is absent in the character B's library (L_B).

Case 2: $\alpha \notin L_A$ and $\alpha \in L_B$
An operator (α) which is absent in the character A's library (L_A) is present in the character B's library (L_B).

Case 3: $\alpha \in L_A$ and $\alpha \in L_B$, $p \in P_A\alpha$ and $p \notin P_B\alpha$
An operator (α) is present in A and B's libraries. However, a precondition (p) of the operator the A's library is absent in $P_B\alpha$, the set of preconditions of the operator in B's library.

Case 4: $\alpha \in L_A$ and $\alpha \in L_B$, $p \notin P_A\alpha$ and $p \in P_B\alpha$
An operator (α) is present in A and B's libraries. However, a precondition (p) of the operator in B's library is absent in $P_A\alpha$, the set of preconditions of the operator in B's library.

Case 5: $\alpha \in L_A$ and $\alpha \in L_B$, $w \in E_A\alpha$ and $w \notin E_B\alpha$
An operator (α) is present in A and B's libraries. However, an effect (w) of the operator in A's library is absent in $E_B\alpha$, the set of effects of the operator in B's library.

Case 6: $\alpha \in L_A$ and $\alpha \in L_B$, $w \notin E_A\alpha$ and $w \in E_B\alpha$
An operator (α) is present in A and B's libraries. However, an effect of the operator in B's library is absent in $E_A\alpha$, the set of effects of the operator in A's library.

Figure 4. Cases of focalization due to the disparity between two plan libraries.

Conclusion

In summary, this paper presents a model of focalization in terms of techniques from artificial intelligence called narrative planning. This technique uses plan libraries which can represent partial and incorrect knowledge of the characters participating in a story. We expect that our research would help bridge narrative theories and the work of artificial intelligence regarding the topic of focalization in narrative.

Selected References

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