# **ICAPS 2024 Tutorial**: PLanning For Storytelling

**Audience**: Beginner  
**Length**: Half-day  
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**In-person Presenters**: TBD

**Website link**: TBD

## Summary

In this tutorial we will demonstrate the role that planning, or planning-based representations, can play in narrative generation methods. The plan becomes the representation of the story and also that of the story world, and thus we use Planning to create logical, believable, and coherent stories (narratives) in a variety of domains. We will cover several techniques, including modern approaches that make use of Large Language Models (LLMs) and provide the opportunity for attendees to play with the technology themselves live.

## Format

The tutorial will focus on planning techniques for modelling story worlds and generating stories. The half-day tutorial will be divided into two equal parts, beginning with an introduction to the techniques, followed by a hands-on component where attendees can try to generate their own stores using the provided data and tools.

## SubTopics

### Subtopic 1 (Intro/Overview) : Plan as a representation of a story.

#### Presenter: TBD

A story can be conceptualized as the telling of a sequence of events that take place within some virtual world. It can therefore be well-modeled by a plan. The plan can represent (i) the sequence of events that actually happen in the story i.e. the `plot’, or it can represent (ii) the sequence of events are they are told to the audience i.e. the `narrative’. The `states’ that the plan traverses can encompass (i) the `physical’ state of the story world; (ii) the state of mind of the characters in the story world (their beliefs, motivations, plans, etc.); (iii) the state of the audience's knowledge/understanding of the world and events of the story; or any combination of these. Using Fully Observable Deterministic (FOD) planning and children’s stories, we can build narratives that take a character from the starting state to the goal state, within the given environment.

### Subtopic 2: Ways to model a Narrative - Plan Space Planning

#### Presenter: TBD

Nodes in a graph are partial plans and edges are plan refinements. The underlying search space is directly shaped so that partial plans become solutions (or fail to do so). Plan-space narrative planning affords modeling story phenomena in terms of narrative-theoretic plan construction flaws and fixes.

\*Reference: Rogelio E. Cardona-Rivera and Arnav Jhala and Julie Porteous and R. Michael Young, The Story So Far on Narrative Planning, 34th International Conference on Automated Planning and Scheduling, 2024

### Subtopic 3: Ways to model a Narrative - HierArchical Planning

#### Presenter: TBD

More expressive and complex than classical planning: STRIPS-style primitive actions are complemented with isomorphic more-abstract compound actions that require decomposition, or associated sub-plan. This is well-suited for representing a wide variety of story phenomena that depend on abstraction, across the narrative layers. In plot, for example, character intentions can be straightforwardly codified. Hierarchical story directors afford users significant

power to define narrative plan quality aligned to their authorial intent, across all narrative layers.

\*Reference: Rogelio E. Cardona-Rivera and Arnav Jhala and Julie Porteous and R. Michael Young, The Story So Far on Narrative Planning, 34th International Conference on Automated Planning and Scheduling, 2024

### Subtopic 4: Ways to model a Narrative - Heuristic Search

#### Presenter: TBD

Using constraints in the narrative domain to encode narrative phenomena and guide story development. Using character intentions (e.g. Glaive) to calculate heuristic estimates. The narrative planning challenge is how best to encode narrative-theoretic phenomena, in order to leverage the efficient performance of such approaches.

\*Reference: Rogelio E. Cardona-Rivera and Arnav Jhala and Julie Porteous and R. Michael Young, The Story So Far on Narrative Planning, 34th International Conference on Automated Planning and Scheduling, 2024

### Subtopic 5: Planning from a character's point-of-view (focalized perspective).

#### Presenter: Nisha Simon

`Choose-Your-Own-Adventure’ (CYOA) stories are interactive narratives where the reader assumes a fictional persona and then takes action to influence the development of the unfolding story (for example, by choosing from various paths which to take in order to reach the end). `Choose-Your-Own-Adventure’ stories can, therefore, be thought of as a representation of an agent proceeding through a non-deterministic environment in order to achieve a certain goal. The agent is the story itself, and the non-determinism is driven by the reader.

The reader is not privy to the details of the generated plan. I.e., the reader is unaware of which paths are `better’ and which paths are `worse’ paths within the story. Instead, the reader selects their choices for each stage of the story through an interactive text-based game whose logic is based on a contingent plan. The reader’s input is merely an instruction to the system to follow a specific edge on the underlying directed graph. The entire plan representation itself already exists in totality and is not updated based on the reader’s choices. Thus, CYOA stories can be created using Fully Observable Non-Deterministic (FOND) Automated Planning.

\*Reference: Proceedings of The 37th Canadian Conference on Artificial Intelligence (Canadian AI 2024),“*To Choose Your Own Adventure, First Make a Plan*”, Nisha Simon and Christian Muise, June 2024, pp 1–6.

### Subtopic 6: Suspense and Surprise in Narrative Planning

#### Presenter: TBD

Generating a narration (selection and ordering) of a given plot (event sequence). Using a planner as "reader model" (a situation is suspenseful if reader can only imagine few plans that lead to protagonist's success). The creation of stories that prompt a particular emotion. The challenge of simultaneously maintaining suspense and coherence.

\*Reference: Yun-Gyung Cheong, R. Michael Young. Suspenser: A Story Generation System for Suspense. IEEE Transactions On Computational Intelligence and AI in Games, vol. 7(1), 2015.

Aiming for an emotional response (surprise). The "reader model" is a planner; an event sequence is surprising if it is different from the reader model's plan. Use of flashbacks and foreshadowing. Bi-partite model of a narrative: a story is described using two levels – story and discourse.

\* Reference: Byung-Chull Bae, R. Michael Young. A Computational Model of Narrative Generation for Surprise Arousal. IEEE Transactions on Computational Intelligence and AI in Games, vol. 6(2), 2014.

A computational reformulation of a psychological model of suspense that focuses on the "reader model". Suspense is considered proportional to unlikeliness/scarcity of successful plans for the protagonist. Perceived likelihood vs. actual likelihood of an event. Formulating an ‘escape plan’ to get out of a negative outcome.

\* Reference: Brian O'Neill and Mark Riedl. Dramatis: A Computational Model of Suspense. AAAI 2014.

### Subtopic 7: Narratives and Multi-Agent planning

#### Presenter: TBD

These narratives revolve around a central Protagonist in pursuit of a goal and who faces a series of obstructions placed in their way by an Antagonist and which they must overcome in order to reach their goal. This problem can be seen as a non-cooperative multi-agent planning problem, or counter planning. The protagonist’s goal is hidden from the Antagonist, who can only make assumptions about the Protagonist’s goal by observing their actions. The Antagonist then reasons about ways to make the Protagonist fail to reach their goal.

\* Reference: Julie Porteous, Alan Lindsay. Protagonist vs Antagonist PROVANT: Narrative Generation as Counter Planning. AAMAS 2019.

### Subtopic 8: bipartite planning

#### Presenter: TBD

Construct the plot (events that happened) and "discourse" (events that are told) in parallel, with authorial goals expressed in the latter. At the story level, the solution represents the actions of characters in the storyworld, whereas at the discourse level, the solution represents the communicative actions by a narrator agent to inform and describe elements in the story to a spectator agent. A pair of compatible story and discourse solutions to story and discourse problems is a bipartite solution.

\* Reference: David R. Winer, R. Michael Young. Discourse-Driven Narrative Generation with Bipartite Planning. 9th International Natural Language Generation Conference, 2016, p. 11–20.

### Subtopic 9: Belief and Narrative Planning

#### Presenter: TBD

Character beliefs may not be consistent with the actual world state and so certain character actions may fail. Converting beliefs into intentions. An agent’s goals are represented using the modal predicate `intends’. Similar to CYOA, A character’s goals are not necessarily the same as the goal state of a planning problem. An epistemic update occurs when an action is attempted but fails. The epistemic update creates a new world state where the material state is unchanged, but the belief states are modified: the character that attempted the action is now uncertain about the preconditions of the attempted action.

\* Reference: Matthew Christensen, Jennifer M. Nelson, Rogelio E. Cardona-Rivera. Using Domain Compilation to Add Belief to Narrative Planners. AIIDE 2020.

\* Reference: Rushit Sanghrajka, R. Michael Young, Brandon Thorne. HeadSpace: Incorporating Action Failure and Character Beliefs into Narrative Planning. AIIDE 2022.

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