Title	
Author(s)	,
Citation	
Issue Date	2007-03
Type	Thesis or Dissertation
Text version	author
URL	http://hdl.handle.net/10119/3588
Rights	
Description	Supervisor: , ,

A Structural Analysis of Novels
by Subjective and Utterance Spaces

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February 8, 2007

Keywords: mental space, structure analysis of novel.

In this research, I present a diagrammatic representation of the structural analysis of the belief states of a novel's actors.

Previous research into discourse and context in the field of natural language processing and formal semantics includes, among others, Fauconnier's Mental Space theory and Kamp's Discourse Representation Theory. According to Mental Space Theory, the information conveyed in a piece of discourse and information obtained through other means can be captured in structures called "spaces", in which identity relations between elements can be formed. By discourse we mean a sequence of multiple sentences. Different kinds of information are expressed by different types of spaces, such as belief spaces, local or temporal spaces, possibility spaces, utterance spaces, situations and state spaces, hypothetical spaces, and so on. Moreover, spaces can themselves include other spaces. For example, a temporal space may live inside a belief space and a hypothetical space may contain a location space. Thus, when the information transmitted throughout a discourse increases, one or more new spaces are created that extend the structure of the original space.

Using this structure, I construct a mental space representation of a novel, by distinguishing the belief states of its characters. While there has been previous research into the temporal representation of simple texts like recipes, in the context of more complex narratives like novels a structural

analysis of the actors' belief state as the story develops has not been carried out to date. This is the reason I chose to analyze actors' belief states in a novel using mental spaces.

Roughly, we can represent a novel in terms of three spaces, namelythe subjective space, utterance space and a space for all other things. The subjective space concerns the mental states of agents, containing for instance a belief space and a hypothesis spaces. Because the hypothesis space contains possible but non-factual or not realized states, it is included in the subjective space. The utterance space keeps track of the story and the contents of conversations so far. One reason for making this into a separate space is that conversations by definition affect the mental state of two or more actors, thereby transcending the subjective spaces of each of them individually.

While reading a novel, new information is added through the introduction of a new character or event. In response to this information update, the structure of the space is extended, and this process of updating continues until the book is finished. At that point the space is complete and we can use it inorder to visualize the novel's structure. The system that generates a visualization of the novel's space structure requires the user to provide a listing of the necessary background knowledge, as a first preparation step. Broadly speaking, there is one list for the various spaces and one listing the [elements] inside them. The system then extracts the information necessary for constructing the space from the novel's text. In this thesis, we call the result of this information extraction step the "intermediate representation". The key information here are the words obtained by annotating the text of the novel with part of speech tags and element tags. Next, the information in this intermediate representation is partitioned into the three respective spaces. Then the various elements are classified according to the spaces and the novel's space structure is generated. Finally, the system outputs a diagrammatic representation of this structure.

To evaluate the system, we used the mystery novel "gujin no doku", by Kosakai Fuboku. We created the subjective space, utterance space and other space based on this novel, andwere able to express the narrative's temporal order and inclusion relation, together with identity relations between the elements. The output diagram shows when the story switches to

the subjective view of one of the actors by branching the subjective space. Inside this subjective space, the temporal order of events is preserved after the point of branching, thereby giving us a view on the temporal order of events inside the branching subjective space as well. Finally, the end point of a space is indicated by an END mark on its branch. Representing subspaces of a space by branches gives a clear way of indicating the various actions of actors inside subjective spaces, utterance spaces, and so on. Moreover, as the branches follow the vertical flow of time as indicated by the graph, we can compare the information across different spaces at various time points. Therefore, we can capture the narrative flow of time and corresponding updates in the actors' belief states using these diagrams.