

## Combining Centering Constraints and Gricean Maxims for the Generation of Referring Expressions

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In general, computational solutions to natural language processing tasks that utilize purely open-ended inference-based reasoning are less preferable to those that make use of structural constraints. At the same time, it cannot be denied that much of natural language processing requires some degree of inference. A model of language that draws on purely structural considerations is equally problematic. What seems to be required is a reconciliation of the conflict between structural constraints and inferencing that seem to be at play and a clear specification of the boundaries between the two processes. In this paper, we propose an approach to modeling the generation of referring expressions that combines inferencing mechanisms from Gricean maxims of cooperative behavior and structural constraints from Centering Theory. We show that a full treatment of the alternative referring expression forms in (2) and (3) to refer to *Herzog* and *his father* cannot be given by either theory on its own and that a combined approach such as the one presented in this paper can provide us with a fuller understanding of the phenomena at hand.

- (1) **Herzog<sub>i</sub>** was broke, and asked **his father<sub>j</sub>** to underwrite a loan.
- (2) **The old man<sub>j</sub>** questioned **him<sub>i</sub>** narrowly, about **his<sub>i</sub>** job, **his<sub>i</sub>** expenses, **his<sub>i</sub>** child.
- (3) **He<sub>j</sub>** had no patience with **Herzog<sub>i</sub>**.

In the approach we have taken, we start out with primitive Gricean principles of cooperative behavior, including in particular the maxims of quantity and manner, and then incorporate structural constraints from Centering Theory, including Rule 1, to explicitly formulate an algorithm for the generation of referring expression forms. The algorithm is formulated in terms of hearer-based expectations and speaker-based constraints. In order to show how well the algorithm can be applied to natural language, we define the domain of its application in terms of the Centering Transition sequences and illustrate with naturally occurring discourses (as well as constructed examples for the Transition sequences that we were not able to identify) that the algorithm is able to account for the observed patterns of anaphoric reference. The proposed generation algorithm can be used for modeling referring expression generation in natural language generation systems.

### References:

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