Beyond Left, Right, and Straight:
How Speakers Disambiguate Route Directions

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This contribution discusses verbalization data collected in a route direction task. The route directions were given on the basis of map information allowing the verbalizer to rely on veridical information. The data were analysed with respect to the following aspects:

- the characterization of the underlying conceptualizations
- the unambiguous specification of actions that have to be performed at intersections

Most pertinent for following a route is direction information at decision points (e.g., Daniel & Denis, 1998) on which the research efforts are therefore placed. In Klippel (2003) the empirical basis for graphic realizations of prototypical directions concepts is detailed as part of the wayfinding choreme theory, i.e. the mental conceptualization of functional primitives of route direction elements. In contrast to graphic externalizations of mental conceptualization verbal externalizations may require a different level of detail depending on the spatial situation, as language often leaves many aspects underspecified. We analysed utterances that indicate the direction change at decision points and we work towards a systematic specification of a) the structure of an intersection, b) the action to be performed at an intersection, c) the conceptualization of this action, and c) the unambiguous verbal reference to it as part of a route direction.

First results indicate the following strategies:

There are standard intersections, like a 4-way intersection, and standard actions, like 'left', 'right', and 'straight'. If standard actions occur at standard intersections unmodified projective terms are used, for example, *turn right* (*at the intersection*). Additionally, people tend to adopt a direction model that comprises axes and sectors, expressed, for instance, by modifications of the projective terms if the angle of the intended direction departs from the prototypical axis. For example, *turn right* may change to *turn sharp right* and may be modified to *turn very sharp right*. While these directions allow some flexibility, i.e. they are sectors, the concept for straight is an axis.

The strategies participants adopt change if the action to be instructed takes place a) at a complex intersection or b) if competing branches require a disambiguation of the situation. For the identification of object locations Tenbrink (2005) provides results on how the contrast of competing objects can be enhanced. Some ideas on how contrastive reference can be achieved in route directions were presented by Klippel and Montello (2004). Besides rendering the direction concept precise, for example, by providing detailed descriptions according to the direction model, and possibly relying on clock directions or an absolute reference system, participants adopt the following strategies: naming the structure in which the actions take place plus a coarse direction concept (e.g., *fork right*), a comparison of possibilities to take (e.g., *furthest right*), a conceptual change to ordering information plus a coarse direction concept (e.g., *the third to your left*), the description of competing directions not to take, or any combination of these strategies. The situation changes again if landmarks are present.

We analysed two corpora and will present a quantitative analysis of the strategies used. This research adds to the pending question criteria for good route directions (Dale, Geldof, & Prost, 2005).

References

Dale, R., Geldof, S., & Prost, J.-P. (2005). Using natural language generation in automatic route description. *Journal of Research and practice in Information Technology, 37*(1), 89-105.

Daniel, M. P., & Denis, M. (1998). Spatial descriptions as navigational aids: A cognitive analysis of route directions. *Kognitionswissenschaft, 7*(1), 45-52.

Klippel, A. (2003). Wayfinding Choremes. In W. Kuhn, M. Worboys & S. Timpf (Eds.), *Spatial Information Theory: Foundations of Geographic Information Science. Conference on Spatial Information Theory (COSIT) 2003.* (pp. 320-334). Berlin: Springer.

Klippel, A., & Montello, D. R. (2004). On the robustness of mental conceptualizations of turn direction concepts. In M. J. Egenhofer, C. Freksa & H. Miller (Eds.), *GIScience 2004. The Thrid International Conference on Geogrpahic Information Science, October 20-23, 2004, University of Maryland (Extended Abstract).* (pp. 139-141). Adelphi, Maryland, U.S.A.: Regents of the University of California.

Tenbrink, T. (2005). Identifying objects on the basis of spatial contrast: An empirical study. In C. Freksa, M. Knauff & B. Krieg-Brueckner (Eds.), *Spatial Cognition IV. Reasoning, Action, and Interaction: International Conference Spatial Cognition 2004, Frauenchiemsee, Germany, October 11-13, 2004, Revised Selected Papers* (Vol. Lecture Notes in Computer Science, Volume 3343, pp. 124-146). Berlin: Springer.