Towards Cognitively Adequate Tactile Maps

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Spatial Knowledge Acquisition with Tactile Maps

Tactile maps, as external representation of the environment, have been used as alternative to visual maps. They convey meaning about geographic environments via the sense of touch. Acknowledging prior work on human perception and cognition involved in touch, this dissertation project focuses on the cognitive aspects of haptic interaction with tactile maps for pre-trip planning which aims to convey survey knowledge. The implicit task is to learn the structure of the depicted environment from a tailored tactile map, that should be cognitively adequate (Strube, 1992). Such a map enables spatial learning by providing to inducing a mental representation that enables the map reader to successfully solve spatial reasoning tasks without the map. The principles behind the construction of cognitive adequate maps are in focus of this research project.

A Model of Cognitive Complexity as Stand-In for Cognitive Adequacy

After elaborating on the cognitive requirements on interpreting tactile maps I introduce and relate the concept of cognitive adequacy (Strube, 1992) with the concept of cognitive complexity, both applied to tactile map reading. I present a model that hypothesizes which factors influence cognitive complexity, namely geometric-topological factors, situational factors and individual factors. Then I develop a research agenda of experiments whose results can show that the model captures relevant factors in the usage of tactile maps. Results from one study that examines a subset of geometric-topologic factors are examined (Graf, to appear). They support further work to validate the model.

Future Work

The model is discussed and how the quality of the proposed factors, for example, their independency, could be investigated. Eventually, this work will provide experimentally well supported principles and guidelines for constructing cognitively adequate tactile maps to be used in pre-trip consultation.

References

Graf, C. (to appear). Verbally Annotated Tactile Maps: Challenges and Approaches. *Spatial Cognition 2010.*

Strube, G. (1992). The role of cognitive science in knowledge engineering. In *Contemporary Knowledge Engineering and Cognition*, Lectures Notes in Computer Science (Vol. 622, pp. 159-174). Berlin/Heidelberg : Springer.