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THEME SECTION EDITORIAL

Presenting spatial information: Granularity, relevance, and integration

In recent years the availability of automatically generated spatial information of various kinds has developed dramatically. Route descriptions of diverse kinds can be obtained from many different sources and across different modalities, and maps and geographic information can be accessed in multifarious ways.

Although this is situation improves the information availability and accessibility—think, for example, of car navigation, local search, or holiday trip planning, and how all of them have fundamentally changed over the past few years—Internet users may not always be comfortable with the ways in which the information has to be requested or is presented. Recent research has shown that automatically generated spatial information exhibits fundamentally different features from information provided naturally by humans, when asked about space and time in route directions, for example. The human-computer-interface remains the last barrier to easy-to-consume spatial information, or in other words to intelligent machines [3]. Therefore, our contention is that substantial further work is required in order to render spatial information services more supportive and cognitively suitable.

This theme section centers on issues pertaining to granularity, relevance, and integration of spatial information in this communication triangle between user, machine, and environment. Spatial information can be requested by, or presented to information seekers on various levels of granularity, ranging from coarse information concerning features at geographic scale, to detailed information concerning concrete spatial actions in environments of vista scale [1]. Not all of this information is relevant for all purposes. Decisions concerning granularity are directly intertwined with issues of relevance across interaction scenarios. Such scenarios frequently require an ability to move between different spatial and temporal granularities. Consider, for example, a train journey: the traveler needs to know the departure time on the minute, where to buy a ticket, the departure platform at the train station, and the section of the platform where the carriage with the reserved seat will stop. Once on board, the traveler might be interested in information about the progress of the trip, but this information is irrelevant during the planning phase of the trip. Next, the traveler needs to know the time of arrival in the destination city, but generally not the arrival platform [2].

In spite of this complex relationship between granularity and relevance humans typically manage to present information in an integrated and coherent way, switching flexibly and smoothly between levels of granularity according to the expected relevance for the information seeker. Research in this area can take two approaches: either an empirical approach, studying this human ability to learn about it; or an engineering approach, implementing and testing models of this capacity in spatial information systems.

Each of the papers in this theme section contributes to this research field in a different way. The first paper by Stephen Hirtle, Kai-Florian Richter, Samvith Srinivas, and Robert Firth addresses human descriptions of decision points in street networks that are viewed as particularly difficult, as evidenced by the phrase "This is the tricky part." The authors extracted route descriptions containing this phrase by a web search and examined the features of the spatial situation systematically. The results of this inspiring and creative study reveal that, apart from accidental problems such as missing signs and the like, a major obstacle to finding the way occurs when the geometrical properties of the environment do not match the expectations of the wayfinder. These expectations are naturally mediated by experience and local knowledge. More complex geometric configurations are more likely to lead to challenges in describing the routes than standard four-way street intersections. The authors provide a detailed account of how these findings can be used to inform the automatic generation of route descriptions. While this results in a set of practical recommendations, the paper concludes that a range of fundamental problems in this regard will certainly persist for a while.

In the second paper, Blake Stephen Howald addresses the granularity structure of spatiotemporal information as presented in crime narratives. A detailed and comprehensive analysis of spatially rich crime narratives, supported by a supervised machine learning procedure, reveals a systematic distribution of spatiotemporal terms within the narratives with respect to pre-crime, crime, or post-crime events. In particular, Howald classifies the spatial expressions with respect to semantic and conceptual distinctions as motivated from the relevant literature, such as Figure and Ground assignments, mereotopologically (part-whole relationship) based verb classes, and four distinct levels of granularity for Ground descriptions. The non-random distribution of these categories within the analyzed texts indicates that space plays a distinct structural role in crime narratives, with granularity of spatial description playing a key discriminatory role.

The final paper by Emile van der Zee, Urpo Nikanne, and Uta Sassenberg proposes a three-level distinction of granularity levels in English terms expressing path curvature. In this framework, "to arc" and "to curve" indicate global path, whereas "to slalom" and "to spiral" indicate local path specifications. In contrast, terms such as "to move" and "to travel" are neutral with respect to curvature. The three distinct conceptual levels are supported by systematic constraints on syntactic transformations, and they correspond to typical kinds of iconic gestures made by speakers while using these terms in a discourse context. These results demonstrate the role of conceptual granularity levels for natural language production and its accompanying gestures.

These papers grew out of a workshop at the Conference on Spatial Information Theory 2009 and an open call for contributions afterwards. The editors would like to express their thanks to an active and supportive program committee, and to all the reviewers of this theme section. We hope you find this section as exciting as we do, and we are looking forward to more work in this interdisciplinary area.

References

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