Connections 2010 Abstract

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Abstract Title: The role of the working space representation and epistemic interactions in map-based visualizations

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At present there are many asynchronous programming interface-enabled digital maps (e.g., Google Maps, Google Earth, MSN Virtual Earth) that can facilitate map-based visualization of documents (such as newspaper articles, metadata records, journal papers, books, medical records, job or real estate listings). These maps have built-in interactions which allow users flying through the space, panning and zooming to any location, rotating maps for proper orientations, traveling through time, and viewing linked items. Absent is such maps are tools for higher-level cognitive activities such as information foraging, exploration, sense making, and collection understanding. Geovisualization researchers (MacEachren, 1995; Pequet & Kraak, 2002; Edsall, 2001 and other) might argue that map representations alone can facilitate high-level reasoning activities. But cognitive researchers suggest that epistemic interactions and the representation of the working space may enhance user's performance in reasoning activities even more (Kirsch, 2009; Maglio, Matlock, Raphaely, Chernicky, Kirsch, 1999; Kirsh, 1995b). This paper presents a conceptualization for augmenting map-based visualizations of documents with epistemic interactions and the representation of the working space.

Epistemic interactions are complementary actions such as preparatory, maintenance and exploratory actions which are not directly relevant to a goal (Kirsh & Maglio, 1994). Examples of such interactions are pointing, rearranging, ordering, annotating, and rotating (Kirsch, 1996). At first glance, these actions might seem superfluous, but experiments in cognitive psychology demonstrate that they help users to externalize thought, reduce cognitive load, and simplify perception and mental computation (Kirsch, 1996; Kirsh & Maglio, 1994). In the context of map-based visualizations, epistemic interactions can facilitate such tasks as document triage (Fast & Sedig, 2010) and document preparation for future use. For example, upon retrieval, users prepare documents for future activities by piling, filing, and binding them in the working space. Enabling users to freely rearrange documents in piles and change pile categories is critical for preserving the context of users' work and reasoning (Kirsch, 2001). Without such capabilities, user tasks and activities in map-based visualizations are highly constrained (Kirsch, 1996).

Not less important for reasoning is the representation of the working space. Regardless of what people do (whether they process information, cook, bartend, sew, or play chess), they are in a constant need to place objects (Kirsch, 1995a) both in electronic and physical environment. During searching or browsing map-based visualizations users also need space to place the

selected documents. Furthermore, they need to place documents in such a way, so that they could remember which ones were more relevant, and which ones were less relevant to their task, and in which order the documents should be used later. For this, they might use sticky notes, clippers, or space arrangements to create cues, constraints, and triggers which can tell them that only certain affordances are present, and so only certain actions can be performed on those objects. Such spatial arrangements, cues and constraints reduce the cost of visual search, and make it easier to notice, identify and remember items in sense making, information foraging, and exploration (Kirsch, 1995a). Without the representation of the working space, map-based visualizations allow only to notice patterns in spatial distributions of documents, and to search and browse the collections, while reasoning on selected documents is taking place somewhere else.

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