How should Orientation Maps look like?

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Abstract

Maps are often used to navigate in unfamiliar environments. However, maps that are displayed on small screen devices cannot simultaneously display overview and detailed information. To bridge that gap, we aim to develop orientation maps and argue that these maps should only display relevant map features instead of simply reducing detailed information with decreasing map scales. In this paper we present a classification scheme for orientation information in orientation maps. Moreover, we specify guiding questions for future work on automatically creating orientation maps.
Keywords: wayfinding, navigation, orientation information, orientation maps

1 Background

Maps are created by humans to represent spatial information and are often used for wayfinding and navigation. In the past decades, there was a major shift from static paper-based maps towards dynamic digital maps, which are often displayed on small screen devices. The small screen sizes require the maps to limit the information content, which is usually done by reducing the details of the represented features with decreasing map scales (Clark 1976). Thereby, maps cannot simultaneously display overview and detailed information. Münzer et al. (2012) showed that maps can either support wayfinding or configurational learning. There have been several approaches that looked at specific map features to support spatial knowledge acquisition (Raubal & Winter 2002; Nothegger et al. 2004; Richter & Klippel 2005; Duckham et al. 2010; Schmid et al. 2010), which, however, add additional information to the maps. We argue that in order to successfully create orientation maps, maps have to be considered as a whole and all types of map features have to be investigated for their relevance to support spatial knowledge acquisition. Only relevant features should be displayed.

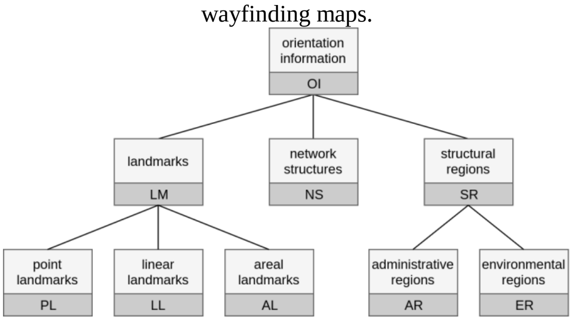
2 Concept

We analyzed several sketch maps to classify the features people include. We assume that people draw relevant information when being instructed to give route instructions. In Figure 1 we see a sketch map that was drawn by a participant during an experiment to convey some route directions. Besides the route itself, it contains additional information, which the participant must have considered as relevant for someone else to orient and find the way. To classify the map features, we marked the features in the sketch map as follows (see Figure 1): red marks the route; green features are landmarks; orange features are the street network apart from the route; blue features are structural regions.

Figure 1: Example sketch map with indication of different features.

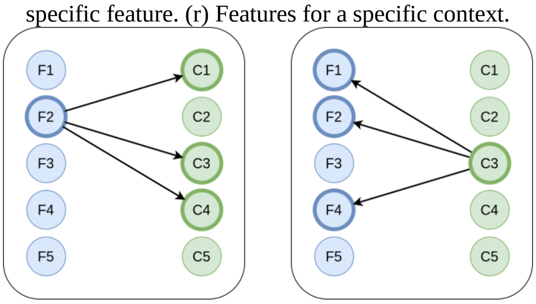
Following Anacta's (2016) classification scheme for landmarks and Richter's (2008) types of landmarks, we develop a classification scheme for orientation information (Figure 2). We classify all types of features of an orientation map, without specifying their role (e.g. local or global) or location (e.g. at decision points). The classes are not mutually exclusive such that features might fall into different classes, depending on their context in the orientation map. We argue that all features in orientation maps can be classified as *landmarks, network structures,* or *structural regions.* Following the literature, we define *landmarks* as "geographic objects that structure human mental representations of space" (Richter & Winter 2014, p.7).Therefore, any object in the orientation map might be a landmark. We use the class *network structures* to mainly refer to the relevant street network in the orientation map. For the *structural regions*, we distinguish *administrative regions* and *environmental regions*.

Figure 2: Classification scheme for orientation information in wayfinding maps.



We distinguish areal landmarks, environmental regions, and administrative regions as follows: Areal landmarks are separate environmental features with an areal extent, such as a lake or a park (see Figure 1). In contrast, environmental regions are regions that might be displayed as single features at small map scales, but serve as container regions for more detailed information at larger map scales, such as a city center (see Figure 1) or the Ruhr region in German. Environmental regions have a semantic meaning, which refers to some kind of homogeneous environmental structure, which is (visually) perceivable in the environment. Environmental regions are defined by their bona fide boundaries, whereas administrative regions are defined by their fiat boundaries (Smith & Mark 1998; Galton 2003). Both, environmental regions and administrative regions are more relevant at smaller map scales in order to reduce map details and indicate containment relations. This might help to better structure the environment with regions for orientation and navigation (see Wiener & Mallot 2003).

Figure 3: Relation of features and context. (l) Contexts for a specific feature. (r) Features for a specific context.



When creating orientation maps, there are two questions that need to be investigated:
(1) Which features are relevant for supporting orientation in a particular context?
(2) In which contexts are particular features relevant for supporting orientation?
These questions approach the feature selection for two different sides. With question 1 we fix the context and select all relevant features for this context (Figure 3, r). With question 2 we fix the feature and define the contexts in which this feature is important to be selected (Figure 3, l). The approaches are interdependent, as question 2 will generalize previous selections from question 1, and question 1 will implement general rules from question 2.
In future work, we will investigate these questions and apply the presented classification scheme for orientation information to the feature selection. On the one hand, we will further collect sketch maps and analyze map features people spontaneously include in route descriptions. We will focus on the type of features according to the presented classification scheme, the context, and the spatial relations of the features towards the route. On the other hand we will prototype feature selections and empirically test and refine the selections. We aim to develop selection rules to automatically generate orientation maps.

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