Gathering a multicultural ontology of outdoor and hiking landmarks from direct terrain observations and sketch maps

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Abstract:

Outdoor hiking is a popular leisure activity that typically takes place in nature environment and is very dependent on successful wayfinding in the unbuilt terrain, thus strongly relying on the spatial cognition of the hiker. Wayfinding is the intellectual component of navigation (Montello, 2005) and, as Golledge (1999, p. 6) puts it, "the process of determining and following a path or route between an origin and a destination". When finding one's way, people importantly rely on landmarks, that are, prominent features of the physical environment used as points of reference in spatial thinking (e.g. Lynch, 1960). Landmarks in many hiking environments are often sparse or overall challenging to determine for a hiker due to inter-similarity and continuousness of potential landmark features in nature. This may be a reason of navigator software for nature hiking not having developed similarly quickly as for personal transports in constructed environments where salient features are typically more common. Therefore, this research aims at building a comprehensive set of empirically justified landmark concepts from several research investigations concerning outdoor environments, and at combining them into a formal ontology of hiking landmarks. This ontology can be used as a basis for nature hiking aids, such as navigation software with turn-by-turn instructions or more easy-to-use hiking maps.

Ontologies in computer and information sciences, such as geoinformatics and cartography, are typically conceptual models of entities (i.e., things) and the semantics between them. They vary from high-level general ontologies to low-level specified application ontologies and from informally described ontologies to formal ontologies with standard file formats, such as the Web Ontology Language (OWL). Ontologies may also reflect expert or non-expert concepts that typically differ considerably from each other, which creates difficulty in communication between experts and non-experts in various domains, including geographic information science (see, e.g., Smith and Mark, 2003). Developers of navigation devices and maps should program their applications to support typical non-expert users of their products, such as outdoor hikers without capabilities to interpret expert ontologies coded in the products.

The planned ontology will be gathered from three original landmark ontologies of outdoors and hiking collected in three countries: Finland, Germany and France. All the three ontologies represent permanent landmarks in nature. The Finnish ontology contains hiking landmarks gathered in forested Finnish environments (see Kettunen, 2014; Figure 1). This application ontology was built from direct observations of hikers on forest routes and their afterwards drawn sketch maps, which makes the ontology empirically strong although reliably representative of only the studied types of forested terrains. The German landmark ontology is based on the Finnish ontology and has been extended for German non-urban areas (Kleinle, 2023). In a nature park, data on objects that could serve as possible landmarks were collected and it was investigated whether they were already included in the Finnish ontology. If not, a corresponding class was added to the ontology (see, for example, the subclasses "fastened road", "gravel road", and "unpaved way" added to "outdoor track", Figure 2). The French ontology is a landmark application ontology for French mountain areas, tailored for mountain rescue purposes (Olteanu-Raimond et al., 2023). This ontology contains landmarks crucial for individuals requiring assistance during their outdoor activities in mountain areas to describe their location to the rescue teams (e.g. "I'm near a circular lake" and "I see a hut"), where "lake" and "hut" are the landmarks and "near" and "see" denote spatial relationships between these landmarks and the person to be located for assistance. The ontology was built iteratively, including researchers and mountain rescue experts, and used several geographic databases (authoritative or crowdsourcing data), a corpus of emergency calls, and knowledge from domain experts (i.e. rescue team members). Particularities of each terrain will be marked down in the new ontology and differences analysed for understanding variations of ontologies in different countries, terrains, and landscapes. Furthermore, locations of recalled landmarks in

sketch maps will be georeferenced and compared to the direct observations in the terrain, thus creating understanding about what landmarks are remembered where on-route. Consequently, the ontology will be tagged with semantical connections about what kinds of landmarks are locationally easy to remember, and thus useful to be provided for the foundation of the cognitive or mental maps of the hikers through wayfinding aids.

The results of the ontology alignment and sketch map analysis will be presented at the conference together with added understanding about how landmarks of nature environments are conceptualised in different cultures.
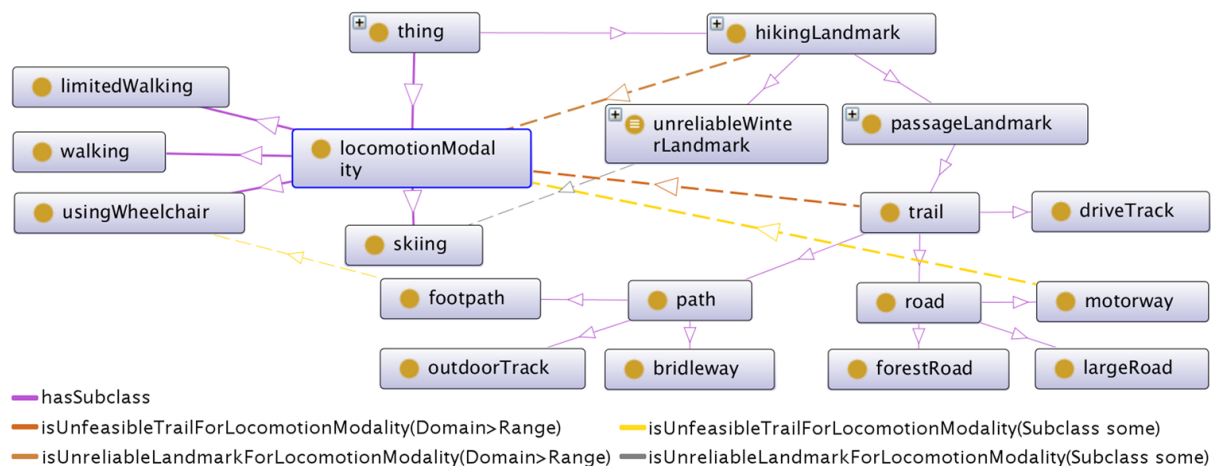

Figure 1. An extract of the hiking landmark ontology from forested Finnish environments (Kettunen, 2014).
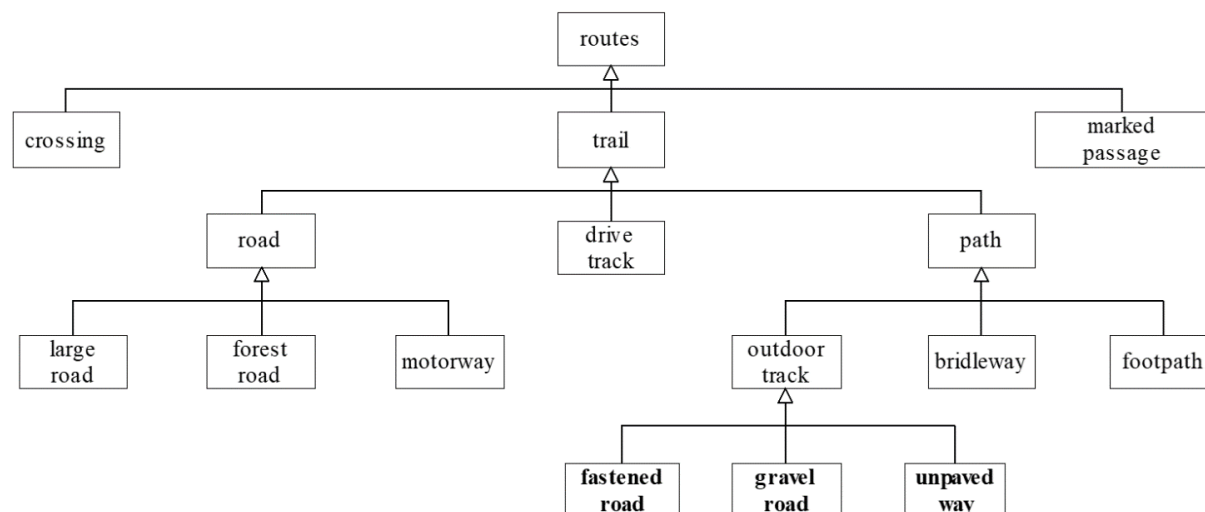

Figure 2. Exemplary extended subclass "outdoor track" from the German landmark ontology based on the Finnish (Kleinle, 2023).

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