The Semantics of Terrain

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Terrain is conventionally represented as a surface presented as a grid of elevation values, such as a digital elevation model, a lattice of points forming a triangulated irregular network, or a series of contour lines or profiles. Generally, these representations provide a layer of data for a particular geographic area, such as a quadrangle, county, or watershed, and do not include explicit representation of individual terrain features such as hills, mountains, and valleys. Often terrain features are shown with only a name and the geographic extent of the feature is interpreted by the user through visual observation. This representation has worked well on printed topographic maps, which are usually visually interpreted in applications. In the modern digital world using machine processing of geospatial data, a representation of individual terrain features, such as mountains, is required to support semantic queries about these features. For terrain representation on the Semantic Web, one must define individual terrain features and provide their characteristics and relations to other features in an explicit specification in a data triple of subject (terrain feature, such as a mountain), predicate (relation to other feature such as part_of), and object (another feature such as mountain range, or a literal object such as a numeric value of height). Developing this object-based representation of terrain is problematic in many respects including the fuzziness of the feature definition and geographic footprint, the cognitive ambiguity of human specification of terrain features, and the resolution and accuracy of the digital data used for the representation. An ontology design pattern based on surface network theory that captures terrain features such as peaks, passes, pits, pales, hills, and dales has been developed and made available on the Semantic Web.

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