

A Reference Landform Ontology for Automated Delineation of Depression Landforms from DEMs

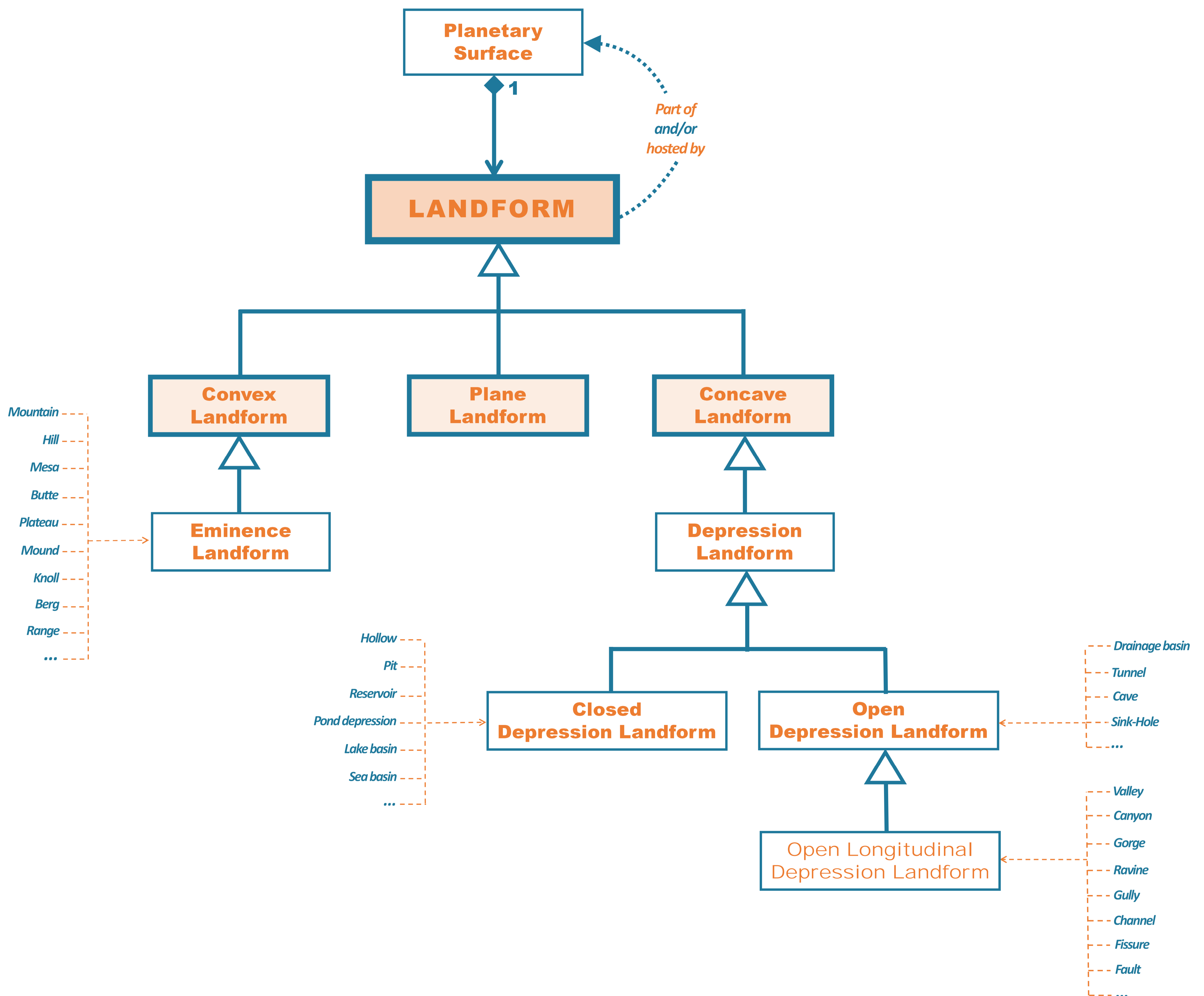
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ABSTRACT

This reference landform ontology is intended to guide automated delineation of landforms from digital elevation models (DEMs) and semantic information retrieval about landforms. Since only form related information is available from DEMs, the categories of this reference ontology are defined based only on morphological criteria. The choice of the landform categories is informed by ethnophysiological and spatial cognition research. The proposed taxonomy is work in progress and reflects the current focus on automated delineation and mapping of depression landforms (e.g., basins, valleys and canyons).

LANDFORM ONTOLOGY

Landforms are **three-dimensional features** located on the solid surface of the Earth (or other planetary bodies). Landforms may be **material** (e.g., mountains) or have both **material and immaterial parts** (e.g., a water body that consists of a *river bed*, the *depression*, and *water*). Landforms may be assigned some characteristic **geometric, topological, mereotopological, temporal and material properties**. Knowledge of the **agents and types of processes** that create landforms or in which landforms participate must also be specified for geoscientific conceptualizations.



HOW CAN THIS REFERENCE LANDFORM ONTOLOGY BE USEFUL?

- ✓ Specifies categories based only on **three-dimensional perceptual form** so that features can be delineated from terrain fields which capture *only the shape of the surface* of the earth or other planetary bodies .
- ✓ Provides a basic framework for **semantic grounding and alignment of landform concepts** from different cultures and languages.
- ✓ Can be used for defining and measuring **semantic similarity** between *types* (e.g., *valley/canyon/gorge, gully/gulch, mountain/hill*) and *instances* (Mt. Washington/Mt. Adams) of landforms across conceptualization systems.
- ✓ First step in designing natural language and visually interactive **semantic search engines for landforms**. This ontology makes it possible to **augment the scope of semantic queries** about landforms by reasoning about related categories and offering the user opportunities to expand or specialize their initial queries.
- ✓ Even advanced **geoscientific conceptualizations of landforms can be formalized** by augmenting this reference ontology with additional concepts of material, agents, and processes that govern the evolution of landforms. Using a common reference ontology for both naïve and geoscientific will mean more intuitive and **similar information retrieval interfaces for both naïve geographic and scientific queries**.