

Creating Naturalistic Virtual Maps for Exploring Digital Libraries

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Large-scale Digital Libraries such as Europeana¹ provide access to vast collections of data through standard search interfaces. These are ideal for experienced users, however for novice users they present a major obstacle, as they give no indication of what is available and how to search for it.

Spatial and temporal visualisations have been proposed² as alternatives. The difficulty with these is they require that the data has explicit spatial or temporal meta-data and that time or space are one of the primary dimensions the user is interested in. Creating thematic maps based on the individual items has also been proposed, but is difficult to scale and interact with when the collections exceed a few thousand items.

We propose a novel spatialisation method for data organised in any kind of hierarchical classification system. These virtual maps allow the user to explore an unknown collection and also let the user make full use of the skills acquired from using real-world maps. The following criteria must hold for such a map:

- similar items should be co-located,
- boundaries on the map should correlate with boundaries in the classification,
- map features should appear natural.

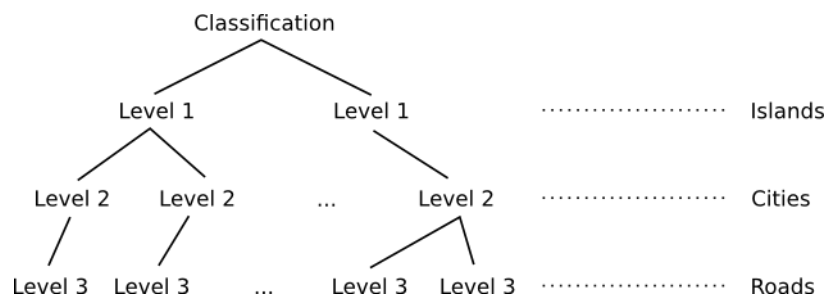


Figure 1 - Classification - Map-feature mapping

To achieve this we map the classification hierarchy into a spatial hierarchy (Figure 1). Top-level classes are represented as islands, the next level as cities on these islands, the third level as road-networks within the cities, and the individual items as points along these roads. This ensures that the topical boundaries defined by the classification match the visual boundaries on the map. To ensure that more similar islands and cities are more closely located, we employ Multi-Dimensional-Scaling (MDS) to place the islands on the map and the cities within the islands (Figure 2). Item similarity is used to order the items along the road network.

¹ European aggregator for museums, libraries, archives, and galleries – <http://www.europeana.org>

² See for example <http://www.europeana.org/portal/timeline.html> or <http://www.informatik.uni-leipzig.de:8080/e4D/>



Figure 2 - Sample map showing islands and cities

To ensure a natural look, the islands and road networks are sampled from existing island and road-network shapes. The island shapes were extracted from a freely available data-set³, filtering out outlines that are too big, small, or distorted. From these a random set of islands is selected and placed at the coordinates determined by the MDS. The islands are scaled relative to the number of items on the island and randomly rotated to reduce their recognisability. The road network sample consists of two sub-sets. Larger outline networks that define the basic structure of the road-network and smaller samples that are inserted into the basic structure and along which the individual items are placed. Random selection of both large and small samples ensures a diverse set of natural-looking layouts.

Early evaluation using a small set of ~11,000 items shows that the virtual maps generate interest in the collection and that people wish to explore them.

³ <http://www.natureearthdata.com/downloads/10m-physical-vectors/10m-land/>