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Expressive map design: OGC SLD/SE++ extension for expressive map styles

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Abstract: In the context of custom map design, handling more artistic and expressive tools has been identified as a carto-graphic need, in order to design stylized and expressive maps. Based on previous works on style formalization, an approach for specifying the map style has been proposed and experimented for particular use cases. A first step deals with the analysis of inspiration sources, in order to extract ‘what does make the style of the source’, i.e. the salient visual characteristics to be automatically reproduced (textures, spatial arrangements, linear stylization, etc.). In a second step, in order to mimic and generate those visual characteristics, existing and innovative rendering techniques have been implemented in our GIS engine, thus extending the capabilities to generate expressive renderings. Therefore, an extension of the existing cartographic pipeline has been proposed based on the following aspects: 1- extension of the symbolization specifications OGC SLD/SE in order to provide a formalism to specify and reference expressive rendering methods; 2- separate the specification of each rendering method and its parameterization, as metadata. The main contribution has been described in (Christophe et al. 2016). In this paper, we focus firstly on the extension of the cartographic pipeline (SLD++ and metadata) and secondly on map design capabilities which have been experimented on various topographic styles: old cartographic styles (Cassini), artistic styles (watercolor, impressionism, Japanese print), hybrid topographic styles (ortho-imagery & vector data) and finally abstract and photo-realist styles for the geovisualization of costal area. The genericity and interoperability of our approach are promising and have already been tested for 3D visualization.

Keywords: map design, geovisualization, map style, expressive rendering, SLD

1. Introduction

In the context of custom cartographic representation with geovisualization tools, some issues are still at stake, as abstraction levels and visual variables are still difficult to select to fit users’ needs and preferences. Furthermore, some geographic spatio-temporal phenomena are still hard to represent in an understandable way.

A way of personalizing a map is to draw inspiration from existing artistic styles. In practice, this is complex to achieve in a GIS because there is currently no formal way to describe an artistic (complex) style. Rendering techniques are more and more used in map design, to manage photo- or non-photo-realistic rendering and pseudo-natural effects or to mimic artistic and old practices in cartography (Patterson et al. 2004; Trapp et al. 2011; Jenny & Jenny 2012; Semmo et al. 2013; amongst others). However, these techniques cannot be easily used and controlled within a GIS to reproduce a given style.

We address the issue of the specification of ‘what the style of a map is’, based on previous works on style formalization, both in expressive rendering (Grabli et al. 2004, Willats & Durand 2005, amongst others) and in

map design (Kent & Vujakovic 2009, Beconyte 2011, Christophe 2012, amongst others). Our main contribution has been published in (Christophe et al. 2016), we focus here on how the extending style formalization in map design allows, in a generic and interoperable way, to design various topographic styles.

In a first step, cartographic needs and design rules have been explored, based on both interviews with cartographers (mainly producers for current map design, and “artist-cartographers” for hand-drawing map design at the time), and the analysis of map design specifications (generalization and legend specification), in order to extract expected salient visual characteristics of ‘what the style of a map’ could be. These requirements are described in the context of several expected styles: current topographic French and Swiss maps (Ory et al. 2015), mountain (by hand) maps, Cassini maps, impressionism and watercolor styles (Christophe et al. 2016). Then, expressive rendering techniques are picked-up from expressive rendering area, and implemented in GIS tools, in order to be able to re-produce or mimic these visual characteristics of map styles. Among these techniques, existing methods for surface filling and line stylization using raster textures have been investigated (Christophe et al. 2016) and an innovative method for

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