

Open Contextual Cartographic Visualization

Jiří Kozel

Laboratory on Geoinformatics and Cartography, Institute of Geography,
Faculty of Science, Masaryk University, Czech Republic
jirikozel@centrum.cz

Abstract. The idea of contextual cartographic visualization is that the user should not care about selecting context-relevant content or symbology; the user should just state his context and he should obtain an appropriate contextual map. Concerning this, we propose a service that selects context-relevant content and symbology instead of the user. It is called Contextual Cartographic Service. The paper presents an idea and a solution of contextual cartographic visualization using Contextual Cartographic Service, which is based on two Open Geospatial Consortium specifications.

1 INTRODUCTION

The idea of contextual cartographic visualization is that the user should not care about selecting context-relevant information or symbology; the user should just state his context and he should automatically obtain an appropriate *contextual map*, including context-relevant information and symbology.

Context-relevant information is crucial to speed up the decision making process. A typical case for using contextual cartographic visualization is risk management, because it consists of many decision making processes. It is also the field of interest within the project “Dynamic geovisualization in risk management“, which comprehensively deals about transferring geoinformation to the user.

The paper begins with the explanation of the terms *context* and *contextual cartographic visualization*, after which it presents idea of an open solution of contextual cartographic visualization based on two OGC specifications.

2 BASIC TERMS

2.1 Context

A useful definition of *context* provide Day and Abowd (1999): “Context is any information that can be used to characterize the situation of an entity.

An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves.”

Important term related to context is *context parameter*, discussed in Reichenbacher (2003). It can be understood as an attribute whose value partially describes the context. Then, the context is completely described by the set of all context parameters. Context parameters have different data types, from basic types (ie. numbers) to composition types.

Reichenbacher mentions context parameters such as location, user, activity, system parameters etc. Nevertheless, definition of the set of context parameters always depends on a specific application.

2.2 Contextual Cartographic Visualization

Contextual cartographic visualization (or *adaptive cartographic visualization*) is a process of adapting a map to a particular context by highlighting context-relevant spatial information. The process of a map adaptation includes operations that change map properties, such as content, extent, scale, symbology or cartographic method (see Friedmannová, Konečný, Staněk 2006).

A map application that is able to adapt to the context is called an *adaptive map*. On the other hand, a *contextual map* is just a static appearance (image) of the adaptive map adapted to specific context.

3 OPEN SOLUTION

One of the main goals of the project “Dynamic geovisualization in risk management” is to design an open solution of contextual cartographic visualization. The word “open” relates to interoperability of different systems. Nevertheless, contextual cartographic visualization is not directly described in any specification due to its experimental stage. Concerning this, the solution must be based on existing specifications related to basic cartographic visualization (see section 3.1).

Regardless of interoperability, the idea of contextual cartographic visualization is that user should not care about selecting context-relevant content or symbology; the user should just state his context and he should obtain appropriate *contextual map*. Concerning this, we propose a service that selects context-relevant content and symbology instead of the user. We call this service *Contextual Cartographic Service* (see part 3.2).

3.1 Open Geospatial Consortium Specifications

Open Geospatial Consortium (OGC) is international standards organization that is leading the development of standards for geospatial services. There exists two OGC specifications related to cartographic visualization and used in the presented solution.

Web Map Service (WMS) is a specification describing communication between a map server and a client using HTTP protocol. The client can request specific map content, extent, scale, and coordinate reference system using specific URL parameters.

Styled Layer Descriptor (SLD) specification extends WMS request with the possibility of detailed client specification of the requested content and symbology. It is realized by another URL parameter and an XML file called SLD Style.

3.2 Contextual Cartographic Service

The purpose of the *Contextual Cartographic Service* (CCS) is to select context-relevant content and symbology from underlying map servers and provide it as *contextual maps* to clients (see Figure 1). Concerning demand for interoperability, CCS should communicate with mapservers using WMS&SLD requests and with clients using extended WMS requests (see Part 3.2.1).

It is obvious that CCS must have predefined map content and symbology for all supported contexts.

3.2.1 Extending WMS Request

CCS looks to WMS clients like any other WMS server, with a little difference: client context must be encoded as a part of WMS GetCapabilities and GetMap requests.

As was mentioned in Part 2.1, context can be completely described as set of context parameters. Because WMS specification enables additional URL parameters, it is possible to encode each context parameter as one additional URL parameter, so the whole context is encoded.

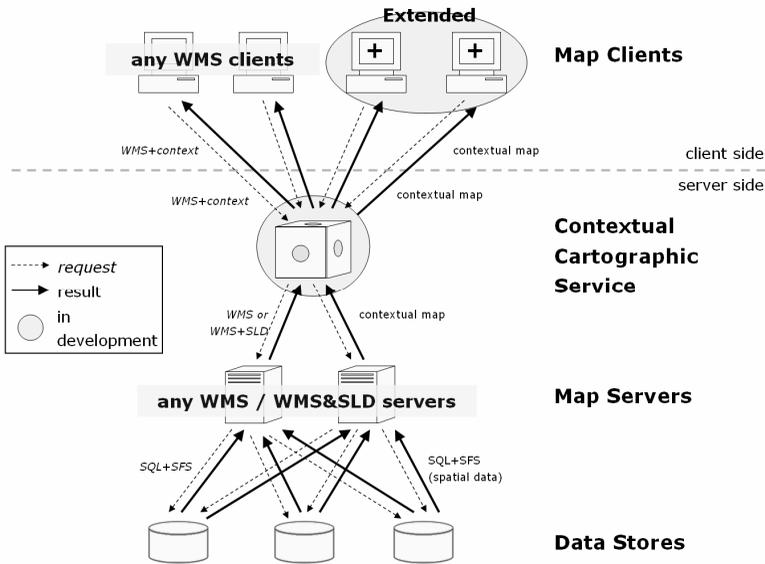


Figure 1: Schema of open solution architecture.

3.2.2 Context Parameters

Only context parameters with enumeration data type are used within the presented solution. Regarding this, it is simple to define the set of supported context parameters and their possible values (see Figure 2). It is also trivial to derive all contexts possibly indicated by the set.

```

<ContextParameters>
  <ContextParameter name="user" title="User">
    <Value name="firebrig" title="Fire Brigade" />
    <Value name="police" title="Police" />
    <Value name="amb" title="Ambulance" />
  </ContextParameter>
  <ContextParameter name="situation" title="Situation">
    <Value name="fire" title="Fire" />
    <Value name="flood" title="Flood" />
  </ContextParameter>
  <ContextParameter name="device" title="Display Device">
    <Value name="crt" title="CRT" />
    <Value name="smallLCD" title="Small LCD" />
  </ContextParameter>
</ContextParameters>

```

Figure 2: Example of defining context parameters and their possible values using XML.

CCS should also have capability to describe all supported context parameters and its possible values, so that client would know what can be requested. The capability should be realized through a special request `GetContextParameters`. Response for the request should be similar to XML structure in Figure 2. An extended WMS client (see Figure 1) then better supports working with context parameters using the request.

4 CONCLUSION

The solution described in this paper requires development of both CCS and extended WMS client. It is expected that the first phase of the development, concerning basic functionality of both CCS and extended WMS client, will be finished at the end of 2007. After testing and verifying the solution, it is supposed to extend the service with Web Feature Service implementation and with better cartographic visualization (ie. multidimensional symbols).

This research has been supported by funding from Project No. MSM0021622418 called "Dynamic geovisualization in risk management".

References

- Dey, A. K. and Abowd, G. D. (1999). *Towards a Better Understanding of Context and Context-Awareness*. Georgia Institute of Technology, Atlanta. 12p.
- Friedmannová, L., M. Konečný and K. Staněk (2006). *An adaptive cartographic visualization for support of the crisis management*. Auto-Carto Conference 2006. Vancouver. 6p.
- Kozel, J. (2007). *Possibilities of open technological solution of contextual cartographic visualization*. Research project MSM0021622418, Brno. 19p. (in Czech)
- OGC 01-068r3 (2002). *Web Map Service Implementation Specification v. 1.1.1*. Retrieved from <http://www.openeospatial.org/standards/wms>
- OGC 02-070 (2002). *Styled Layer Descriptor Implementation Specification v. 1.0.0*. Retrieved from <http://www.openeospatial.org/standards/sld>
- Reichenbacher, T. (2003). *Mobile Cartography – Adaptive Visualisation of Geographic Information on Mobile Devices*. Technical University München. 189p.

