



**Cartographic journal, The, ISSN 0008-7041**  
**Volume 53, number 3 (august 2016)**

---

**An Empirical User Study for Measuring the Influence of Colour Distance and Font Size in Map Reading Using Eye Tracking**

P. 202-212

Alzbeta Brychtova & Arzu Coltekin

**Abstract**

The primary goal of this study is to empirically analyse the influence of *colour distance* and *font size* on map readability. We utilized eye-tracking to complement the classical usability metrics; thus, we studied performance metrics such as *effectiveness* (i.e. success, accuracy), *efficiency* (i.e. time to answer, task completion time), and selected eye tracking metrics *fixation frequency*, *fixation duration* and *scanpath speed* as well as conducting an *area-of-interest (AOI) analysis* to understand the performance and strategy issues that may be influenced by colour distance and font size during map reading. The user experiment was carried out in a controlled laboratory where participants were asked to conduct a visual search task and mark the correct answer with a mouse click on a static map on a computer screen. Collected data was analysed through descriptive and inferential statistics. Task completion times for the five tested colour distances show that as the colour distances grow larger, the relative differences in task completion times become statistically significant; empirically confirming our intuition that larger colour distances are better for map readability. The comparison of the scanpath speeds for the tested font sizes suggests that the medium font size leads to a more efficient search.

---

---

**User-Centred Map Applications Through Participatory Design: Experiences Gained During the 'YouthMap 5020' Project**

P. 213-229

Sabine Hennig & Robert Vogler Department of Geoi

**Abstract**

In recent years, the concepts of usability, user experience, and user-centricity have gained in interest. Digital applications, developed in line with criteria related to these approaches, ask for a deeper understanding of users and their requirements. But, even though there is a wide range of methods available, the creation of user-centric applications with good usability and user experience still poses great challenges for developers. This is also true for web maps, i.e. web map applications, which today are ubiquitous on the Internet. They have evolved into an important information and communication tool and address users who do not possess any specific knowledge of Geoinformatics (GI) or Cartography. Despite the efforts made to meet the requirements and preferences of laymen, these users still often face problems when dealing with web map applications. This refers to aspects of design, content, and functionality. Here, participatory design, which is well-known in the field of Software and Web Engineering, might provide a suitable means. By engaging users directly and actively in the application development process, developers are able to gain a profound understanding of the users and their needs. However, there are several open questions regarding the use of participatory design for designing and implementing web map applications: What does the use of participatory design in web map development processes look like in detail? How and to what degree can users be involved in the development processes? Which added values exist? These questions are addressed by the project YouthMap 5020, whose main goal it was to create a prototype youth-centric web map for the Austrian city of Salzburg (zip code 5020). Applying the approach of participatory design, about 120 teenage pupils from several local schools were involved in all kinds of tasks related to the phases of generating the youth-centric Salzburg web city map. Experience and knowledge gained thereby allowed elaborating recommendations generally useful for generating youth-centric web map applications.

---

---

**Building Displacement Based on the Topological Structure**

P. 230-241

Yageng Sun, Qingsheng Guo, Yuangang Liu, Xiuqin Lv &amp; Nai Yang

**Abstract**

Map data at smaller scales than their source can result in spatial conflict, whereby map symbols become too close, or overlaid. Server map generalisation operators may be applied to solve this problem, including displacement. In this paper, we show how an optimisation algorithm, the snake algorithm, was used to displace multiple objects in order to resolve spatial conflicts and maintain important spatial relationships between objects during displacement. Two principles based on the snake algorithm are proposed in this paper. First, the truss structure mirroring spatial proximity relationships between buildings and between building and road is formed based on the weighted proximity graph derived from constrained Delaunay triangulations (CDT) in each map partition. In the weighted proximity graph, each connecting line is determined as a snake and as an element unit to assemble the global stiffness matrix in snake algorithm. Second, a buffer method that calculates force between a building and a road (or other linear features) or between pair of buildings is adopted in the snake algorithm. This avoids the imbalance phenomenon caused by different force calculation methods during the displacement. The feasibility of the approach is demonstrated in obtaining real geographic data. Finally, the results are cartographically usable and in particular, the spatial relationships between objects are preserved.

---

**The Visvalingam Algorithm: Metrics, Measures and Heuristics**

P. 242-252

Mahes Visvalingam

**Abstract**

This paper provides the background necessary for a clear understanding of forthcoming papers relating to the Visvalingam algorithm for line generalization, for example on the testing and usage of its implementations. It distinguishes the algorithm from implementation-specific issues to explain why it is possible to get inconsistent but equally valid output from different implementations. By tracing relevant developments within the now-disbanded Cartographic Information Systems Research Group (CISRG) of the University of Hull, it explains why (a) a partial metric-driven implementation was, and still is, sufficient for many projects but not for others; (b) why the effective area (EA) is a measure derived from a metric; (c) why this measure (EA) may serve as a heuristic indicator for in-line feature segmentation and model-based generalization; (d) how metrics may be combined to change the order of point elimination; and (e) how Tobler's rule-of-thumb is useful for scale-related filtering of EA. The issues discussed in this paper also apply to the use of other metrics. It is hoped that the background and guidance provided in this paper will enable others to participate in further research based on the algorithm.

---

**Implications of Weighting Metrics for Line Generalization with Visvalingam's Algorithm**

P. 253-267

M. Visvalingam &amp; J. C. Whelan

**Abstract**

Visvalingam's algorithm was designed for caricatural line generalization. A distinction must be made between the algorithm and its operational definition, which includes the metric used to drive it. When the algorithm was first introduced, it was demonstrated using the concept of the effective area of triangles. It was noted that alternative metrics could be used and that the metrics could be weighted, for example to take account of shape.

Ordnance Survey (Great Britain) and others are using Visvalingam's algorithm for generalizing coastlines and other natural features, with complex parameter-driven functions to weight the original metric. This paper shows how free software and data were used to scrutinize the implications of one of Matthew Bloch's simple and transparent weighting functions. The results look promising, when compared with manually produced mid and small-scale maps; and encourage further research focussed on weighting functions and related topics, such as self-intersection of lines and model-based generalization. The paper discusses why weights were used in some projects. It comments on their range of applicability and reiterates the original guidance provided for the use of weights. It also demonstrates how weights can undermine the algorithm's capacity to draw caricatures with very few points. The paper provides sufficient background and links to the authors' test data and to open source software for the benefit of others wishing to undertake research in line generalization using Visvalingam's algorithm.

---

---

**The 3d Model-Map of Cadiz (1779): A Unique Project of Cartography in Modern Spain**

P. 268-281

Gabriel Granado-Castro &amp; Andrés Martín-Pastor

**Abstract**

The goal of this article is to analyse several aspects of the construction of a unique project in cartography: the three-dimensional model of the city of Cadiz constructed between 1777 and 1779. Cadiz was the most important fortification in Spain at the time. We focus on new investigations of the two documentary sources relating to the construction of this maquette, or relief map, which hitherto have not been studied in conjunction. This approach facilitates an elucidation of the details of the production of the relief map that benefits from improved knowledge regarding materials, tools, construction techniques and the cost of preparing the model. Additionally, new conclusions are drawn regarding the true utility of maquettes at court and the possible causes of the sudden cancellation of this military project.

---

---

**Régnauld de Lannoy de Bissy's Nineteenth Century Map of Africa at a Scale of 1:2 000 000**

P. 282-293

Olivier Loiseaux

**Abstract**

Cartographic projects of national importance are often only reported on in local journals which are published in the language of the author or mapping organisation. Owing to this, important maps and map series often stay unknown outside their country of origin. A case in point is the important *Carte d'Afrique* on a scale of 1:2 000 000 which, during the last decades of the nineteenth century, was compiled by the French army officer Captain Richard de Régnauld de Lannoy de Bissy. The map made an enormous contribution to the history of cartography of Africa with regard to not only the discovery and exploration of the continent, but also the expansion of colonial control and the political rivalry between European powers. It was an impressive project to be executed by one man and at the time guaranteed a prominent position for the author in geographic and cartographic circles worldwide. Although afterwards superseded by many more accurate maps, Lannoy de Bissy's map to date remains a lasting witness to the mapping of the 'dark continent' and of the fragile, hesitating progress made during the search for geographical knowledge before the advent of aerial photography and satellite imagery.

---