

Contributions to Geovisualization for Territorial Intelligence

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Introduction

This thesis topic was chosen due to the perception of a lack of systematic methods and universally approved empirical experiments for the data visualization design and evaluation; in particular we were looking for standard and interoperable methods that could lead to standard rules for visualization design, considering:

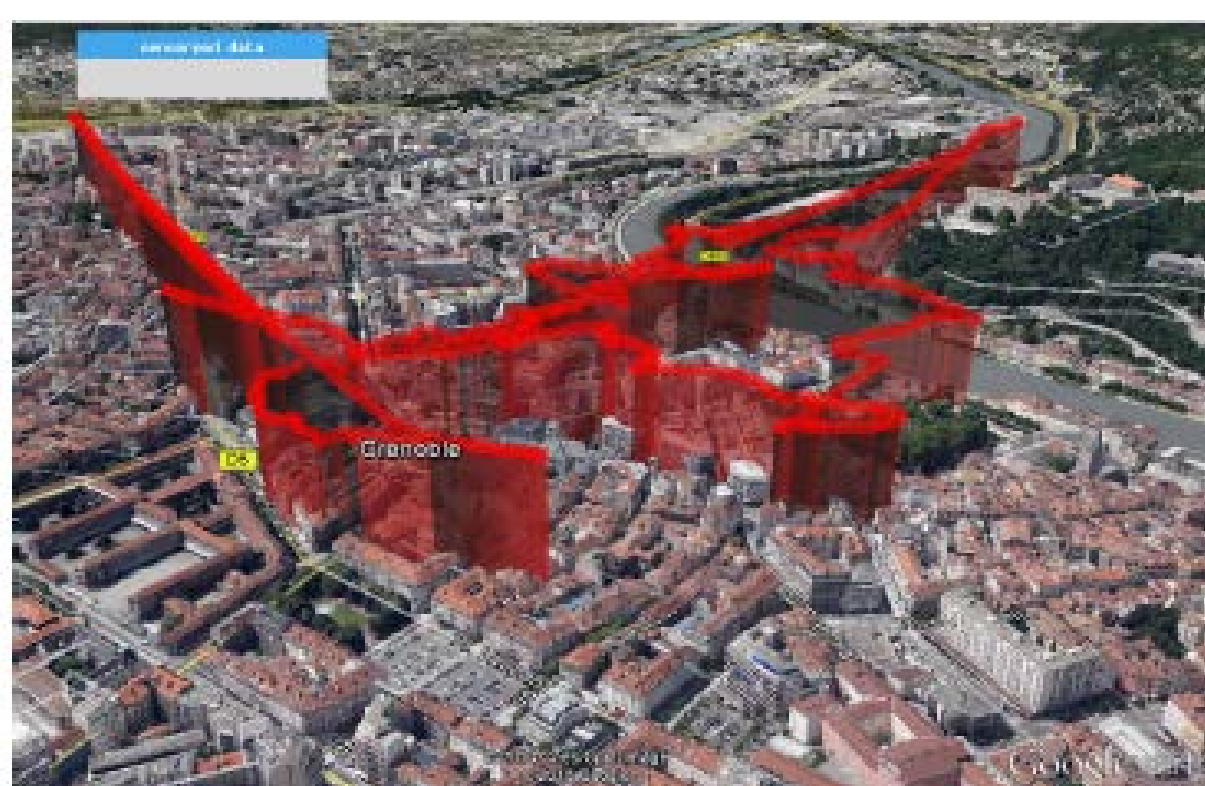
- different types of data,
- different environmental contexts,
- different dimensional systems
- different methods of representations, etc.

Geovisualization

Geovisualization, is a short term for “Geographic Visualization” and refers to a set of tools and techniques to support geospatial data analysis through the use of interactive visualization.

Territorial Intelligence

Girardot (2009), defines Territorial Intelligence as the science having for object the sustainable development of territories and having for subject the territorial community.



Purpose of the research

The implementation of an empirical method to analyze the the perception of visual variables in different representations of geospatial data.

Objectives of the dissertation

1. the assessment of the most efficient visual display, and visual variable,
2. the assessment of the most efficient combination of visual variables,
3. the assessment of the maximum number of visual variables that can be combined.

Evaluation of the graphic system

- Analyzing *functionality*, that is the parameter to investigate to what extend the system provides the characteristics required by the users;
- Analyzing *effectiveness*, that permits to understand if the visualizations provide new insight and information, and how;
 - Analyzing *efficiency*, that means to what extend the visualizations help the users in achieving a performance and pursuing a task;
 - Analyzing *usability*, that is the indicator to measure how easily the users interact with the system; this parameter provides the indication if the information is transmitted in a clear and understandable way;
 - Analyzing *usefulness*, or the indicator of how much the visualizations are useful for decision making systems.

Experimental proposal

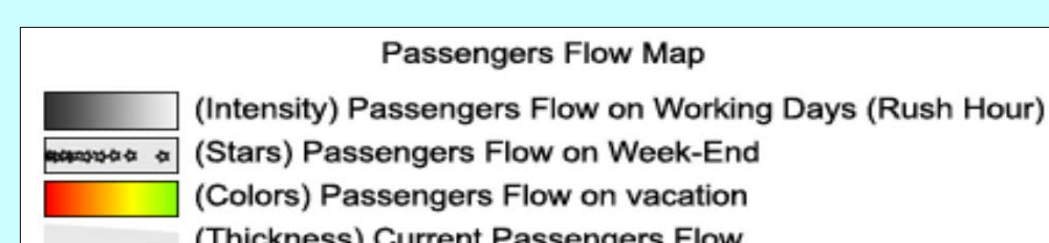
The implementation of a set of **prototype tests** to evaluate the efficiency of visual variables; we wanted that this method:

- could be easily reproduced for different scenarios,
- could be available online, in order to automatically increase the number of tested users,
- could be in real time in order to update the results;

Test #1

The test #1, passenger flow in a subway system, is available online at the link:

<http://www.metrorosamarina.altervista.org/index.php>, Testing *colors, texture, size and intensity*



Test #1

The test #2, - Urban noise in building façades, is available online at the link:

<http://www.rosamarina.altervista.org/index.php>

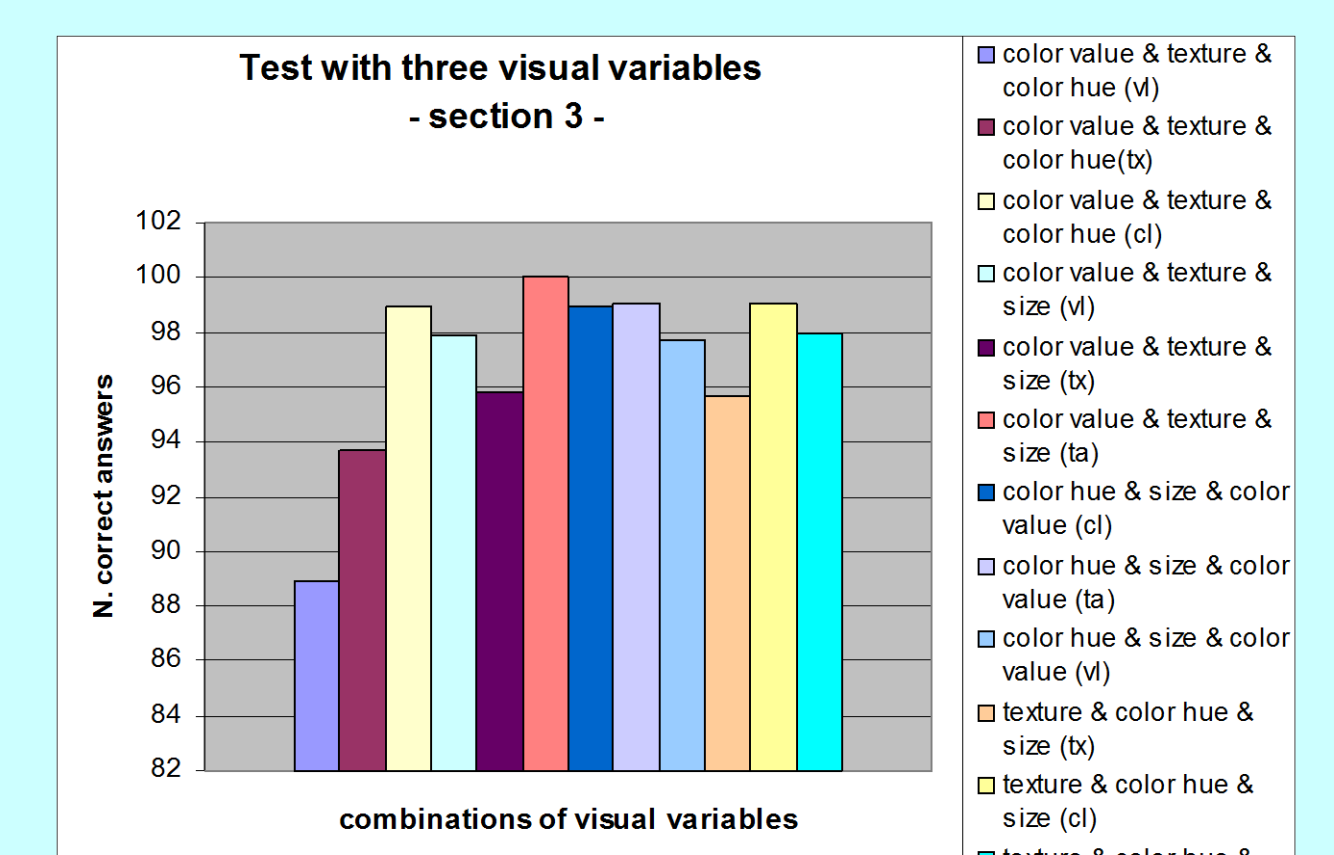
System in 3D or 2.5D

Testing *colors, texture, size and intensity*

Some results

We can say that the most understandable variable resulted to be the “color hue”, and the less understandable the “color value” in all the four sections of the test.

We can say that up to all four visual variables, users were able to understand the questions concerning the map understanding and the map purpose;



Conclusions and Perspectives: open issues

- Few study-cases analyzed and the few relative tests implemented.
- The possibility to implement the test also in different scenarios could lead to a better comparison of the results, and could permit to verify if the same results can obtained in different study-cases.
- implementation of the test also for real and not simulated study-cases.
- analysis of other visual variables.
- analysis in a 3-D scenario.
- analysis of the different perception of visual variables by men and women.
- the implementation of the tests is easily replicable for different scenarios at different scales, contexts and dimensions (2D, 2.5D, 3D).
- the idea of proposing the tests and the results of the tests in an online web-site; a larger number of potential user can do the tests allowing a better validation by the increasing number of tested users.
- the automatic update of the results of the tests in real time.
- the analysis of the different perception of visual variables by expert and non-expert users.