International Cartographic Association
Association Cartographique Internationale

Performing cartographic visual search experiments online: opportunities and challenges

Vassilios Krassanakis [a,*], Anastasios L. Kesidis [a], Athina Pappa [a], Loukas-Moysis Misthos [a,b,c]

[a] *Department of Surveying and Geoinformatics Engineering, University of West Attica, Egaleo (Athens), Greece, Vassilios Krassanakis – krasvas@uniwa.gr, Anastasios L. Kesidis – akesidis@uniwa.gr, Athina Pappa – tg13052@uniwa.gr, Loukas-Moysis Misthos – lmmisthos@uniwa.gr*
[b] *School of Mining and Metallurgical Engineering, National Technical University of Athens, Zographos, Greece*
[c] *Institute for Space Applications and Remote Sensing, National Observatory of Athens, Athens, Greece*

* Corresponding author

Keywords: mouse tracking, online experiments, visual search, map reading

Abstract:

Cartographic experimentation constitutes an essential process towards the examination of several map reading aspects. Among those, the evaluation of both the efficiency and the effectiveness of different types of cartographic products is undoubtedly of great significance. This statement can be directly proved considering the clear influence of the produced outcomes on the related theoretical framework (i.e. evaluation and ranking of the design variables) as well as on the practical issues connected to cartographic production (i.e. development of specific design rules).

Different experimental techniques have been utilized for the study of map perception and cognition. Such techniques include simple (e.g. reaction time recordings) or more sophisticated (e.g. electroencephalogram) approaches. Over the last decades, the implementation of eye tracking experiments seems to have a great influence in cartographic community since it can provide objective and quantitative results regarding visual behavior. It can also reveal critical patterns of visual scanning during the observation of several cartographic stimuli by delivering qualitative visualizations of the collected gaze data. Nevertheless, eye tracking remains an expensive technology in general. Although low-cost, do-it-yourself, and webcam-based methods and devices have been proposed in the recent literature, such solutions seem to be sensitive (in terms of data noise) and require the careful consideration of the experimental parameters, especially in the case of being used for scientific purposes. Hence, in practice, the existing eye tracking methods are not considered adequate enough for running remote (online) visual search experiments.

Computer mouse tracking is one of the most promising methods that could be used for conducting visual search experiments in cartography and related fields (e.g. landscape perception). Several research studies indicate that mouse movements data are significantly correlated with the corresponding gaze data collected during an experimental trial. Taking into account that the method is based on participants' reaction using mouse (typical) clicks, it can be considered quite suitable for the performance of cartographic visual search (task-oriented, top-down) experiments (e.g. experiments where participants are asked to locate a target-symbols among different distractor-symbols, or asked to enumerate specific symbols). At the same time, the aforementioned technique is much simpler than eye tracking since it does not require a separate calibration of each experimental participant.

Recently, Krassanakis and Kesidis (2020) proposed a new MATLAB toolbox (called MatMouse) which provides specific functions in order to build, run and analyze mouse tracking experiments. More specifically, the toolbox supports the analysis of mouse movements data via specific metrics. Moreover, it gives the opportunity of (collected) data exploration using several visualization methods (Figure 1).

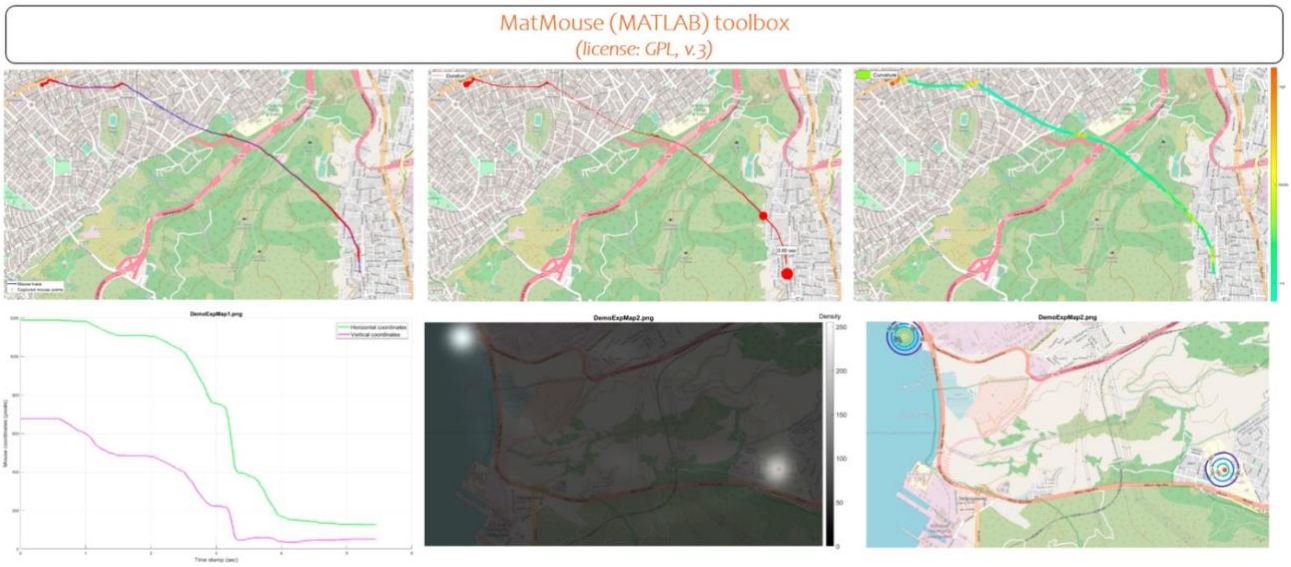

Figure 1. Examples of experimental data visualization using MatMouse toolbox (Krassanakis and Kesidis (2020)).

The aim of the present study is to examine the potential opportunities and challenges for the remote performance of cartographic visual search experiments based on the utilization of MatMouse toolbox. An integrated framework towards this direction is presented in order to describe and discuss practical approaches tested. An abstract and simple representation of this framework is presented in Figure 2. The first trials seem to be quite promising and indicate that the proposed framework could be implemented for the execution of online experimentation.

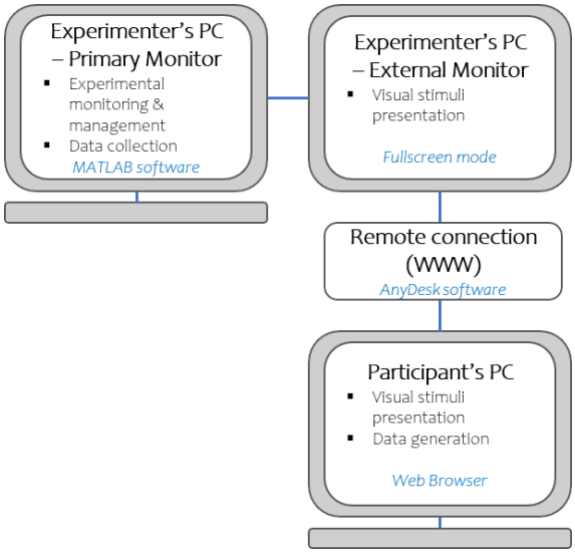

Figure 2. An abstract illustration of the proposed experimental framework.

References

Krassanakis, V., and Kesidis, A. L., 2020. MatMouse: A Mouse Movements Tracking and Analysis Toolbox for Visual Search Experiments. *Multimodal Technologies and Interaction*, 4(4), 83. https://doi.org/10.3390/mti4040083