Eye-tracking

Experimental Laboratory Research

department of
geoinformatics

Eye-tracking at Department of Geoinformatics

Eye-tracking technology is based on the principles of tracking the movements of human eye while perceiving the visual scene. Recoding eye movements does not rely on self-reporting, therefore it can be considered as an objective method, and can enhance traditional methods of evaluating user interfaces. Eye movement analysis provides valuable quantitative and qualitative information on visual search strategies of users.
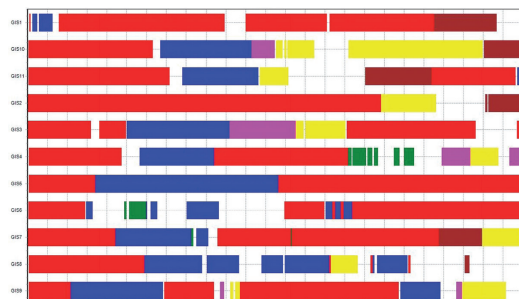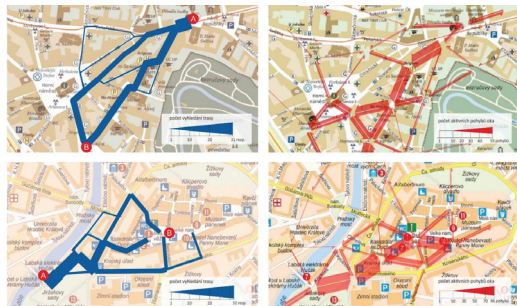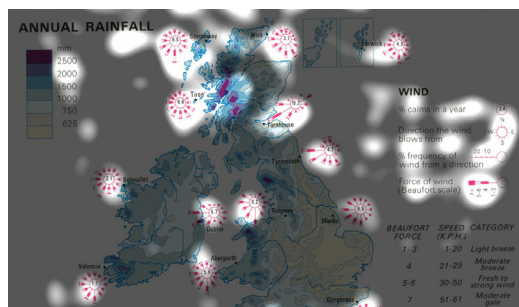
The Department of Geoinformatics at Palacký University Olomouc is engaged in the wide area of cartographic research topics. Feeling the absence of objective evaluation of cartography products, since June 2011 we have started the research on cognitive visualization using eye-tracking.

The research eye-tracking team is formed by young scientist, who are interested in the different aspects of geographic information visualization. Research topics deal with cognition of maps complexity, 3D visualization, uncertainty, map elements and layout and other themes. Leading us to the only aim; to do better maps.

Developed Tools

smi2ogama is a web application for data conversion between SMI BeGaze and open-source software OGAMA. The smi2ogama provides a user-friendly and almost fully automatic process of conversion. The OGAMA software is involved in our research because it runs outside the eye-tracking laboratory (without the hardware key).

eyetracking.upol.cz/smi2ogama

HypOgama is a web application for interconnection of a low-cost eye-tracker EyeTribe with the Hypothesis software for experiment creation, experiment execution, and data collection developed at Masaryk University. Such interconnection provides conducting the mixed-research design experiments.

eyetracking.upol.cz/hypogama

ScanGraph is a web application that performs the scanpath comparison based on the String Edit Distance method and its output is a simple graph. Groups of similar sequences are displayed as cliques of this graph. ScanGraph is applied in all our studies where differences between gaze movements among different groups of participants are investigated.

eyetracking.upol.cz/scangraph
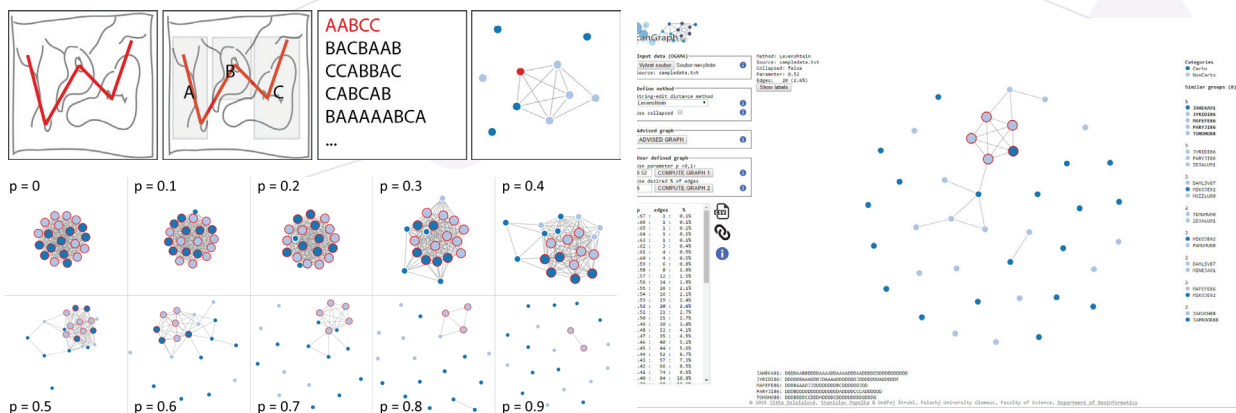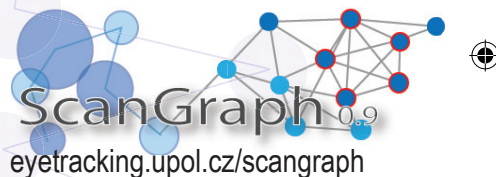
Equipment

- **Hardware**
  - SMI RED 250 eye-tracker
  - EyeTribe Tracker PRO
  - 3x EyeTribe Tracker
  - Emotiv EPOC EEG
- **Software**
  - SMI Experiment Center
  - SMI BeGaze
  - OGAMA
  - V-Analytics
  - own tools

Topics of Research Experiments

- Evaluation of thematic maps
- Comparison of 2D and 3D visualization
- Hill shading in tourist maps
- Colour distance
- Comparison of road atlases
- Evaluation of urban plans
- Evaluation of promotional maps
- Assessment of Visual Programming Language (VPL) components
- Assessment of E-learning portal
- Optimization of interactive maps
- Development of analysis tool for Scanpath comparison
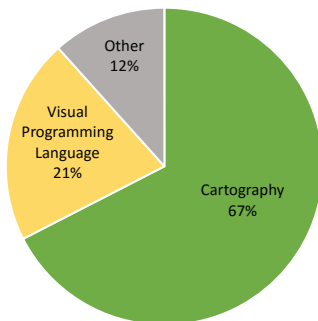- Comparison of professional and low-cost eye-trackers
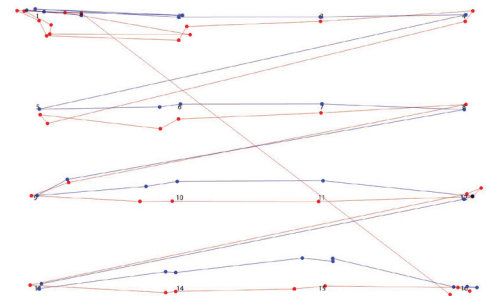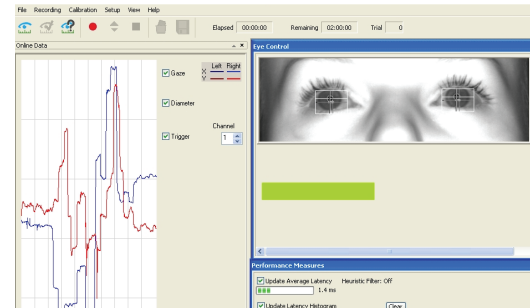
Achievements

- The Eye-tracking laboratory at Department of Geoinformatics has been the first in the Czech Republic that introduced the eye-movement analysis in cartography and GIScience.
- More than 40 experiments have been performed since the beginning of eye-tracking research.
- More than 25 scientific papers are indexed at Web of Science and SCOPUS.
- Researchers of the eye-tracking group spent research internships at prestigious universities, e.g. Lund in Sweden, Zurich in Switzerland, Ghent in Belgium, Trondheim in Norway, Bochum in Germany.

Topics of the experiment

Other 12%
Visual Programming Language 21%
Cartography 67%
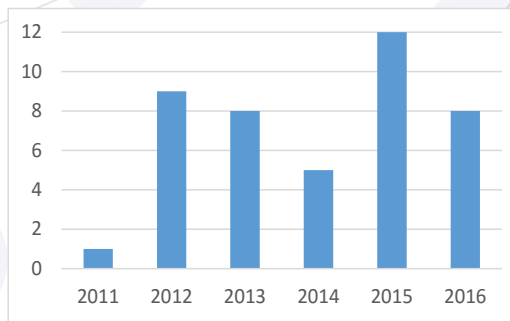
Number of experiments
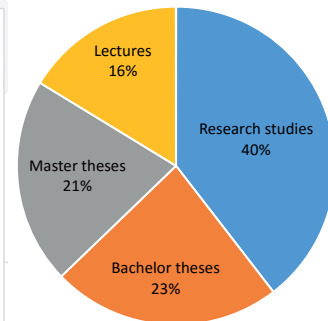
Origin of the experiment

Lectures 16%
Master theses 21%
Research studies 40%
Bachelor theses 23%

Evaluation of 3D visualization

The book *Evaluation of 3D visualization in GIS using eye-tracking* (*Hodnocení 3D vizualizací v GIS s využitím sledování pohybu očí*) published by Department of Geoinformatics is the first research book in Czech Republic dealing with eye-tracking technology.

The book describes seven eye-tracking experiments from three areas where eye-movement analysis can be used - visualization of terrain, visualization of urban areas and thematic 3D maps.

It should serve to a researchers who are starting with an eye-tracking research in cartography.

www.eyetracking.upol.cz

visit our website for more information about our research, current projects, tools and publications

Department of Geoinformatics
Palacký University Olomouc
17. listopadu 50
771 46 Olomouc, Czech Republic
tel.: +420 585634525, 4516
www.geoinformatics.upol.cz
e-mail: geoinformatics@upol.cz

eye-tracking