„10 Bucks Eye Tracking System”

DIY Eye Tracking Experiments at the Department of Cartography and Geoinformatics,
Eötvös Loránd University, Budapest, Hungary

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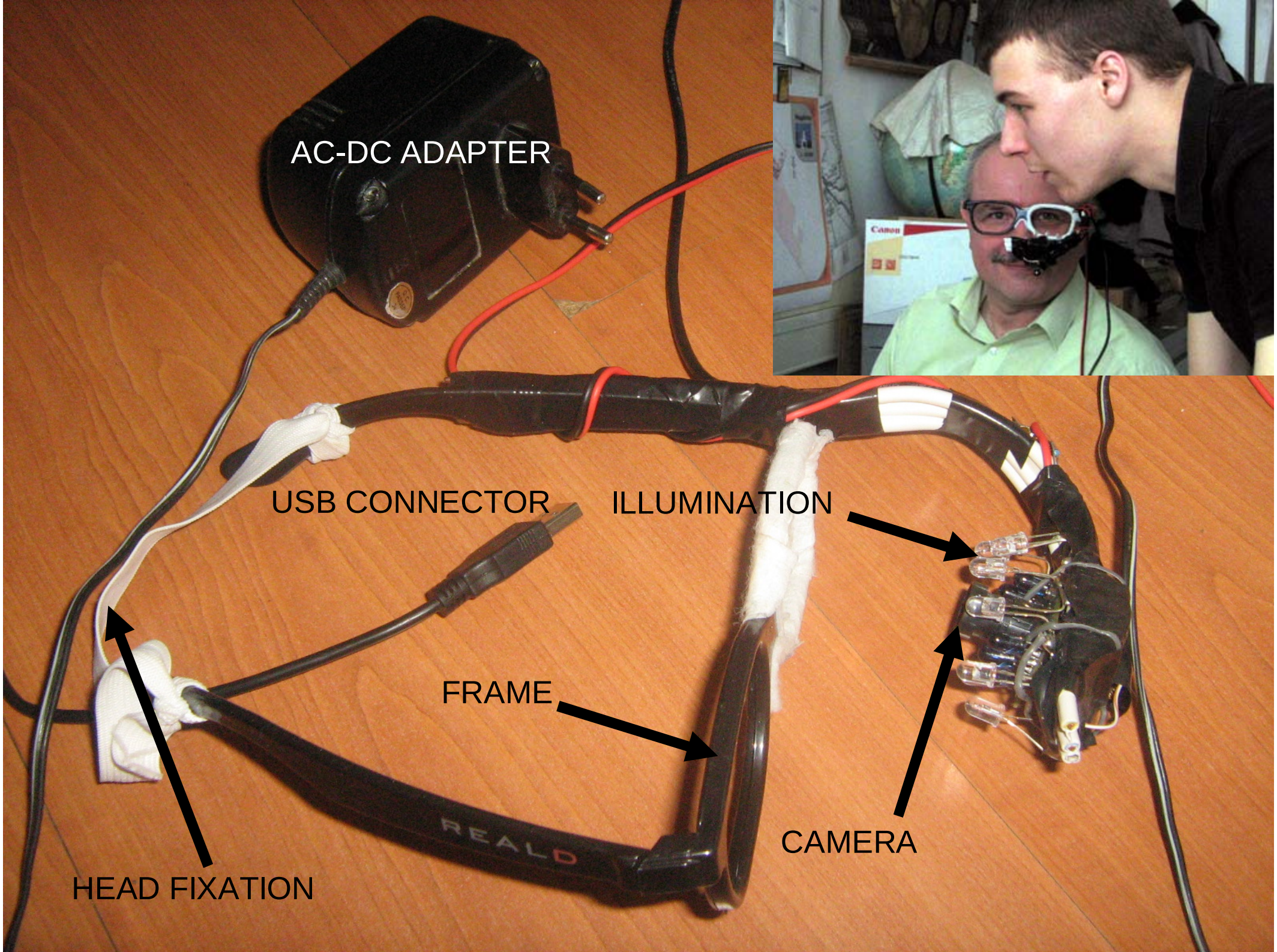
Introduction

- Cartography MA: Subject ‘Cartographic visualization’
- Cognitive issues in cartography
- Human visual system – eye tracking experiments (usability studies, visual salience etc.)
- Learning by doing: first experiments with students
- 2013: Cartography MA thesis by Ádám Bérces
- Eye Tracking group at the department of cartography at the Informatics Department
- Future: experimentation with eye-tracking driven, dynamic cartographic visualizations, collaboration with cognitive neuropsychologists (spatial cognition project) etc.

Hardware tools

- The eye tracking tool made for the experiments is a special, DIY self-soldered camera fixed to an eyeglass frame
- Two main parts:
- USB 2.0 webcam (for fast & easy communication with the computer)
- and IR illumination of the eye
- The camera is powered from the computer, while the illuminator (for higher efficiency) is operated using an external adapter (7.5-9 V, 6-7.2 W)
- Total costs c. **EURO 10** !!!


AC-DC ADAPTER
USB CONNECTOR
ILLUMINATION
FRAME
CAMERA
HEAD FIXATION
REALD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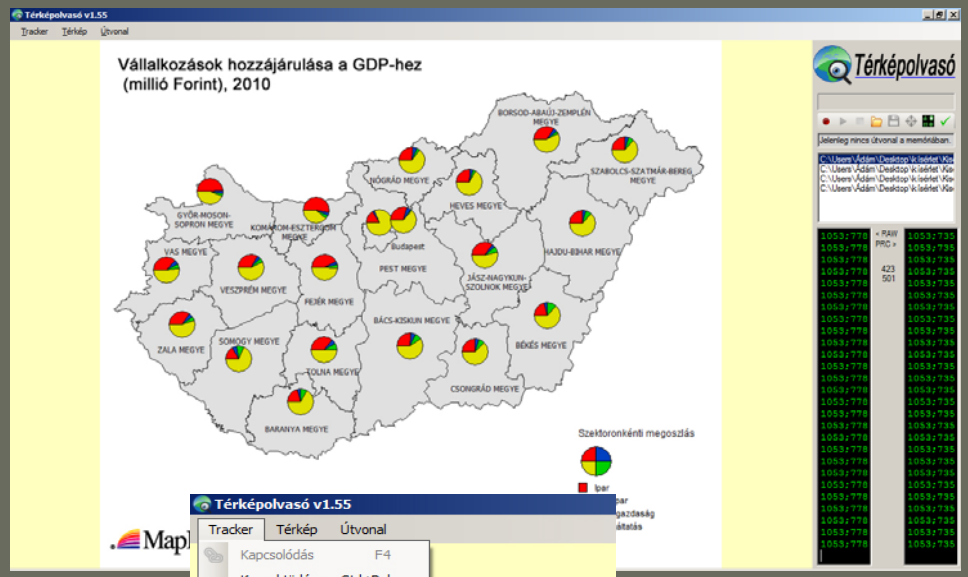
Software

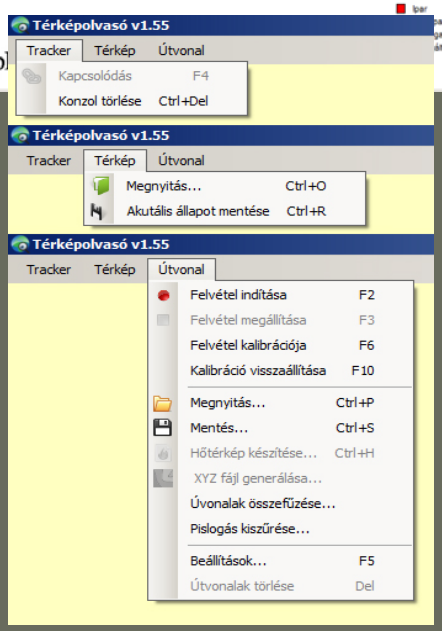
- Our system is based on the **open source** software and DLL library **ITU GazeTracker**
- The function of GazeTracker is to provide gaze data in the screen coordinate system via UTP protocol

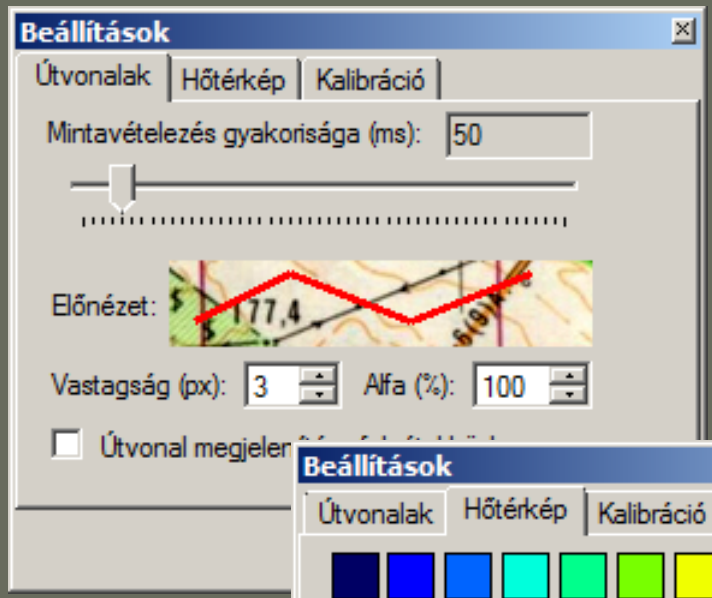
Software+

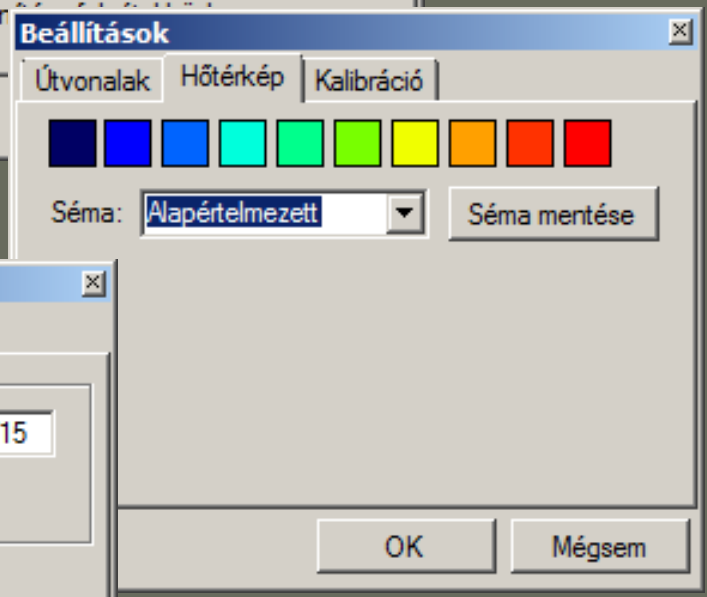
- Our self-delevoped software, **MapReader** is capable of recording, filtering and storing gaze data, and applying operations on multiple files, eg. merging gaze data
- can provide various, customizable visualisations from the collected information, thus it can also be also **a ‘cartographic’ tool**
- it can convert and export gaze data to the popular file format XYZ (used by other cartographic and GIS software), from which we can make DEMs/ interpolate pseudo-isolines

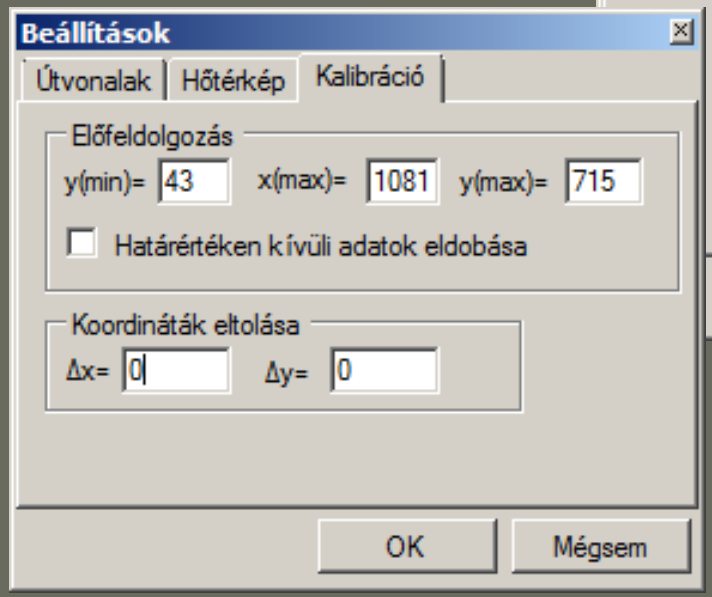
MapReader 1.55





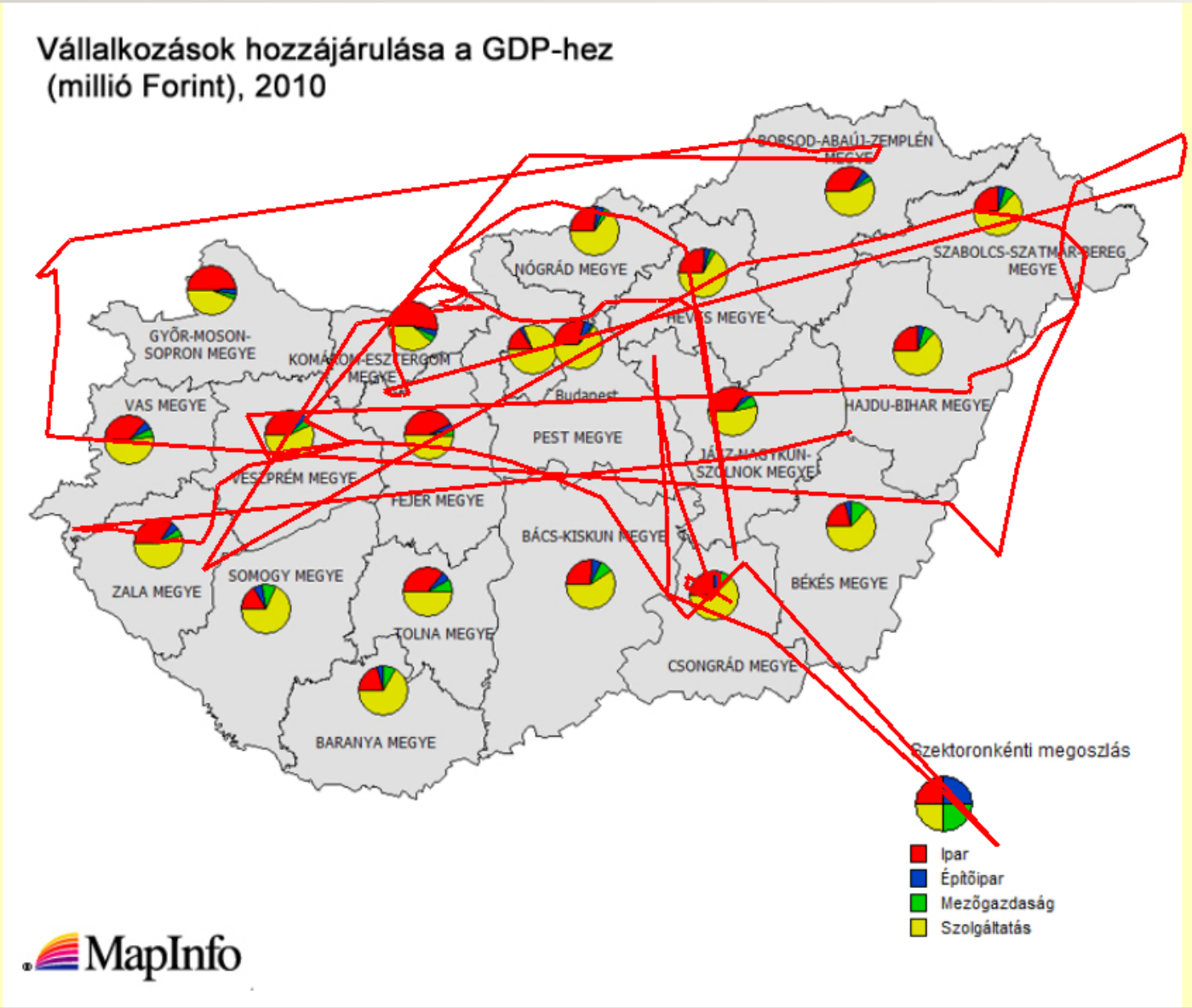






Térképolvasó v1.55

Tracker Térkép Útvonal



Térképolvasó

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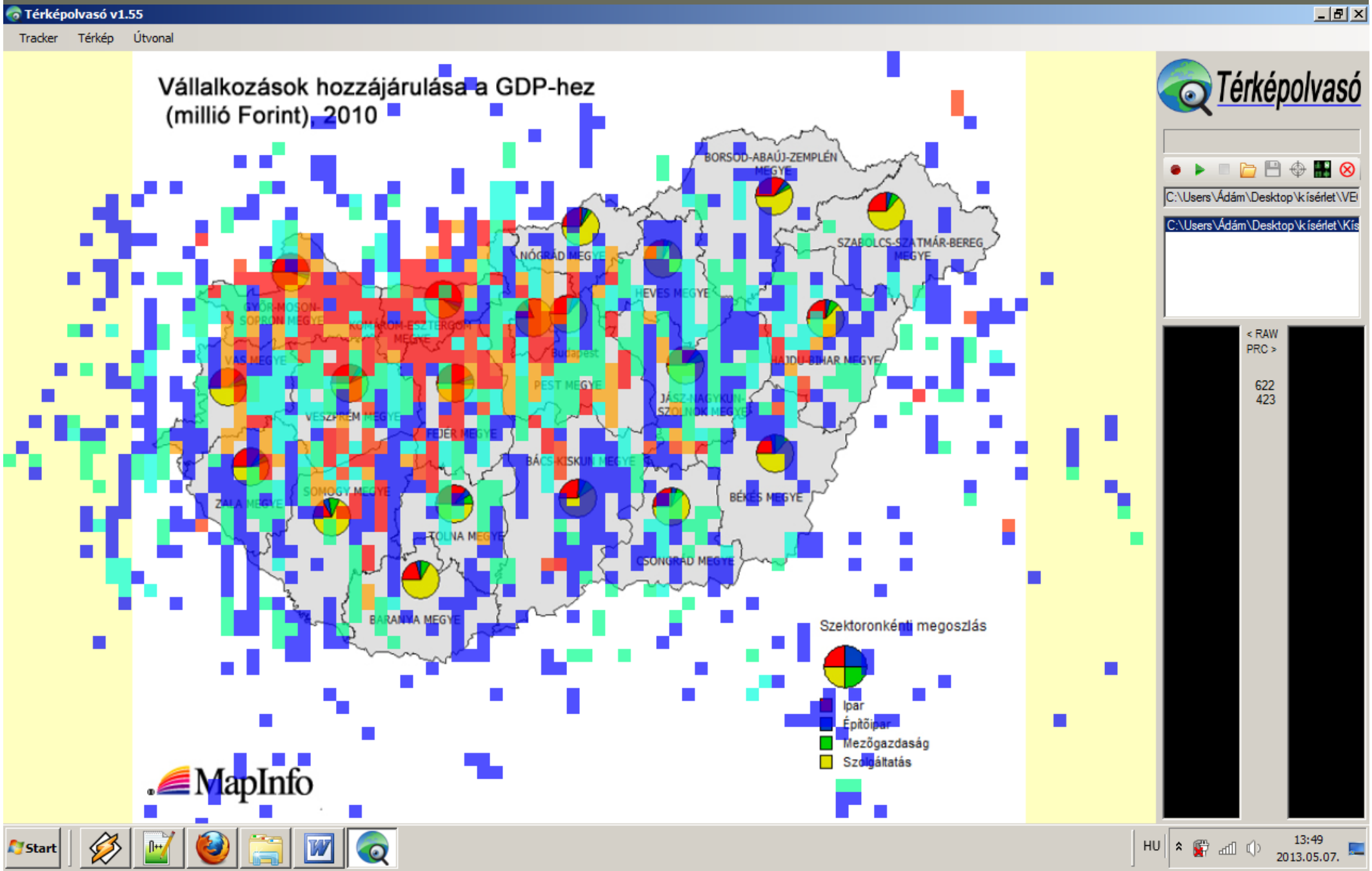
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Tracker
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HEVES MEGYE
HAJDÚ-BIHAR MEGYE
Budapest
PEST MEGYE
JÁSZ-NAGYKUN-SZOLNOK MEGYE
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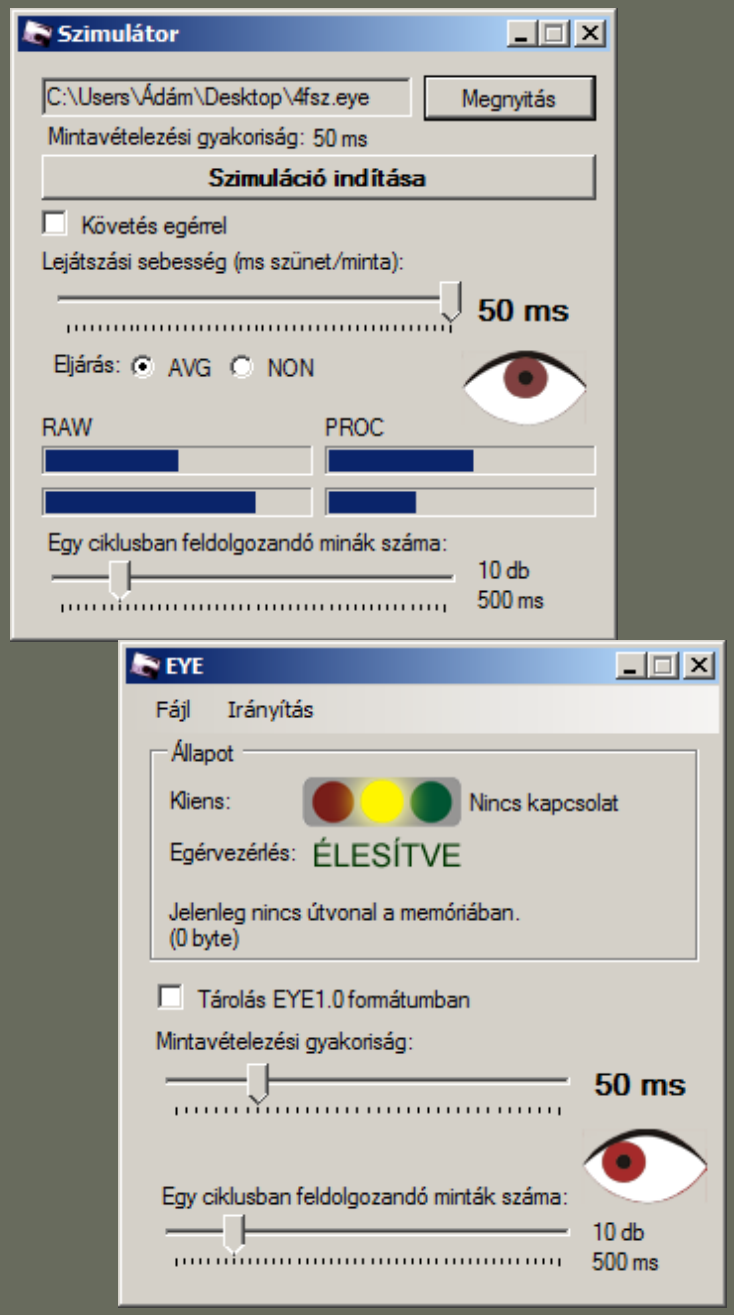
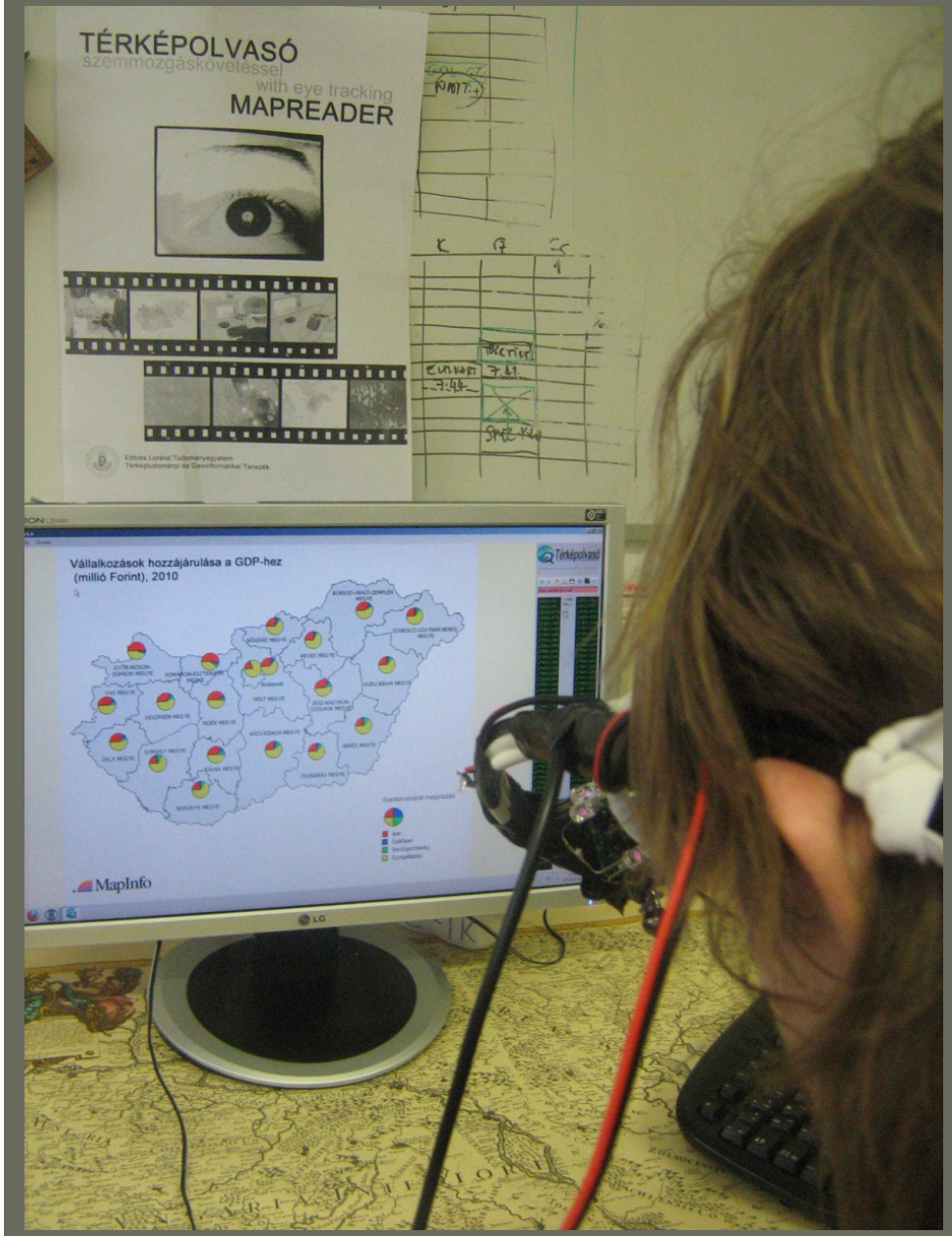
MapReader 2.0

- **Improved precision** with real-time augmentation methods
- Simulations/ replay of previously recorded gaze data for further examination
- Under development…

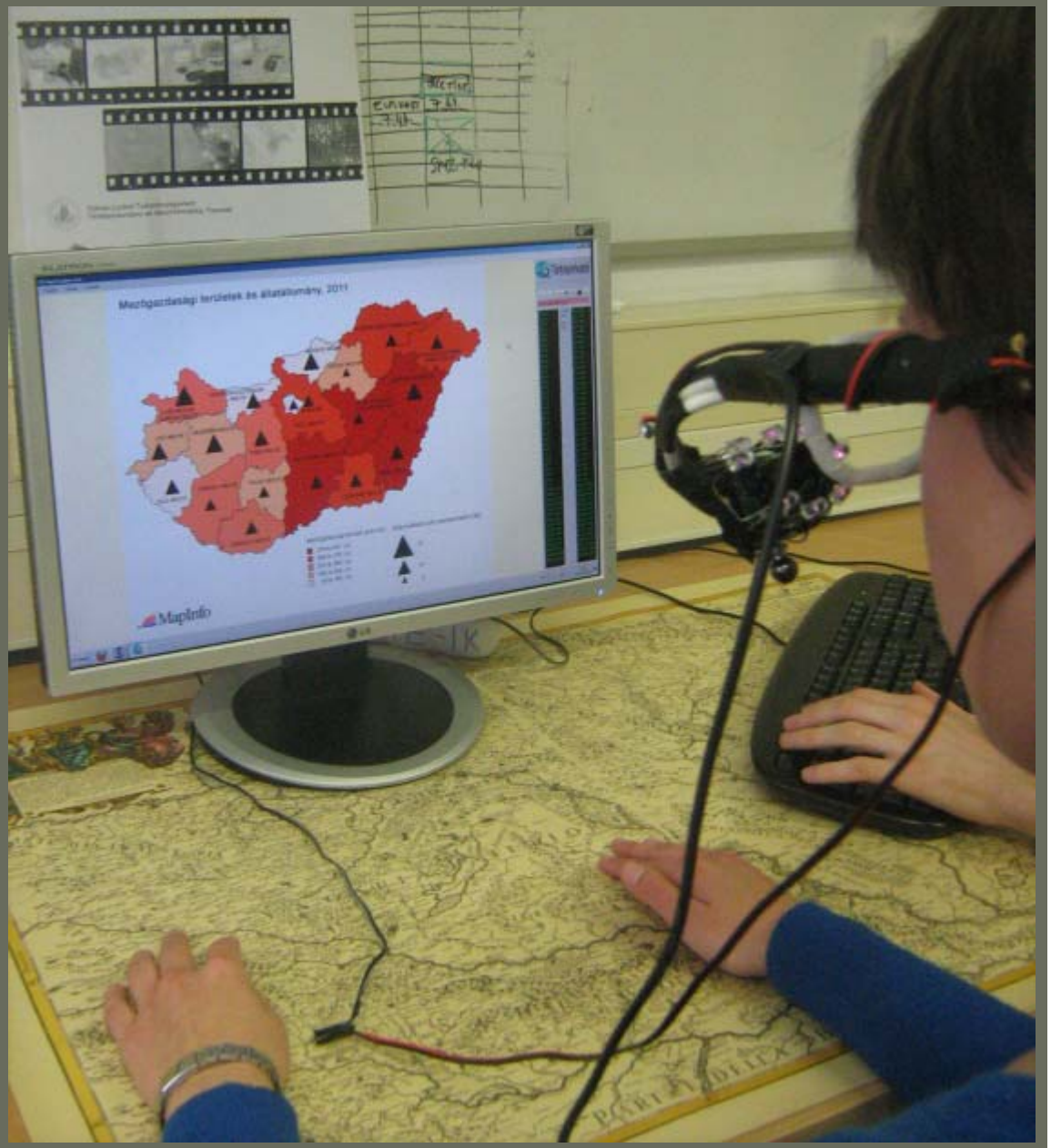


Experiments and results

- Our primary goal was not the development of a product,
- the hardware and software presented is a tool for our own gaze tracking experiments made on maps
- During the first series of experiments we examined GIS visualisations
- the difference between free and targetted visual explorations on **40 subjects**

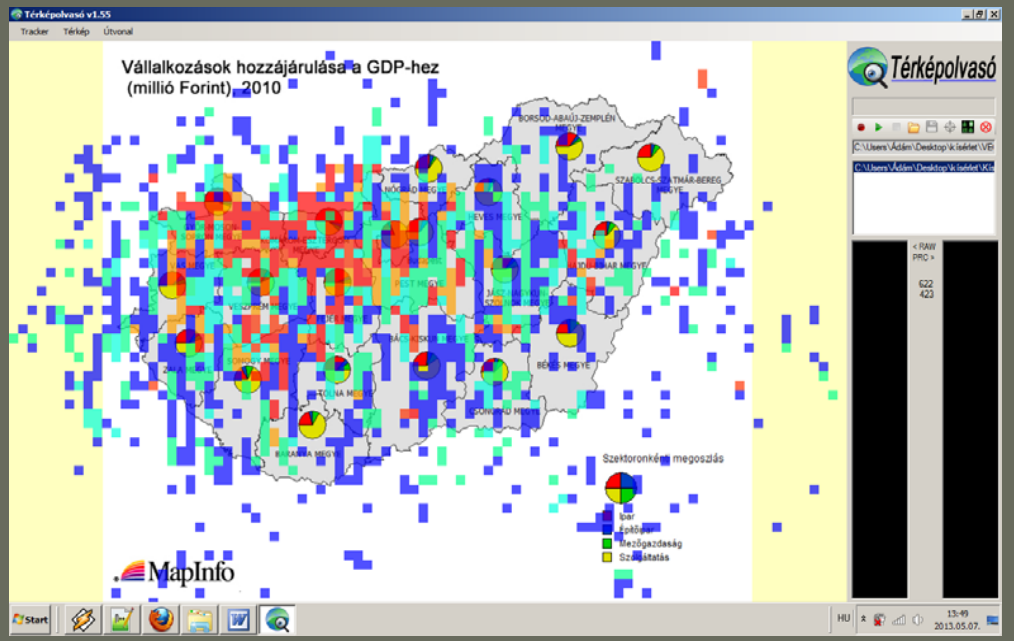


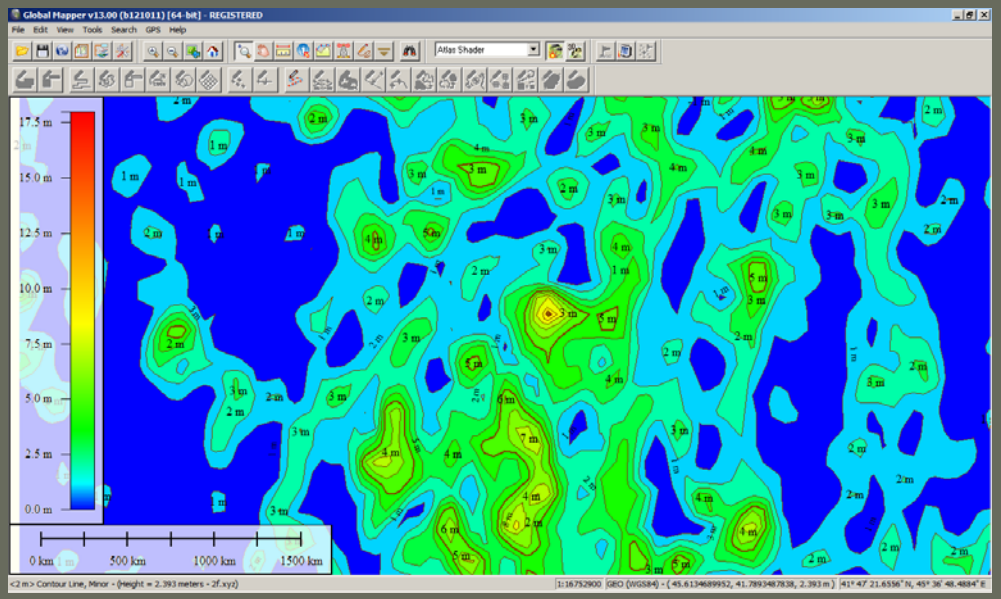
First cartographic eye tracking experiment in Hungary (March, 2013)

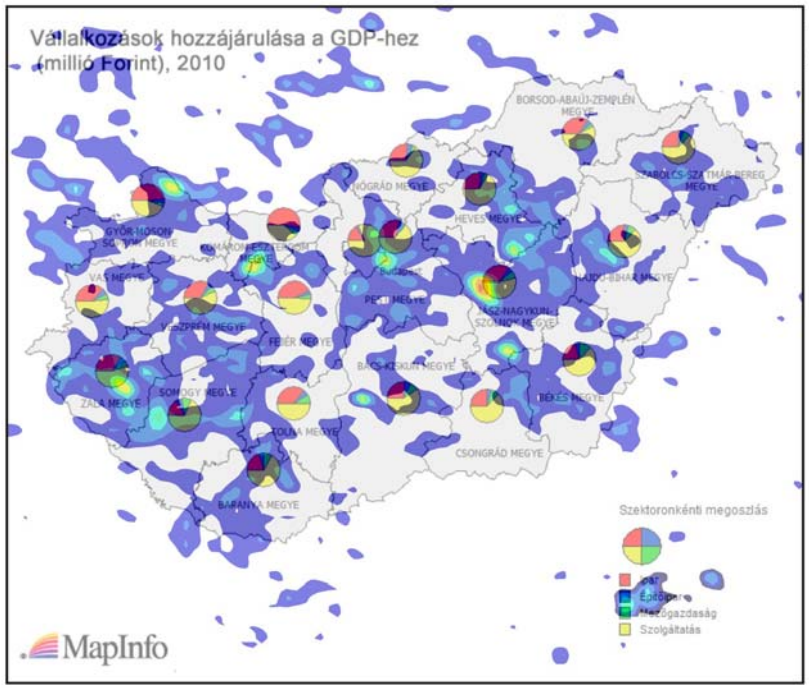


Visualisation

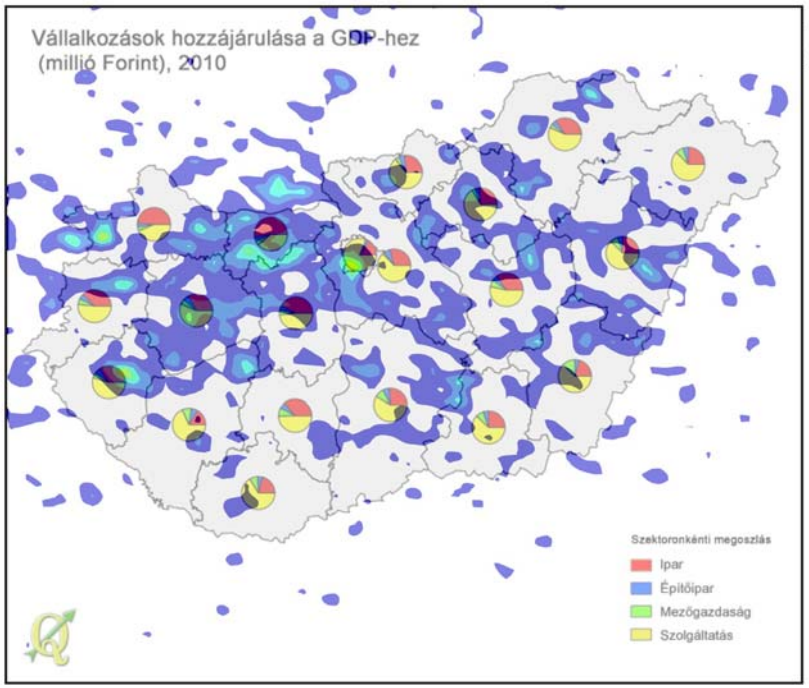
- We displayed the preliminary results of our experiments on simple heat maps
- Using the GIS export functionality of MapReader we made DEMs and produced pseudo-isolines,
- These were exported to vector graphics software and more sophisitacted visualizations were designed







Szabad felderítés



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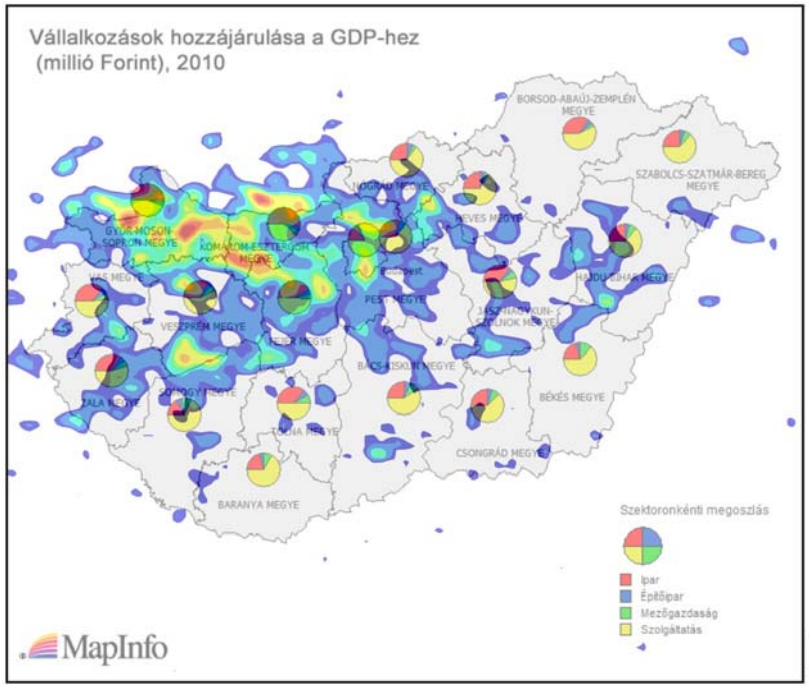

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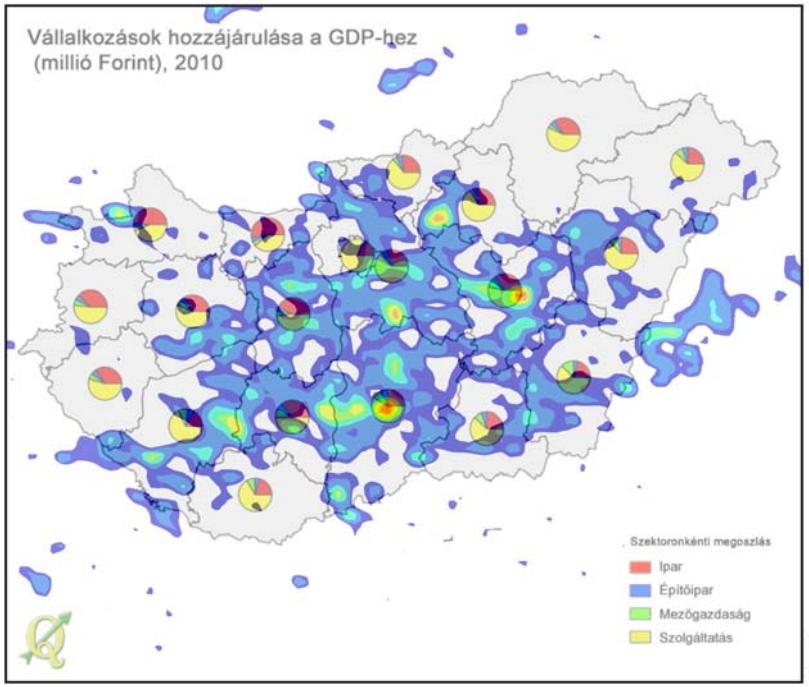

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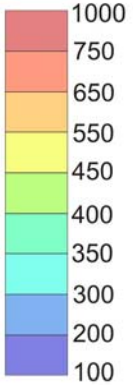
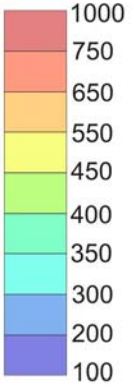


Fixáció időtartama (ms)



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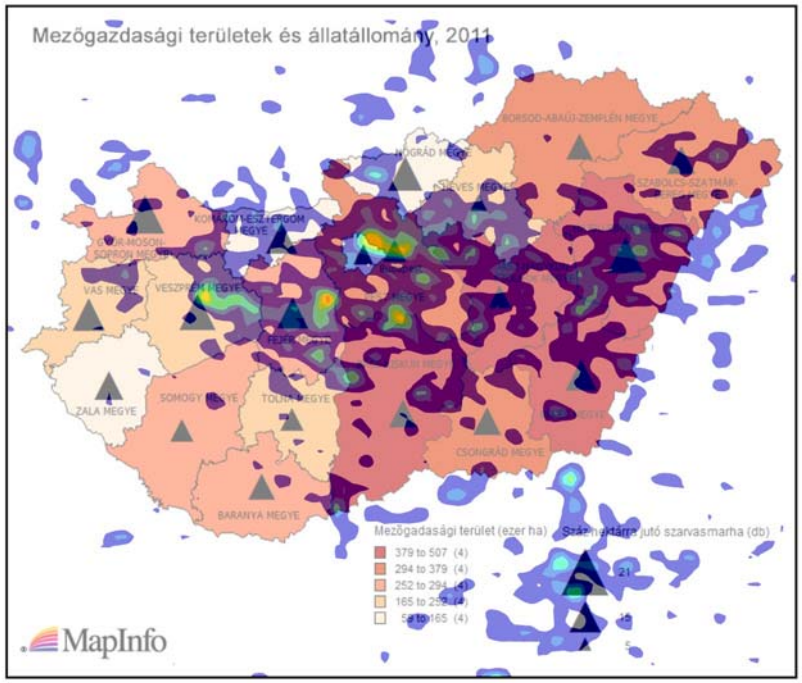

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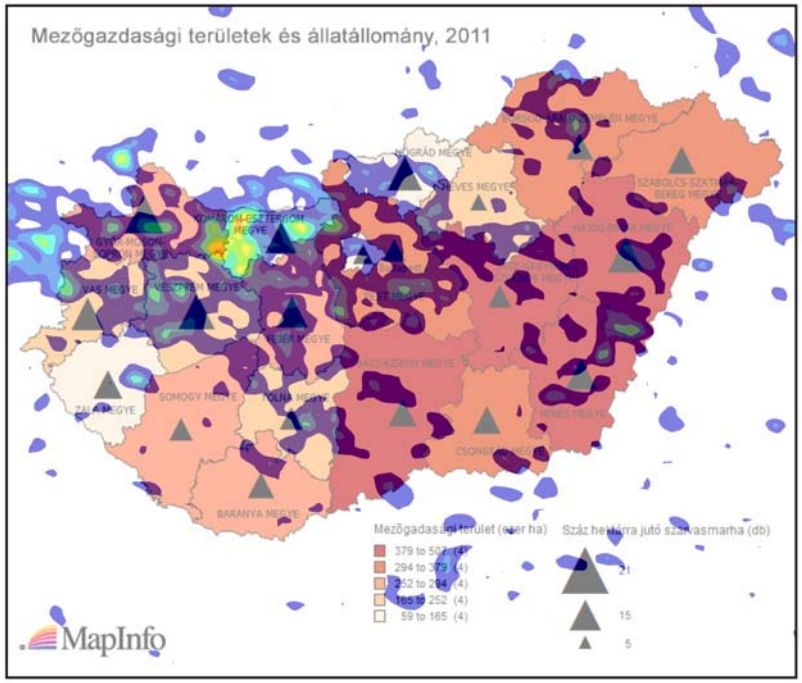

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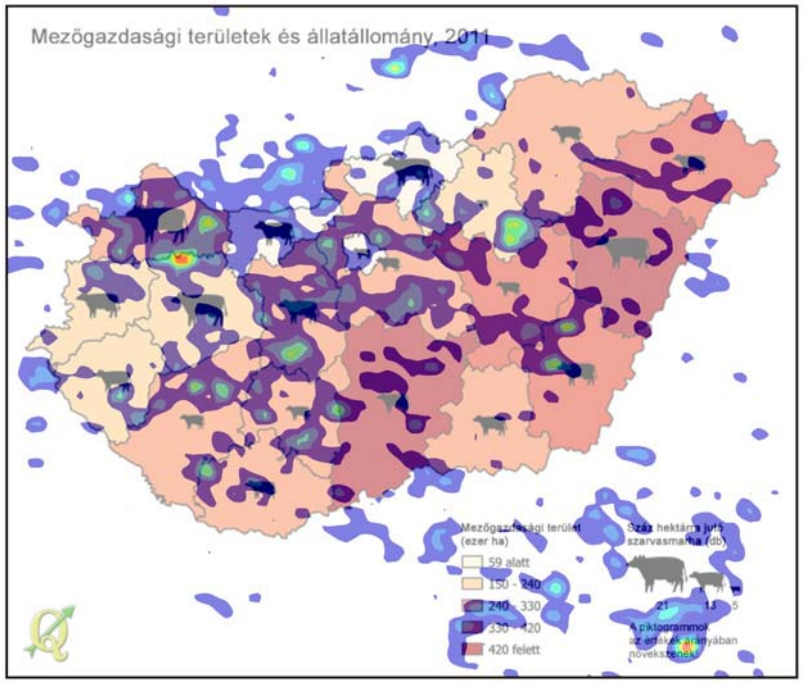

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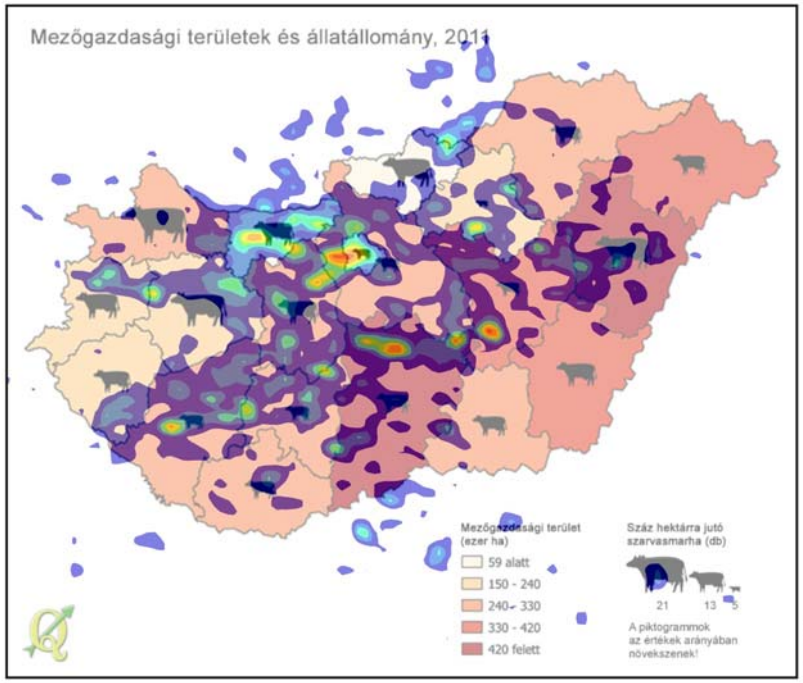

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