



# Map design and its influence on users perception

Alena VONDRÁKOVÁ

Czech Republic

Palacký University, Olomouc

Department of Geoinformatics

[alena.vondrakova@upol.cz](mailto:alena.vondrakova@upol.cz)



# Why this PLACE and TIME?

- map is one of the **most important communication tools** for all spatial data
- **thousands** of pages of text can be replaced by **hundreds** of tables, **tens** of graphs and diagrams or **several maps...**
- communicate geographical information graphically is the main aim of **cartography**

*Student: **Making maps is rife with rules.***

*Teacher: **There is a lack of standardization in cartography.***

....

*Colleague: **Can you tell me who said this rule and where the hell did you find it?***

*Colleague (a few minutes later): **You also read everything so that you can reproduce it!***





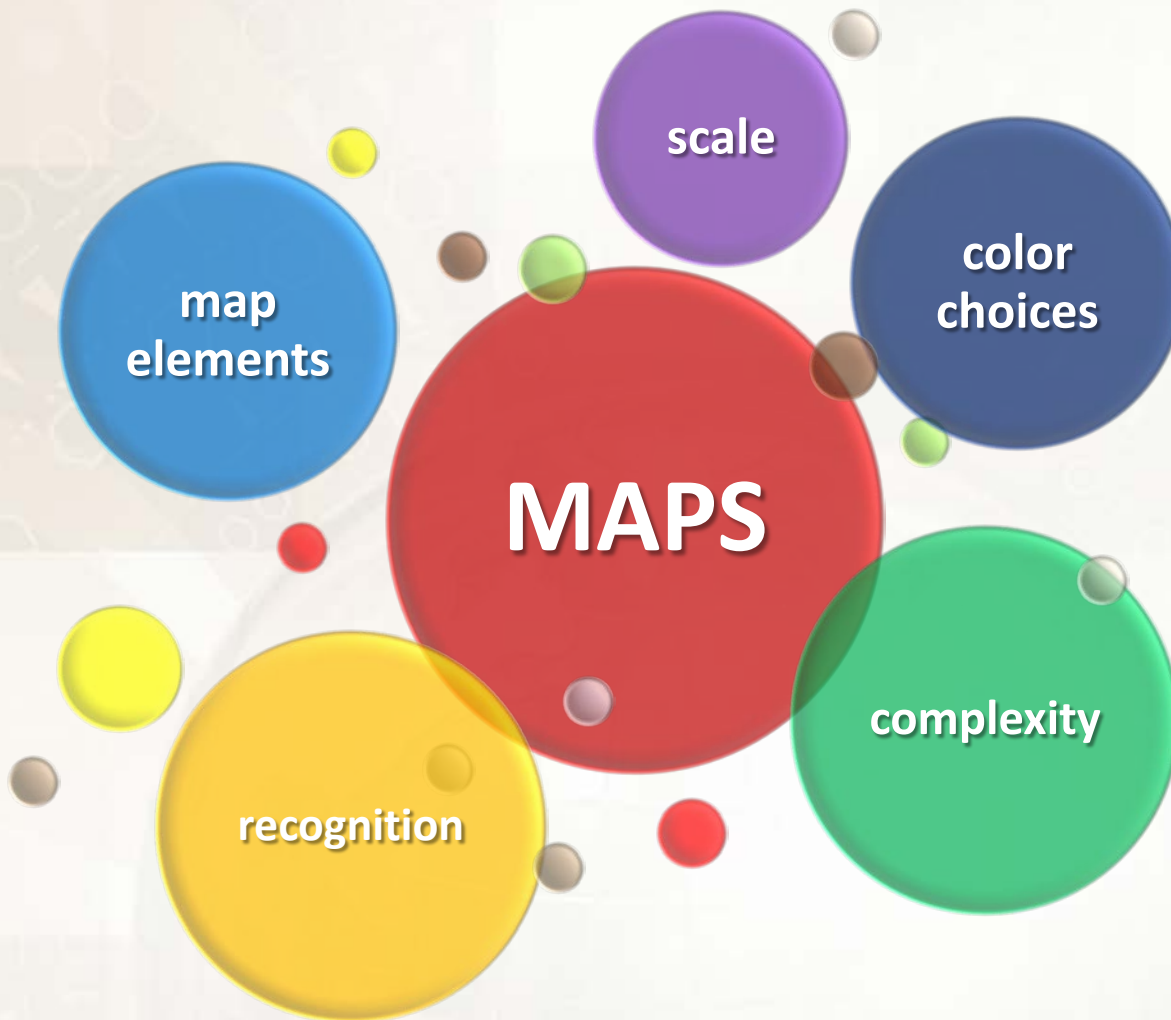
# MAP DESIGN

LAYOUT

PLANNING



# What is it about?



# Map design & Designing maps

- cartographers apply many **design principles** when compiling their maps and constructing page layouts
- main **design principles** are
  - Legibility, Visual contrast, Figure-ground organization, Hierarchical organization and Balance *(Aileen Buckley, Esri)*
  - Concept before Compilation, Hierarchy with Harmony, Simplicity from Sacrifice, Maximum Information at Minimum Cost, Engage the Emotion to Engage the Understanding *(John Krygier)*
  - Harmony, Composition, Clarity *(Bethany Bradley)*
  - Clarity, Order, Balance, Unity, Harmony *(Judith A. Tyner)*

*...and others*



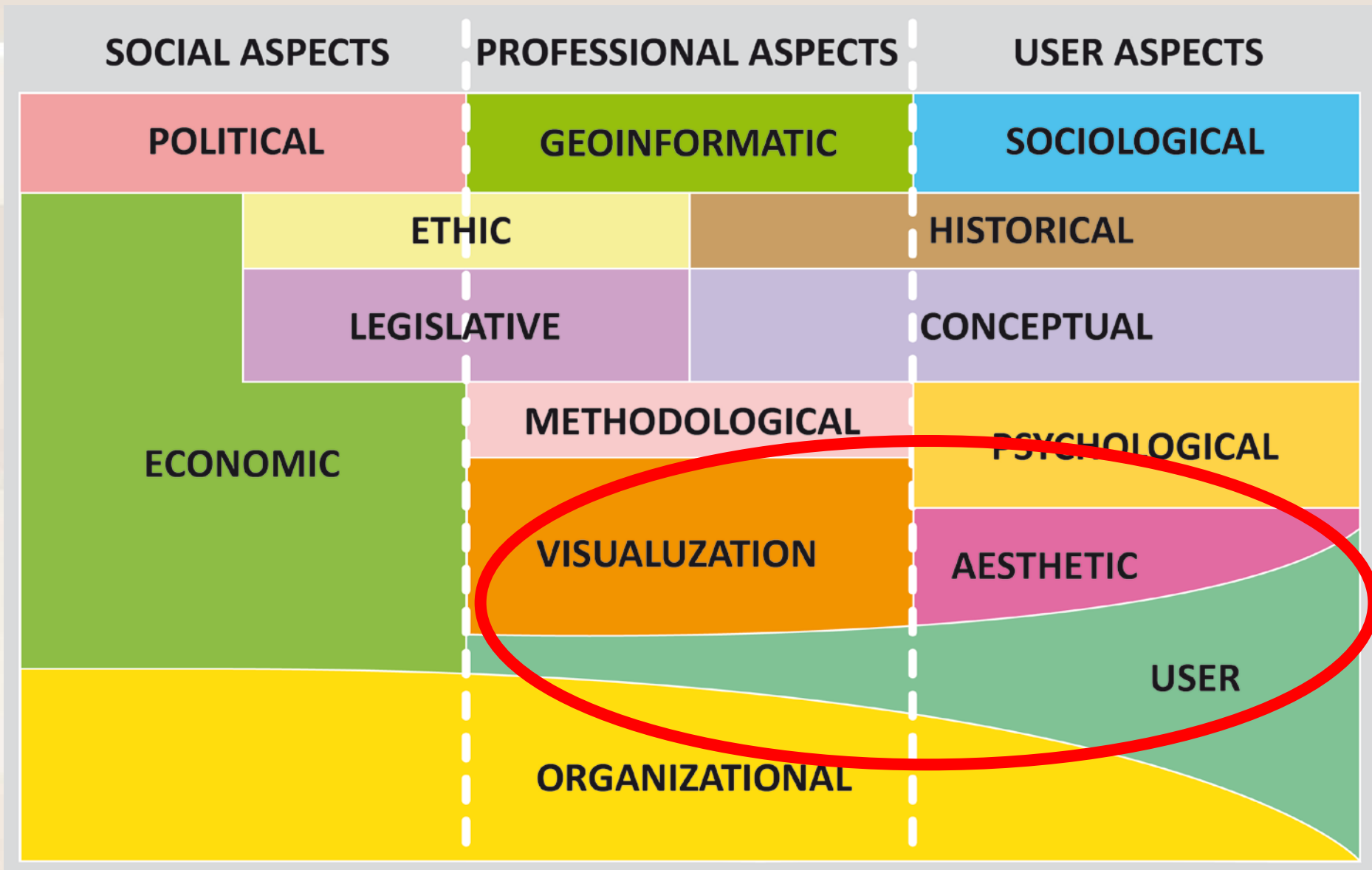
# More about MAP or DESIGN?

- ‘ten principles of good design’ by Dieter Rams converted to eight principles of good design in cartography
  - Understanding of **user requirements**
  - Consideration of **display format**
  - A clear **visual hierarchy**
  - **Simplicity**
  - **Legibility**
  - **Consistency**
  - **Accessibility**
  - Good **composition**





# Non-Technological Aspects



# User Issues & User perception

- **User issues**
  - combination of many aspects
- **User map perception**
  - complex process with many internal and external factors

***How to make maps with emphasis on user issues?***

***How to create maps, that  
people want to look at***

***???***





# Looking for a solution?

- you need a **good cartographer**
- you **need to know** about...
  - map **purpose**
  - selection of **information**
  - map **generalization**
  - map **symbolology** in other maps
  - map **projections**
- there is **no simple solution**
- question is **very broad** and experts dealing with cartography focus to a number of **sub-areas**

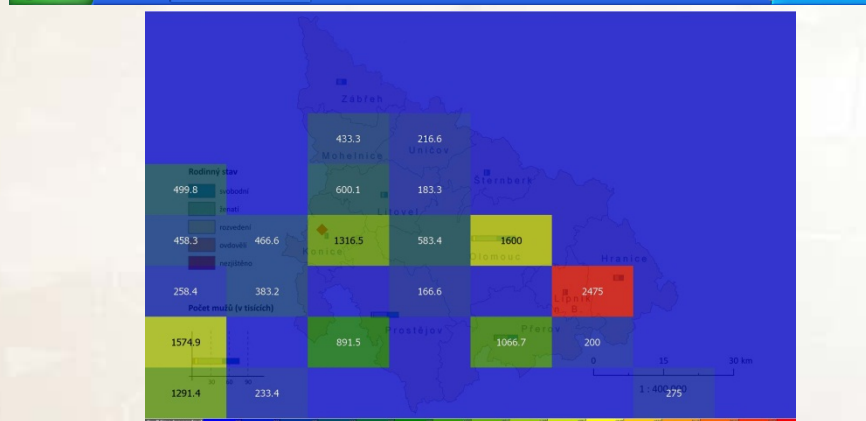


# Objective Research Methods

- **perception of users** can be assessed by the eye-tracking technology in combination with other research methods
- **individual's eye movements are measured**
- there are monitored localization of eye-movement in any given time



# SMI RED 250



## Example

# Methods of Cartographic Visualization

- choice of method of cartographic visualization depends on the opinion of the map author
- way of expressing the same information by different methods of cartographic visualization leads to **different user perception**
- users have to get the information **as quickly as possible** and **as accurately as possible**
- maps have to **help their users** to better understand geospatial relationships, **not to confuse the user**



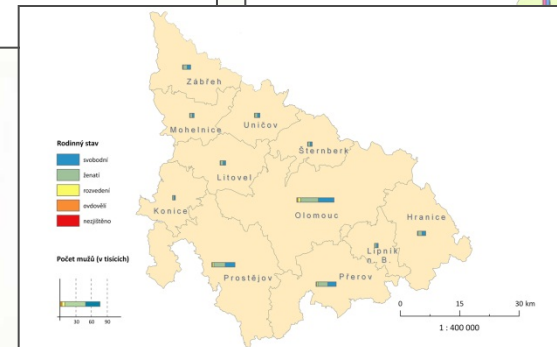
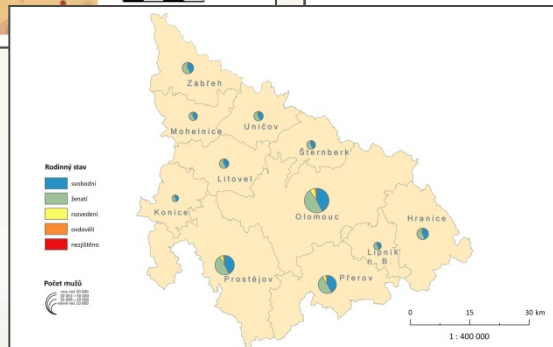
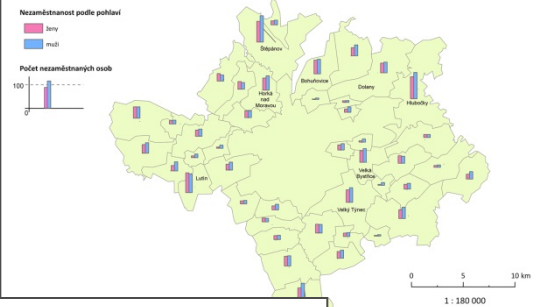
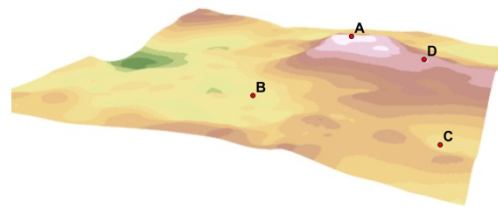
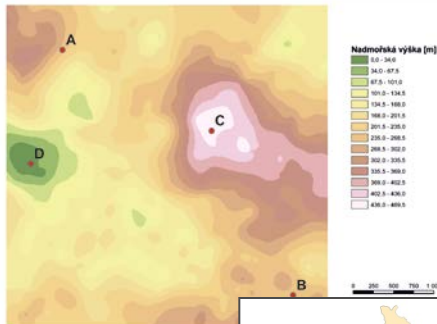
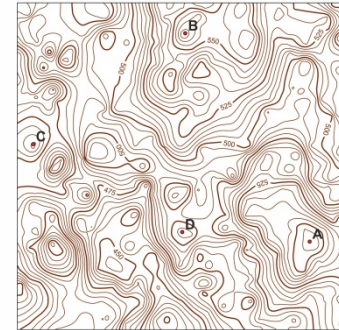
# Case study accomplishment



Kliknutím ukazatele myši určete,  
který z vyznačených bodů A–D  
má nejvyšší nadmořskou výšku.

Pokud nebudete vědět, přejděte na další otázku stiskem mezerníku.

Základní interval vrstevnic je 5 metrů.





# Case study accomplishment

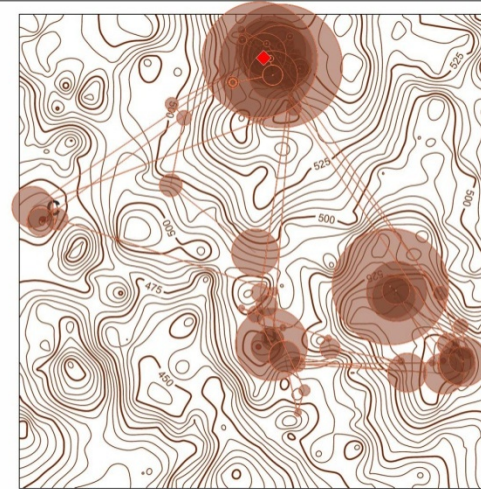
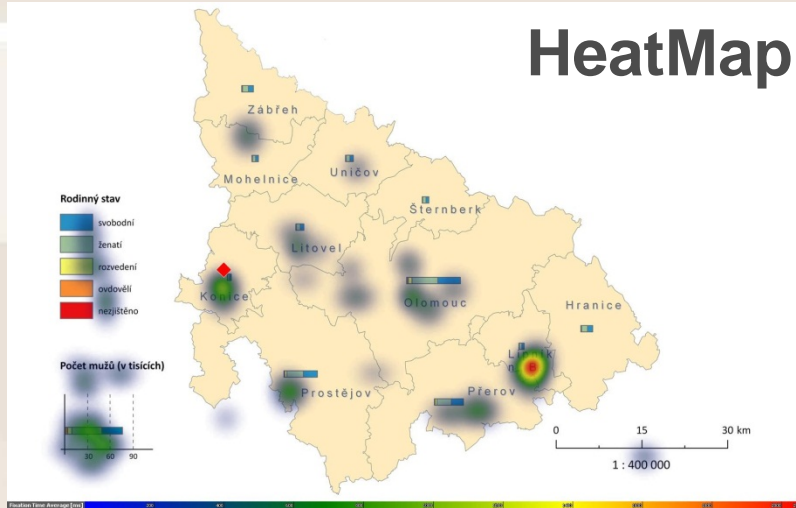
| AOI statistics - Poznámkový blok        |         |                |                |               |           |          |                  |           |           |           |       |     |   |
|---|---------|----------------|----------------|---------------|-----------|----------|------------------|-----------|-----------|-----------|-------|-----|---|
| Soubor Úpravy Formát Zobrazení Nápisová |         |                |                |               |           |          |                  |           |           |           |       |     |   |
| Trial                                   | Subject | Color          | hohlaví ročník | identifikátor | kartograf | stimulus | Area of Interest | AOI Group | AOI Scope | AOI Order |       |     |   |
| Trial001                                | P01     | Coral          | muz            | 1986          | STAPOP    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P02     | Crisson        | zena           | 1993          | BARSKA    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P03     | Crisson        | zena           | 1993          | LENTOS    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P04     | Cyan           | muz            | 1993          | SVA MIS   | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P05     | Darkblue       | muz            | 1993          | TOMITC    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P07     | Darkblue       | muz            | 1993          | MARCKE    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P08     | Darkgray       | muz            | 1990          | JANKOP    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P09     | Darkgreen      | zena           | 1991          | MARBOB    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P10     | Darkhaki       | muz            | 1990          | JANKUS    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P11     | Darkmagenta    | zena           | 1993          | NIKSEL    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P12     | Darkolivegreen | muz            | 1993          | JANTRU    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P13     | Darkorange     | muz            | 1993          | KACRA     | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P14     | Darkorchid     | zena           | 1993          | MARSTA    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P15     | Darkred        | zena           | 1990          | RENLOS    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P16     | Darksalmon     | zena           | 1985          | Alevoan   | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P17     | Darkseagreen   | muz            | 1988          | JANHAN    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P18     | Darkslateblue  | zena           | 1989          | dancip    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P19     | Darkslategray  | zena           | 1990          | LENPAC    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P20     | Darkturquoise  | muz            | 1990          | MICVOS    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P21     | Darkviolet     | muz            | 1989          | vojhas    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P22     | Deeppink       | muz            | 1989          | MICVKA    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P23     | Deepskyblue    | zena           | 1989          | MARLOS    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P24     | Dimgray        | muz            | 1988          | marfin    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P25     | Dodgerblue     | muz            | 1989          | otmpet    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P26     | Firebrick      | zena           | 1987          | petasad   | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P27     | Forestgreen    | muz            | 1990          | tomurb    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P28     | Gainsboro      | zena           | 1989          | heluhr    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P29     | Gold           | zena           | 1989          | adeote    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P30     | Goldenrod      | muz            | 1989          | tomhed    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P31     | Gray           | zena           | 1990          | veroba    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P32     | Green          | zena           | 1982          | oligon    | ne       | 01. obr. jpg     | A         | Local     | 1         | 27473 | 1,6 | 0 |
| Trial001                                | P01     | Coral          | muz            | 1986          | STAPOP    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P02     | Crisson        | zena           | 1993          | BARSKA    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P03     | Crisson        | zena           | 1993          | LENTOS    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P04     | Cyan           | muz            | 1993          | SVA MIS   | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P05     | Darkblue       | muz            | 1993          | TOMITC    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P07     | Darkblue       | muz            | 1993          | MARCKE    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P08     | Darkgray       | muz            | 1990          | JANKOP    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P09     | Darkgreen      | zena           | 1991          | MARBOB    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P10     | Darkhaki       | muz            | 1990          | JANKUS    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P11     | Darkmagenta    | zena           | 1993          | NIKSEL    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P12     | Darkolivegreen | muz            | 1993          | JANTRU    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P13     | Darkorange     | muz            | 1993          | KACRA     | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P14     | Darkorchid     | zena           | 1993          | MARSTA    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P15     | Darkred        | zena           | 1990          | RENLOS    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P16     | Darksalmon     | zena           | 1985          | Alevoan   | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P17     | Darkseagreen   | muz            | 1988          | JANHAN    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P18     | Darkslateblue  | zena           | 1989          | dancip    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P19     | Darkslategray  | zena           | 1990          | LENPAC    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P20     | Darkturquoise  | muz            | 1990          | MICVOS    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P21     | Darkviolet     | muz            | 1989          | vojhas    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P22     | Deeppink       | muz            | 1989          | MICVKA    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P23     | Deepskyblue    | zena           | 1989          | MARLOS    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P24     | Dimgray        | muz            | 1988          | marfin    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P25     | Dodgerblue     | muz            | 1989          | otmpet    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P26     | Firebrick      | zena           | 1987          | petasad   | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P27     | Forestgreen    | muz            | 1990          | tomurb    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P28     | Gainsboro      | zena           | 1989          | heluhr    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P29     | Gold           | zena           | 1989          | adeote    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P30     | Goldenrod      | muz            | 1989          | tomhed    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P31     | Gray           | zena           | 1990          | veroba    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P32     | Green          | zena           | 1982          | oligon    | ne       | 01. obr. jpg     | B correct | Local     | 2         | 27473 | 1,6 | 0 |
| Trial001                                | P01     | Coral          | muz            | 1986          | STAPOP    | ne       | 01. obr. jpg     | C         | Local     | 3         | 27473 | 1,6 | 0 |
| Trial001                                | P02     | Crisson        | zena           | 1993          | BARSKA    | ne       | 01. obr. jpg     | C         | Local     | 3         | 27473 | 1,6 | 0 |
| Trial001                                | P03     | Crisson        | zena           | 1993          | LENTOS    | ne       | 01. obr. jpg     | C         | Local     | 3         | 27473 | 1,6 | 0 |
| Trial001                                | P04     | Cyan           | muz            | 1993          | SVA MIS   | ne       | 01. obr. jpg     | C         | Local     | 3         | 27473 | 1,6 | 0 |
| Trial001                                | P05     | Darkblue       | muz            | 1993          | TOMITC    | ne       | 01. obr. jpg     | C         | Local     | 3         | 27473 | 1,6 | 0 |
| Trial001                                | P07     | Darkblue       | muz            | 1993          | MARCKE    | ne       | 01. obr. jpg     | C         | Local     | 3         | 27473 | 1,6 | 0 |
| Trial001                                | P08     | Darkgray       | muz            | 1990          | JANKOP    | ne       | 01. obr. jpg     | C         | Local     | 3         | 27473 | 1,6 | 0 |
| Trial001                                | P09     | Darkgreen      | zena           | 1991          | MARBOB    | ne       | 01. obr. jpg     | C         | Local     | 3         | 27473 | 1,6 | 0 |
| Trial001                                | P10     | Darkhaki       | muz            | 1990          | JANKUS    | ne       | 01. obr. jpg     | C         | Local     | 3         | 27473 | 1,6 | 0 |
| Trial001                                | P11     | Darkmagenta    | zena           | 1993          | NIKSEL    | ne       | 01. obr. jpg     | C         | Local     | 3         | 27473 | 1,6 | 0 |

| mouseclick - Poznámkový blok            |         |              |                 |               |             |            |         |              |  |
|---|---------|--------------|-----------------|---------------|-------------|------------|---------|--------------|--|
| Soubor Úpravy Formát Zobrazení Nápisová |         |              |                 |               |             |            |         |              |  |
| Trial                                   | Subject | Stimulus     | Time Trial [ms] | Time Run [ms] | Type        | Event      | Content | Content 2    |  |
| Trial001                                | P01     | 01. obr. jpg | 24458           | 24458         | User Action | mouseclick | left    | x=856 y=121  |  |
| Trial001                                | P02     | 01. obr. jpg | 26208           | 26208         | User Action | mouseclick | left    | x=859 y=702  |  |
| Trial001                                | P03     | 01. obr. jpg | 28632           | 28632         | User Action | mouseclick | left    | x=846 y=725  |  |
| Trial001                                | P04     | 01. obr. jpg | 29680           | 29680         | User Action | mouseclick | left    | x=875 y=706  |  |
| Trial001                                | P05     | 01. obr. jpg | 6951            | 6951          | User Action | mouseclick | left    | x=1234 y=758 |  |
| Trial001                                | P07     | 01. obr. jpg | 23201           | 23201         | User Action | mouseclick | left    | x=1238 y=758 |  |
| Trial001                                | P08     | 01. obr. jpg | 25927           | 25927         | User Action | mouseclick | left    | x=1233 y=757 |  |
| Trial001                                | P09     | 01. obr. jpg | 13547           | 13547         | User Action | mouseclick | left    | x=1233 y=755 |  |
| Trial001                                | P10     | 01. obr. jpg | 23007           | 23007         | User Action | mouseclick | left    | x=867 y=120  |  |
| Trial001                                | P07     | 01. obr. jpg | 23591           | 23591         | User Action | mouseclick | left    | x=853 y=123  |  |
| Trial001                                | P08     | 01. obr. jpg | 15088           | 15088         | User Action | mouseclick | left    | x=852 y=124  |  |
| Trial001                                | P08     | 01. obr. jpg | 16818           | 16818         | User Action | mouseclick | left    | x=855 y=121  |  |
| Trial001                                | P09     | 01. obr. jpg | 9956            | 9956          | User Action | mouseclick | left    | x=854 y=124  |  |
| Trial001                                | P09     | 01. obr. jpg | 11860           | 11860         | User Action | mouseclick | left    | x=856 y=122  |  |
| Trial001                                | P09     | 01. obr. jpg | 12203           | 12203         | User Action | mouseclick | left    | x=880 y=105  |  |
| Trial001                                | P09     | 01. obr. jpg | 16883           | 16883         | User Action | mouseclick | left    | x=1233 y=756 |  |
| Trial001                                | P09     | 01. obr. jpg | 19515           | 19515         | User Action | mouseclick | left    | x=846 y=728  |  |
| Trial001                                | P10     | 01. obr. jpg | 20274           | 20274         | User Action | mouseclick | left    | x=1243 y=754 |  |
| Trial001                                | P10     | 01. obr. jpg | 21162           | 21162         | User Action | mouseclick | left    | x=1257 y=723 |  |
| Trial001                                | P12     | 01. obr. jpg | 27774           | 27774         | User Action | mouseclick | left    | x=1233 y=757 |  |
| Trial001                                | P13     | 01. obr. jpg | 22386           | 22386         | User Action | mouseclick | left    | x=1234 y=752 |  |
| Trial001                                | P14     | 01. obr. jpg | 23288           | 23288         | User Action | mouseclick | left    | x=853 y=123  |  |
| Trial001                                | P14     | 01. obr. jpg | 39800           | 39800         | User Action | mouseclick | left    | x=858 y=112  |  |
| Trial001                                | P16     | 01. obr. jpg | 17864           | 17864         | User Action | mouseclick | left    | x=851 y=122  |  |
| Trial001                                | P17     | 01. obr. jpg | 15191           | 15191         | User Action | mouseclick | left    | x=834 y=121  |  |
| Trial001                                | P18     | 01. obr. jpg | 26490           | 26490         | User Action | mouseclick | left    | x=849 y=121  |  |
| Trial001                                | P19     | 01. obr. jpg | 32512           | 32512         | User Action | mouseclick | left    | x=857 y=122  |  |
| Trial001                                | P20     | 01. obr. jpg | 43344           | 43344         | User Action | mouseclick | left    | x=854 y=125  |  |
| Trial001                                | P21     | 01. obr. jpg | 47878           | 47878         | User Action | mouseclick | left    | x=855 y=120  |  |
| Trial001                                | P23     | 01. obr. jpg | 28431           | 28431         | User Action | mouseclick | left    | x=857 y=122  |  |
| Trial001                                | P24     | 01. obr. jpg | 32594           | 32594         | User Action | mouseclick | left    | x=857 y=120  |  |
| Trial001                                | P25     | 01. obr. jpg | 35569           | 35569         | User Action | mouseclick | left    | x=855 y=126  |  |
| Trial001                                | P26     | 01. obr. jpg | 30576           | 30576         | User Action | mouseclick | left    | x=856 y=123  |  |
| Trial001                                | P26     | 01. obr. jpg | 34880           | 34880         | User Action | mouseclick | left    | x=856 y=123  |  |
| Trial001                                | P28     | 01. obr. jpg | 33439           | 33439         | User Action | mouseclick | left    | x=865 y=120  |  |
| Trial001                                | P28     | 01. obr. jpg | 41462           | 41462         | User Action | mouseclick | left    | x=1235 y=756 |  |
| Trial001                                | P29     | 01. obr. jpg | 13576           | 13576         | User Action | mouseclick | left    | x=877 y=99   |  |
| Trial001                                | P30     | 01. obr. jpg | 18433           | 18433         | User Action | mouseclick | left    | x=855 y=121  |  |
| Trial001                                | P31     | 01. obr. jpg | 18450           | 18450         | User Action | mouseclick | left    | x=861 y=117  |  |
| Trial001                                | P32     | 01. obr. jpg | 21633           | 21633         | User Action | mouseclick | left    | x=857 y=122  |  |
| Trial002                                | P01     | 02. obr. jpg | 18583           | 18583         | User Action | mouseclick | left    | x=756 y=514  |  |
| Trial002                                | P02     | 02. obr. jpg | 8035            | 8577          | User Action | mouseclick | left    | x=252 y=495  |  |
| Trial002                                | P03     | 02. obr. jpg | 6061            | 3347          | User Action | mouseclick | left    | x=234 y=515  |  |
| Trial002                                | P04     | 02. obr. jpg | 5376            | 503           | User Action | mouseclick | left    | x=238 y=508  |  |
| Trial002                                | P05     | 02. obr. jpg | 7006            | 3139          | User Action | mouseclick | left    | x=236 y=516  |  |
| Trial002                                | P07     | 02. obr. jpg | 9756            | 4298          | User Action | mouseclick | left    | x=237 y=514  |  |
| Trial002                                | P08     | 02. obr. jpg | 3167            | 448           | User Action | mouseclick | left    | x=235 y=520  |  |
| Trial002                                | P09     | 02. obr. jpg | 7182            | 8048          | User Action | mouseclick | left    | x=237 y=511  |  |
| Trial002                                | P10     | 02. obr. jpg | 10067           | 4548          | User Action | mouseclick | left    | x=236 y=513  |  |
| Trial002                                | P11     | 02. obr. jpg | 7300            | 5242          | User Action | mouseclick | left    | x=239 y=515  |  |
| Trial002                                | P12     | 02. obr. jpg | 17181           | 5285          | User Action | mouseclick | left    | x=240 y=517  |  |
| Trial002                                | P13     | 02. obr. jpg | 9924            | 4635          | User Action | mouseclick | left    | x=242 y=511  |  |
| Trial002                                | P14     | 02. obr. jpg | 10988           | 4563          | User Action | mouseclick | left    | x=238 y=518  |  |
| Trial002                                | P15     | 02. obr. jpg | 12139           | 6695          | User Action | mouseclick | left    | x=240 y=508  |  |
| Trial002                                | P16     | 02. obr. jpg | 6739            | 2959          | User Action | mouseclick | left    | x=236 y=505  |  |
| Trial002                                | P18     | 02. obr. jpg | 6987            | 134           | User Action | mouseclick | left    | x=238 y=520  |  |
| Trial002                                | P18     | 02. obr. jpg | 6514            | 4114          | User Action | mouseclick | left    | x=234 y=520  |  |
| Trial002                                | P19     | 02. obr. jpg | 9657            | 5419          | User Action | mouseclick | left    | x=247 y=516  |  |
| Trial002                                | P20     | 02. obr. jpg | 6679            | 1284          | User Action | mouseclick | left    | x=241 y=518  |  |
| Trial002                                | P21     | 02. obr. jpg | 9890            | 8179          | User Action | mouseclick | left    | x=237 y=517  |  |
| Trial002                                | P22     | 02. obr. jpg | 15338           | 102650        | User Action | mouseclick | left    | x=228 y=515  |  |
| Trial002                                | P24     | 02. obr. jpg | 4030            | 9             | User Action | mouseclick | left    | x=234 y=518  |  |
| Trial002                                | P24     | 02. obr. jpg | 9505            | 54240         | User Action | mouseclick | left    | x=238 y=517  |  |
| Trial002                                | P25     | 02. obr. jpg | 6796            | 4949          | User Action | mouseclick | left    | x=245 y=516  |  |
| Trial002                                | P26     | 02. obr. jpg | 7219            | 388           | User Action | mouseclick | left    | x=241 y=518  |  |
| Trial002                                | P27     | 02. obr. jpg | 8699            | 9300          | User Action | mouseclick | left    | x=241 y=514  |  |
| Trial002                                | P28     | 02. obr. jpg | 60830           | 60830         | User Action | mouseclick | left    | x=239 y=514  |  |
| Trial002                                | P29     | 02. obr. jpg | 26660           | 26660         | User Action | mouseclick | left    | x=262 y=518  |  |
| Trial002                                | P30     | 02. obr. jpg | 9240            | 69970         | User Action | mouseclick | left    | x=233 y=516  |  |
| Trial002                                | P31     | 02. obr. jpg | 6165            | 31162         | User Action | mouseclick | left    | x=240 y=513  |  |
| Trial002                                | P32     | 02. obr. jpg | 14228           | 47423         | User Action | mouseclick | left    | x=241 y=513  |  |

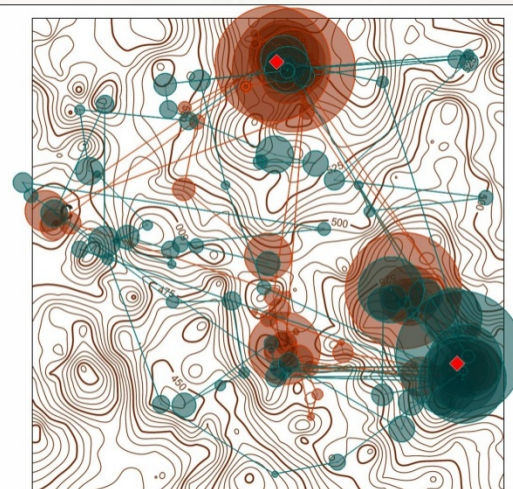
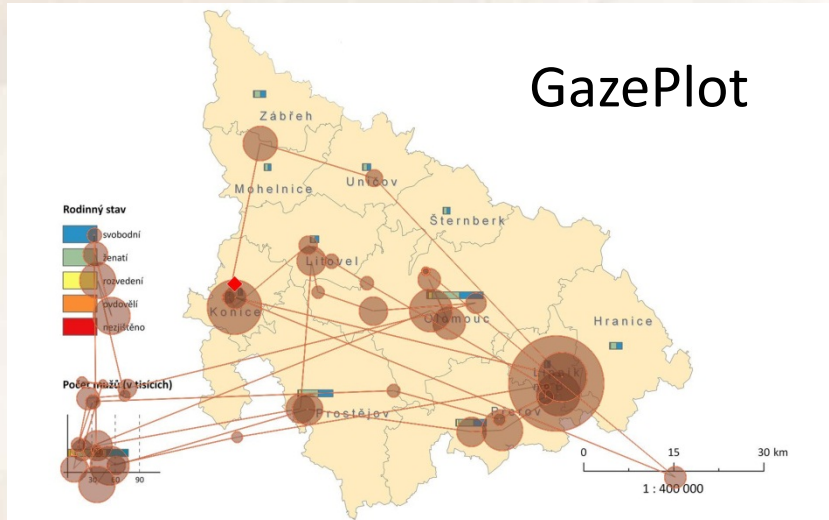


# Case study accomplishment

## HeatMap



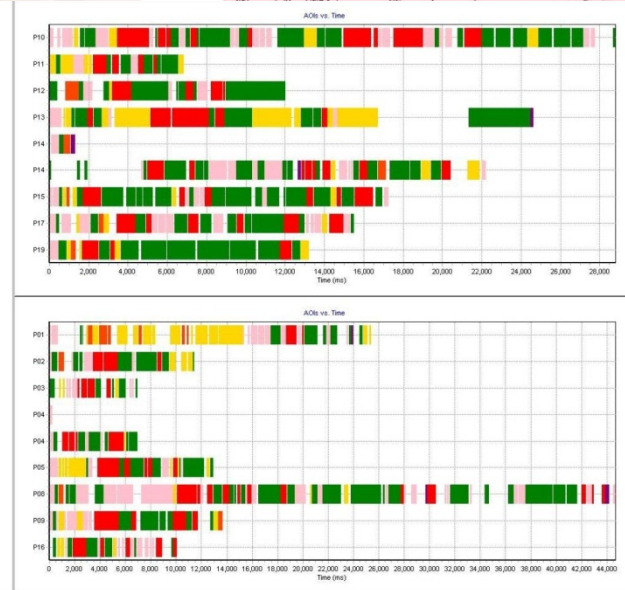
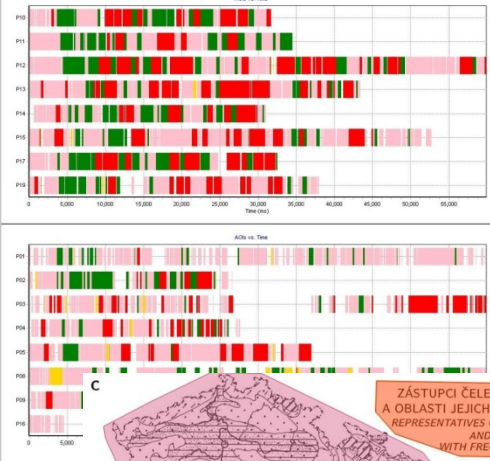
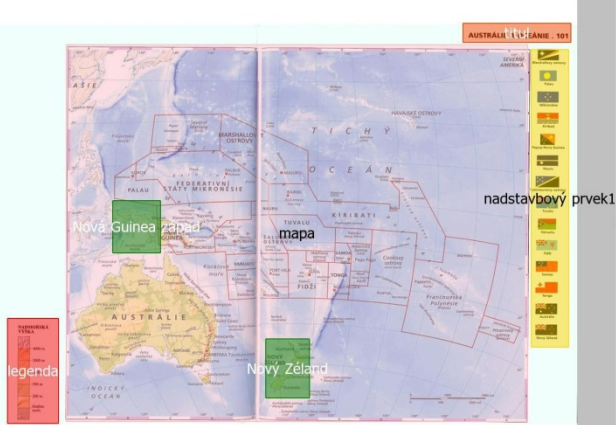
## GazePlot



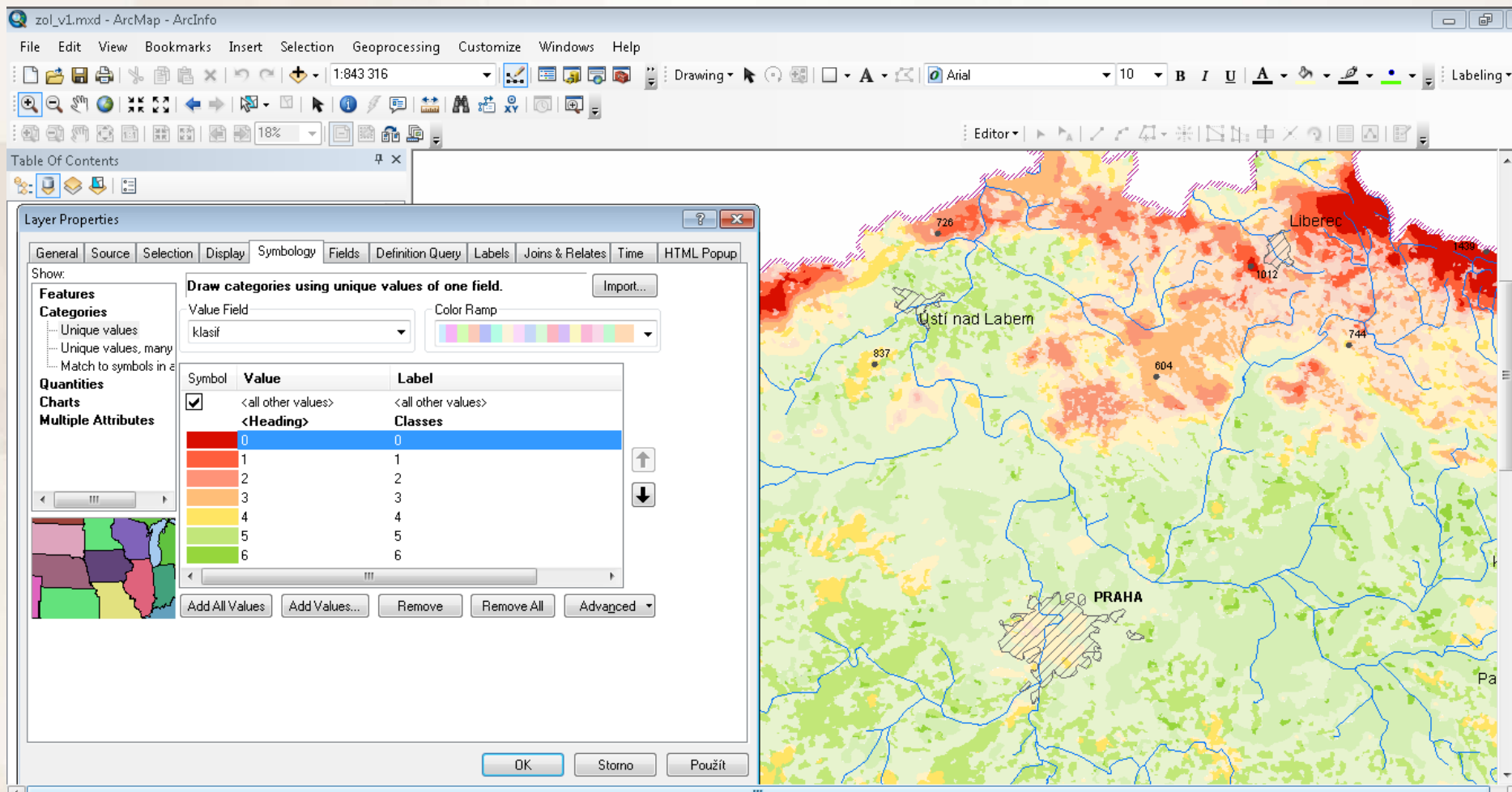
■ SUM of answers    ■ Cartographic education    ■ Non-cartographic education



# Map composition



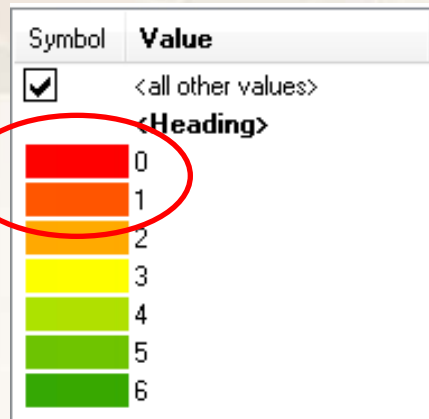
# User's ability to distinguish colors



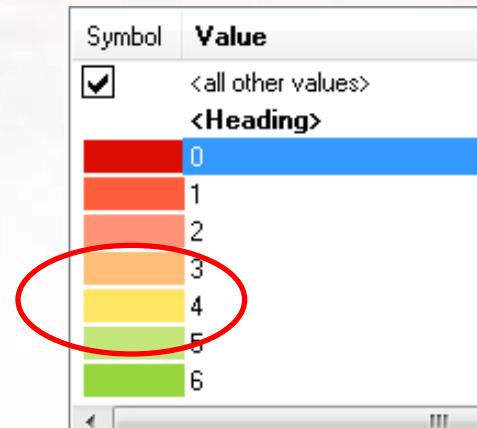
# Correct presentation of the information

- problems
  - ability to distinguish red colors (ET experiment)
  - NORMAL value is not AVERAGE value

ESRI color range

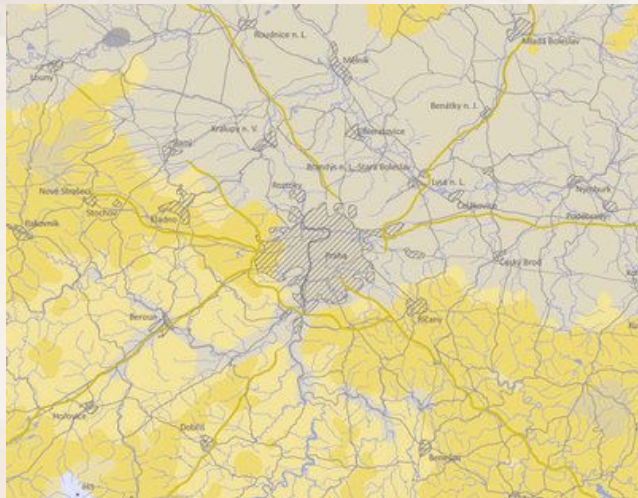
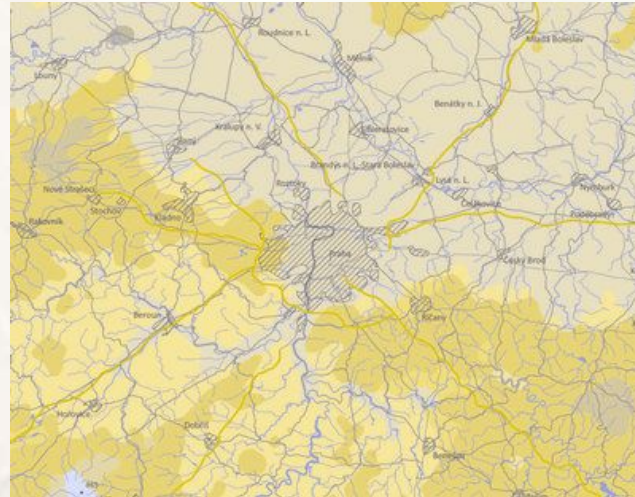
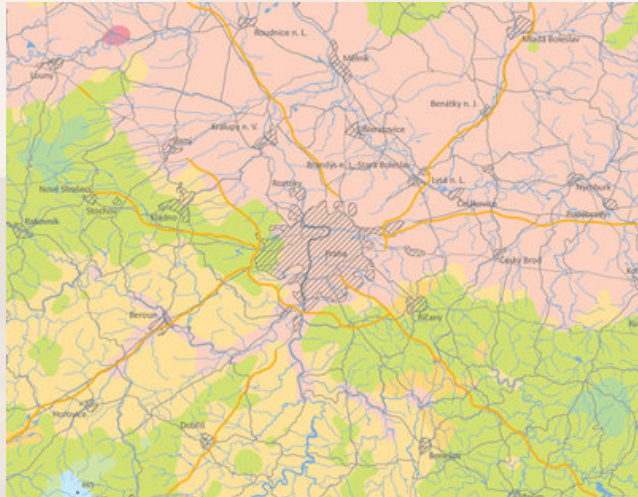


Authors color range





# Customization – Color Blindness



*Vischeck  
Color Blindness  
Simulator*





# Findings

- **users** are the **key determinants** of any cartographic work
- it is important to identify **needs of the target users** before you work with graphic design
- **user needs may differ** with respect to their intellectual and physical condition
- view of users, cartographers and producers to the design of maps **vary considerably**
- choice of methods of cartographic representation and their applications can have a significant impact on the **perception of presented phenomena**



# References

- Buckley, A. *Design principles for cartography* [online]. [cit. 2014-11-09]. <http://blogs.esri.com/esri/arcgis/2011/10/28/design-principles-for-cartography/>
- Buckley, A. *Make Maps People Want to Look At* [online]. [cit. 2014-11-09]. <http://www.esri.com/news/arcuser/0112/make-maps-people-want-to-look-at.html>
- Robinson, A. H. (1982). *Early Thematic Mapping: In the History of Cartography*. Chicago: The University of Chicago Press. ISBN 0-226-72285-6.
- MacEachren, A. M. (1995). *How Maps Work*. New York: The Guilford Press. ISBN 1-57230-040-X.
- Tyner, J. A. (2014) *Principles of Map Design*. The Guilford Press, 1st edition. ISBN 978-1462517121
- Rams, D. *Cartographic design principles* [online]. [cit. 2014-11-09]. <http://www.ordnancesurvey.co.uk/resources/carto-design/carto-design-principles.html>
- Bradley, B. *Cartographic design principles* [online]. [cit. 2014-11-09]. [http://people.umass.edu/bethanyb/NRC585\\_lecture2\\_5\\_cartography.pdf](http://people.umass.edu/bethanyb/NRC585_lecture2_5_cartography.pdf)
- Vondrakova, A. *Non-technological Aspects of Map Production*. Dissertation Thesis, Department of Geoinformatics, Palacký University, Olomouc, 2013.
- Vondrakova, A. *Map Creation with Emphasis on User Issues*. Presentation at Esri UC 2013 conference, San Diego, 2013.



**alena vondrakova@gmail.com**

**Palacký University, Olomouc  
CZECH REPUBLIC**

**THANK YOU  
FOR YOUR  
ATTENTION**

