Testing the Usability of Interactive Maps

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Geo(graphical) Visualisation

- Ideas and principles of Exploratory Data Analysis (EDA) in application to spatial data

EDA: represent data so as to facilitate understanding and prompt hypotheses

The greatest value of a picture is when it *forces* us to notice what we never expected to see.

John W. Tukey

Current standard:
high user interactivity

Geovisualisation:

emphasis on the role of **highly interactive maps** in individual and small group efforts **at hypothesis generation, data analysis, and decision-support**

Commission on Visualisation and Virtual Environments of the International Cartographic Association

CommonGIS: System for Geovisualisation

- Interactive, dynamically changeable maps
  - Interactive operations designed specially for supporting analysis
- Interactive non-geographical displays
  - All displays are dynamically linked
- Tools for querying, search, and classification
- Computation-enhanced visual techniques

All the tools comply with the current standard of **high user interactivity** **BUT…**

Research question

Are people able to do exploratory data analysis using interactive maps (and other geovisualisation tools)?

Problem: not only the **tools** are new but the **ideas**; no analogues exist in user's usual experience

⇓

Not only the UI needs to be learned but (first of all!) the ideas understood

Organisation of Usability Tests

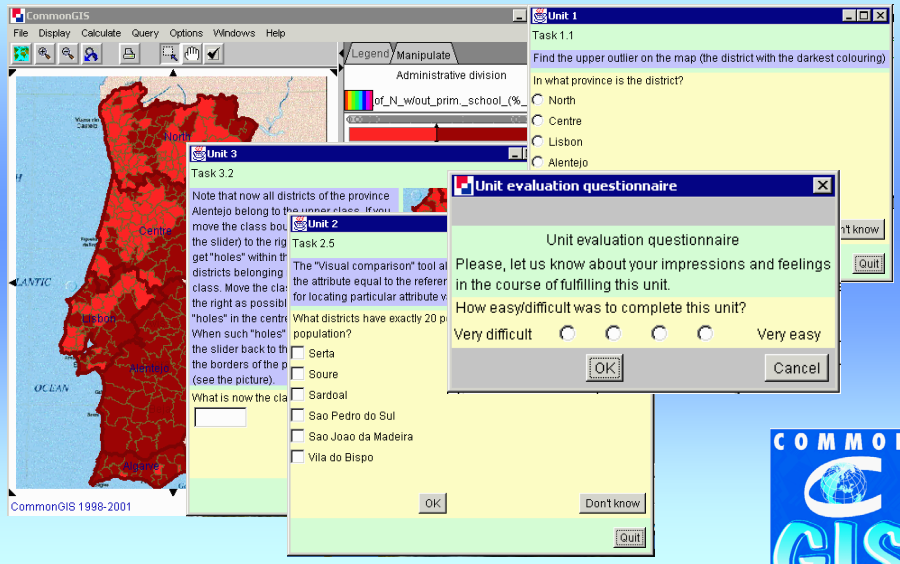
- **1st round (Lisbon, Portugal): 9 participants - professional users of GI, programmers, managers.**
  - **Introductory demo about 30 minutes, then the test (57 tasks, 71 questions). Test language: Portuguese.**
- **2nd round (Lisbon, 1 month later): 6 of 9 participants of the 1st round.**
  - **No access to the system between the tests. Shorter test (38 tasks, 44 questions). Test language: Portuguese.**
- **3rd round (WWW-based): 102 complete test records from students of Univ. Darmstadt (11 persons, computer science) and Univ. Muenster (91 persons, geoinformatics).**
  - **Written illustrated instructions. 38 tasks, 44 questions (same as in 2nd round). Test language: English.**

Interactive Techniques Tested

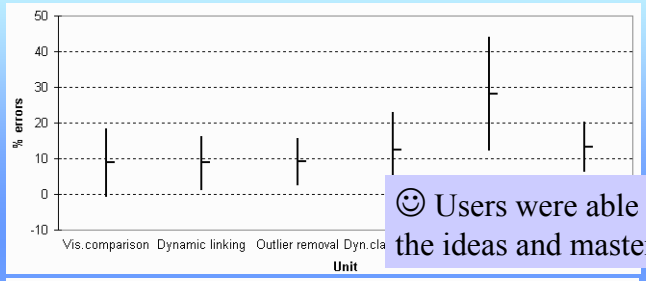
- Focusing (outlier removal)
- Visual comparison
- Dynamic classification
- Dynamic query
- Dynamic linking of heterogeneous displays (map and scatter plot)

See a demo…

Test Tasks and Questions (Examples)

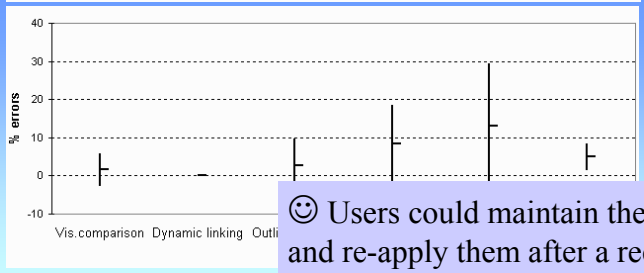


Test Results; Rounds 1 and 2



Round 1

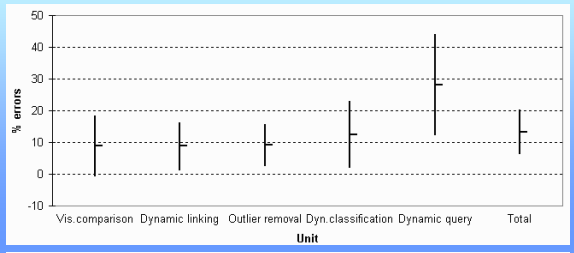
☺ Users were able to understand the ideas and master the tools



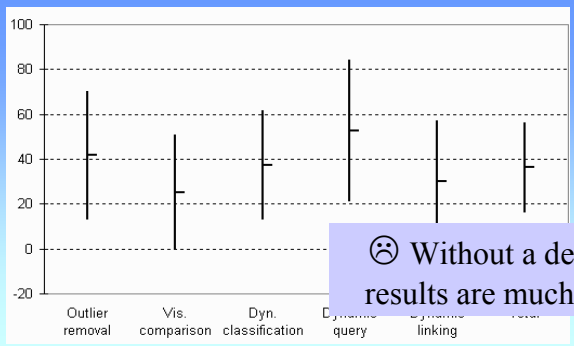
Round 2

☺ Users could maintain the skills and re-apply them after a recess

Test Results; Rounds 1 and 3



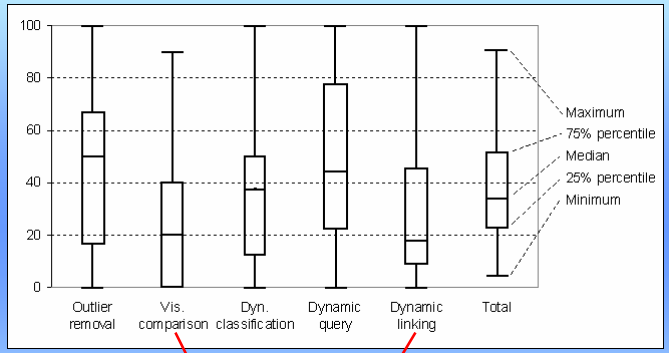
Round 1



Round 3

☹ Without a demo the results are much poorer

3rd Round Results: Percentiles



☺ These two techniques seem to have been easier to understand

3rd Round: Use of Explanations

Unit	Mean time spent viewing the explanations (sec)	Number of participants			
		Not opened	Viewed for less than 1 min	Viewed for 1 to below 2 min	Viewed for 2 min and more
Outlier removal	112	23	25	24	30
Visual comparison	143	12	18	23	49
Dynamic classification	101	14	25	22	41
Dynamic query	85	16	36	18	32
Dynamic linking	117	15	31	17	39

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Conclusions

- After a demo, users are able to understand and use geovisualisation tools
- Written instructions cannot adequately substitute a demo
  - Research challenge: how to instruct users and introduce new ideas when demo is impossible (e.g. tools in WWW)
- Communication in users' native language is important

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Present Time and Future

- More interactive tools appeared in CommonGIS, e.g. tools for spatio-temporal analysis, multi-criteria decision support, etc.

⇒ More tests are needed

- We seek partners for conducting new tests
- We seek tool users for getting feedback
- We seek support from industry for integrating our tools with widely used software

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