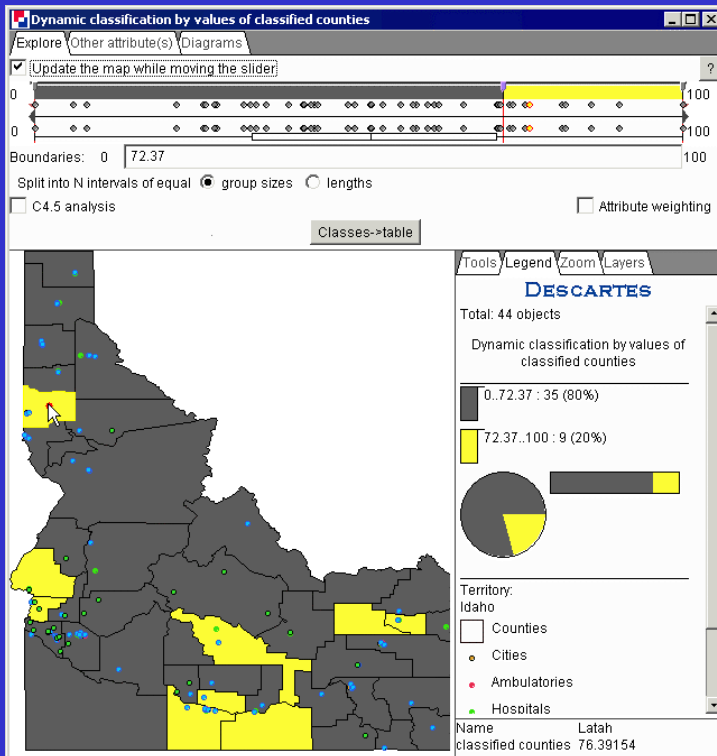


Enabling Technology for Participatory Spatial Decision Making



Hans Voss

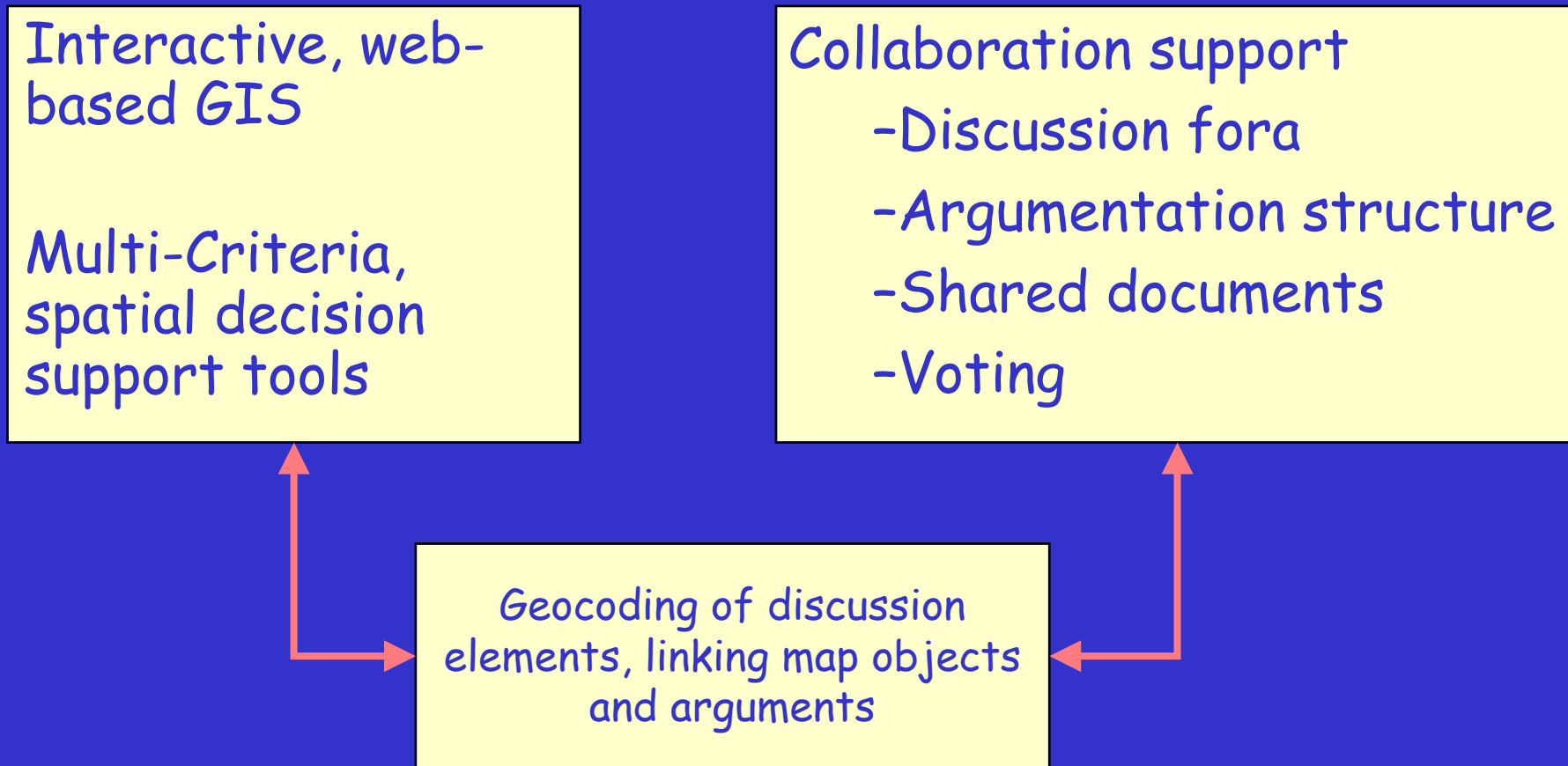
Gennady Andrienko

Natalia Andrienko

Spatial Decision Support Team

<http://www.ais.fhg.de/and/>

Participatory Spatial Decision Making



The Context

Past: production of thematic maps and their analysis is a business of professional designers and cartographers

- Now:
- Wide spread availability of statistical graphics and GIS software
 - Appearance of visualization and mapping services in the Internet

Problem:

- Thematic mapping and decision support tools become principally available to novice and casual users, but
- Many potential users lack the required knowledge to utilize the tools

CommonGIS Approach

CommonGIS Project and Software

Common Access
to Geographically
Referenced Data

Provide intuitive
tools and build
semantics and
smart user support
into the software

→ Enable learning
while doing

www.commongis.de

Esprit Project No. 28983

10/1998-06/2001

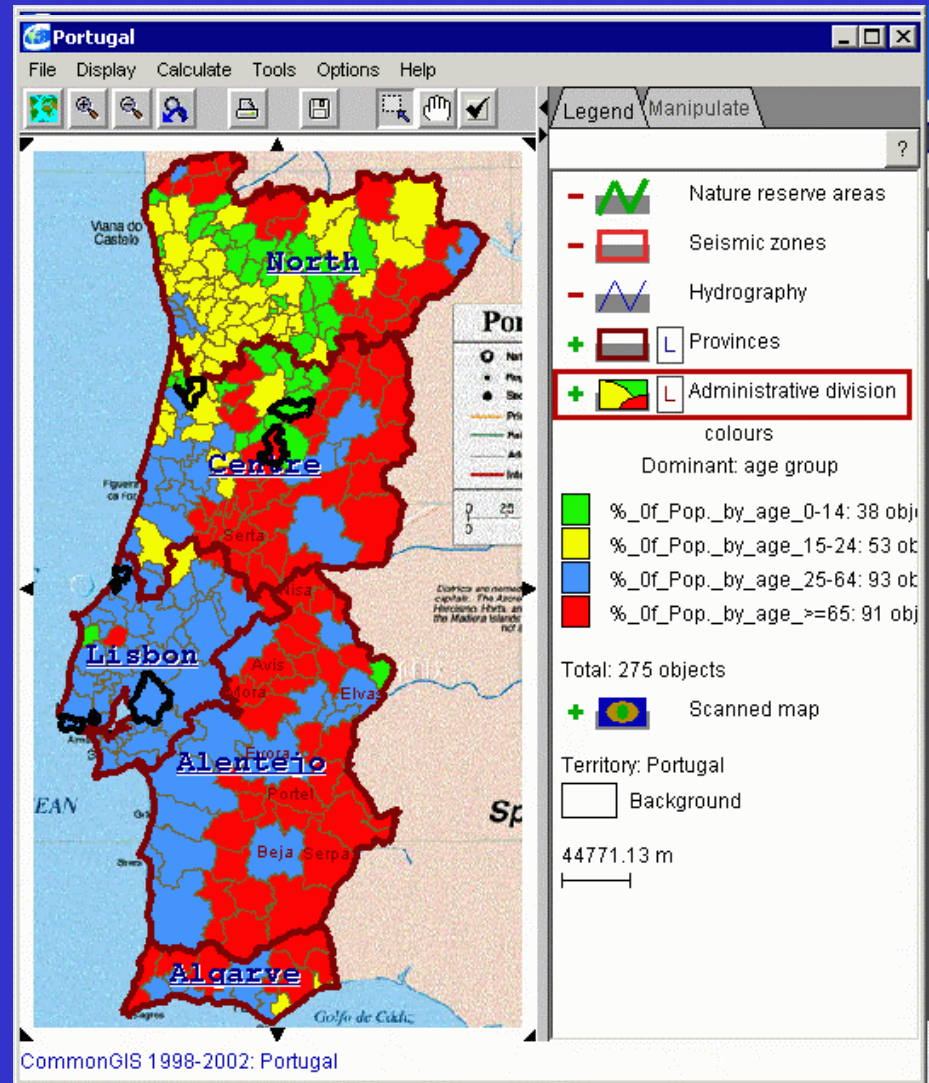
Basic characteristics

- Automated map design
- Interactive maps for visual data exploration
- Linked statistical graphics displays
- Intelligent problem solving support

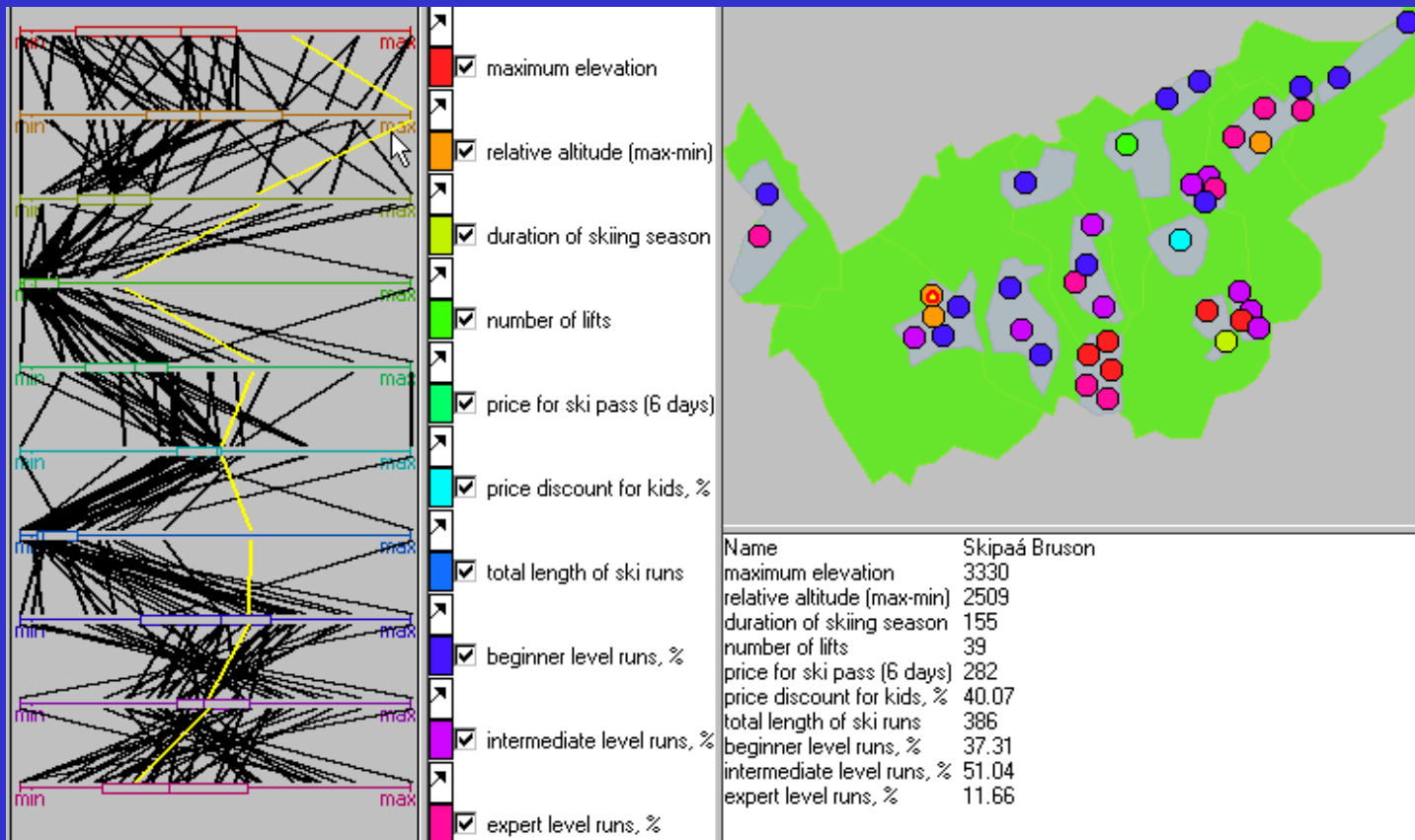
... same interactivity in local application and on web client (Java applet)

Interactive displays

- Dot plot
- Scatter-plot (matrix)
- Parallel coordinates plot
- Table lens view
- Dynamic query device
- Various classification tools
- ... and
- Various styles of interactive maps



Multi-Criteria Decision Making



- option 1
- option 2
- ...
- option k

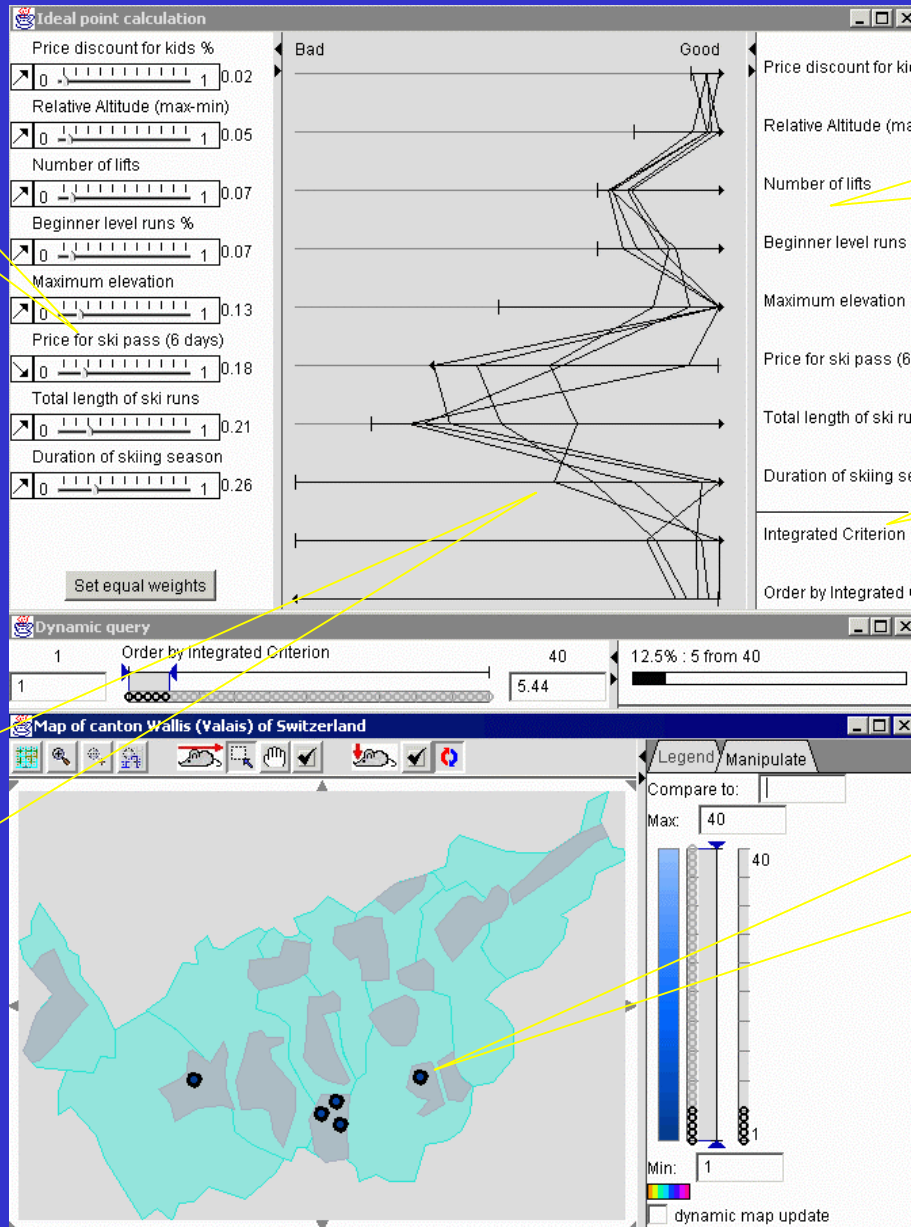
Ideal point method

Weights

Evaluation criteria

Integrated criterion

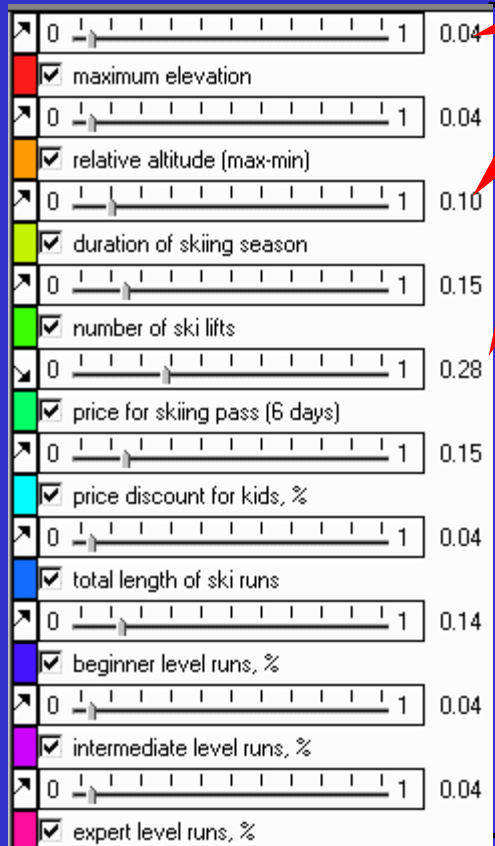
5 best options are shown on the map



Criteria
“path”
for
each
option

Ranking of Options

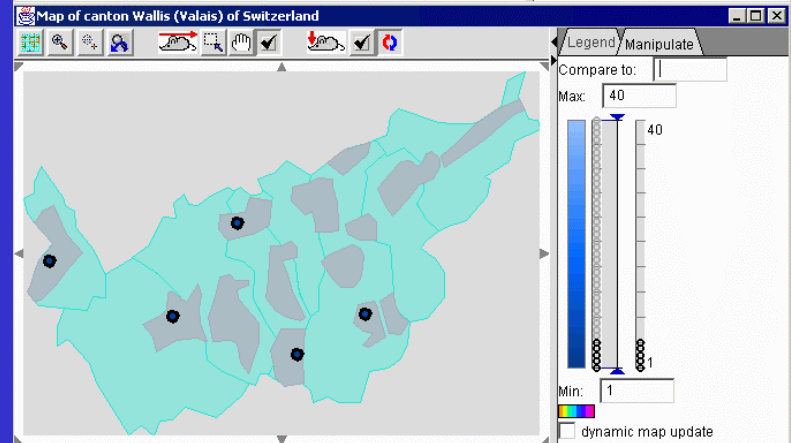
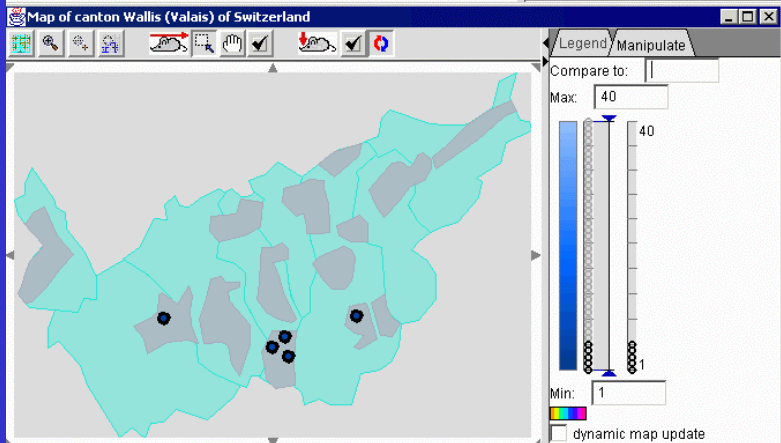
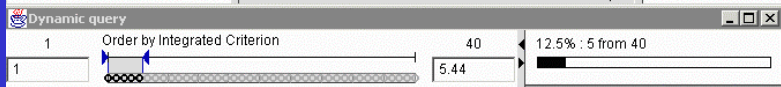
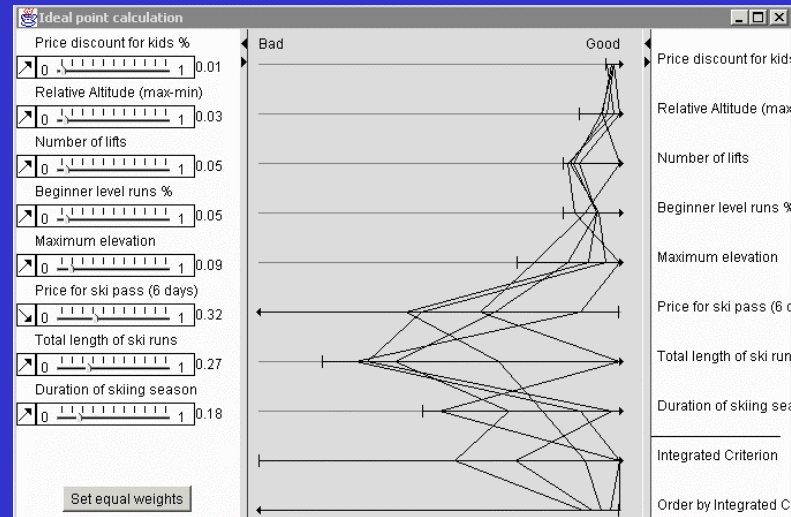
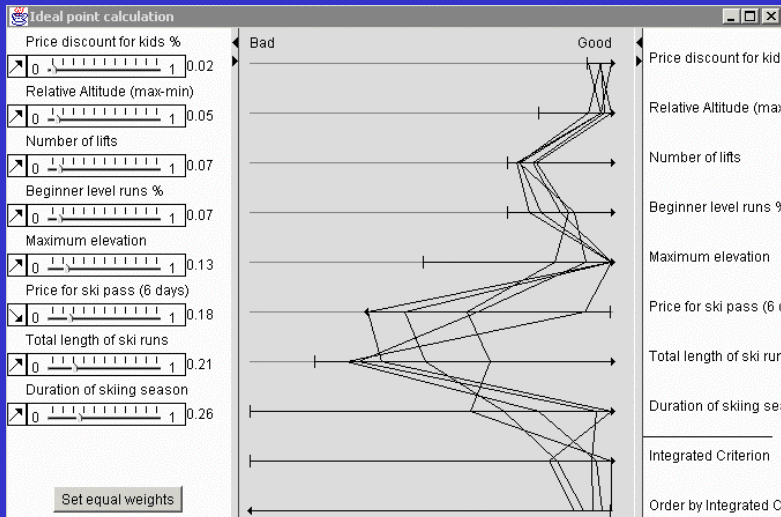
assigning weights to criteria



	option 1	...
criteria 1	0.18	...
criteria 2	0.87	...
...
criteria n	0.33	...
overall score	x	...

aggregating values

Comparison of results obtained with different preferences (weights)



Sensitivity analysis

Sensitivity analysis parameters

Let's shake the weights !

Relative Altitude (max-min) 0.18

iterations between weights and

Duration of skiing season 0.50

iterations between weights and

Price for ski pass (6 days) 0.32

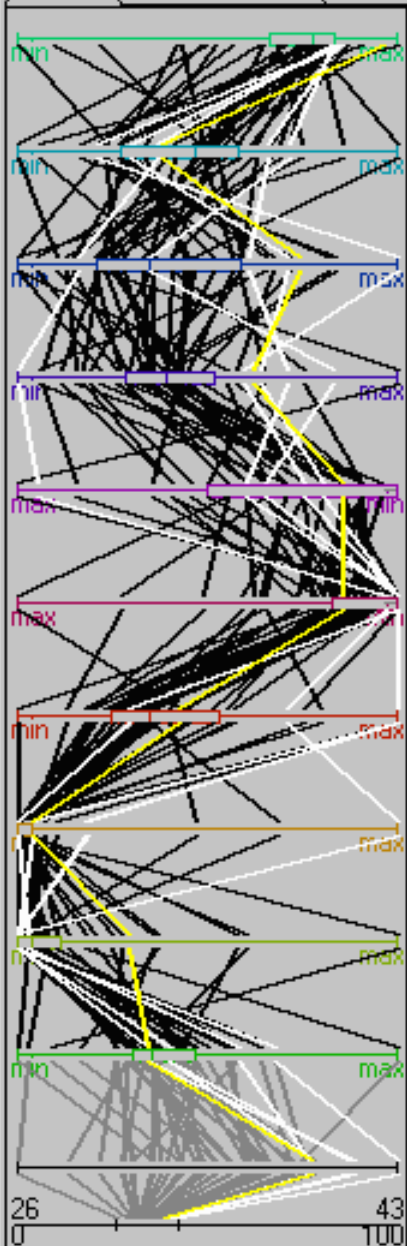
iterations between weights and

	Ranking	MinOrder0	MaxOrder0	MeanOrder0	VarianceOfOrder0
Klein Matterhorn-Schwarzsee	1.0	1.0	1.0	1.0	0.0
Saas-Fee	2.0	2.0	2.0	2.0	0.0
Sunnegga-Rothorn	3.0	3.0	3.0	3.0	0.0
Riffelberg-Stockhorn	4.0	4.0	5.0	4.0266666	0.16110729
Skipaß 4-Vallees/Mt.-Fort	5.0	5.0	6.0	5.2066666	0.40491426
Generalabo Zermatt	6.0	4.0	6.0	5.7666667	0.4818944
Skipaß Zermat-Cervinia	7.0	7.0	9.0	7.24	0.63958234
Crans Montana	8.0	7.0	9.0	7.9866667	0.2825279
Belalp	9.0	7.0	9.0	8.7733334	0.5790407
Evolene	10.0	10.0	12.0	10.4866667	0.5258224
Skipaß Saas	11.0	10.0	17.0	11.76	2.1375363
La Forclaz	12.0	10.0	18.0	12.1	1.5088629
Arolla	13.0	12.0	15.0	13.4733333	1.1117344
Hanningalp-Seetalhorn	14.0	12.0	15.0	13.5	0.6904105
Fiescheralp	15.0	11.0	18.0	14.7266666	1.6848203
Riederalp	16.0	12.0	24.0	16.54	2.423853
Visperteninen	17.0	15.0	19.0	16.48	0.77218386
Unterbäch/Eischoll	18.0	16.0	21.0	18.3866667	1.3749502
Zinal	19.0	17.0	20.0	18.6	0.5656856
Skipaß Printze	20.0	18.0	24.0	20.2266667	1.5455165
Bettmeralp	21.0	19.0	28.0	22.62	2.1684709
Bürchen-Törbel	22.0	20.0	26.0	22.8066667	1.6760939
St. Luc/Chandolin	23.0	20.0	27.0	23.2866667	1.678638
Skipaß Savoieyres/La Tzoum	24.0	20.0	31.0	24.8933333	3.2683268
Torrent	25.0	23.0	26.0	24.4466667	0.84488004
Grimentz	26.0	22.0	28.0	25.16	1.6333199
Skipaß Verbier	27.0	14.0	36.0	26.5066666	4.4970307
Aletsch-Abo	28.0	17.0	33.0	26.7133333	2.8620179
Bellwald-Richinen	29.0	24.0	36.0	29.1066667	2.1233509
Saas-Almagell	30.0	28.0	37.0	30.3333334	2.1249802
Vercorin	31.0	29.0	35.0	32.06	1.3328161
Skipaß Bruson	32.0	28.0	34.0	31.9933334	1.6472058
Skipaß CLCF	33.0	30.0	36.0	32.8733333	1.9775292
Ferianskipaß	34.0	27.0	35.0	32.9866668	2.0132468
Emergelen	35.0	30.0	36.0	33.9333334	1.6519371
Skipaß Grund-Almagell-Bale	36.0	29.0	37.0	35.28	1.7247995
Saas-Grund	37.0	32.0	38.0	36.8666665	1.0370893
Lauchernalp	38.0	35.0	39.0	38.0066668	0.6480408
Les Portes du Soleil	39.0	38.0	40.0	38.9066666	0.45235145
Gspon	40.0	39.0	40.0	39.94	0.23748676

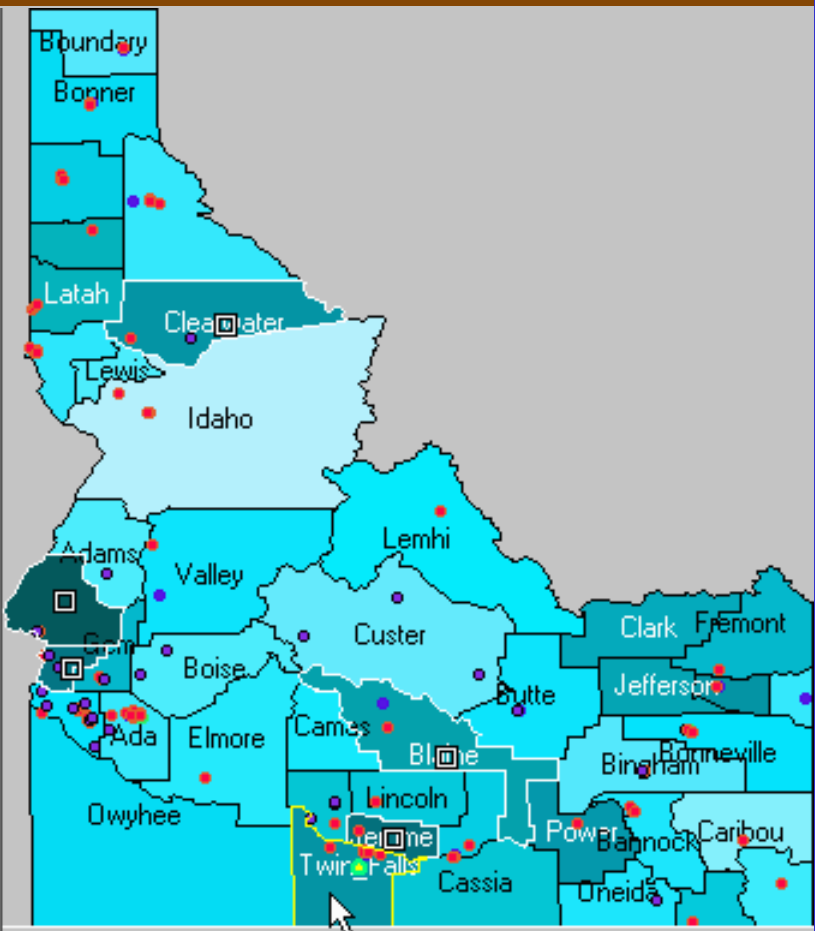
Ranking Descending Ascending TableLens

Decision options outcome map

Explore Other attribute(s) Diagrams

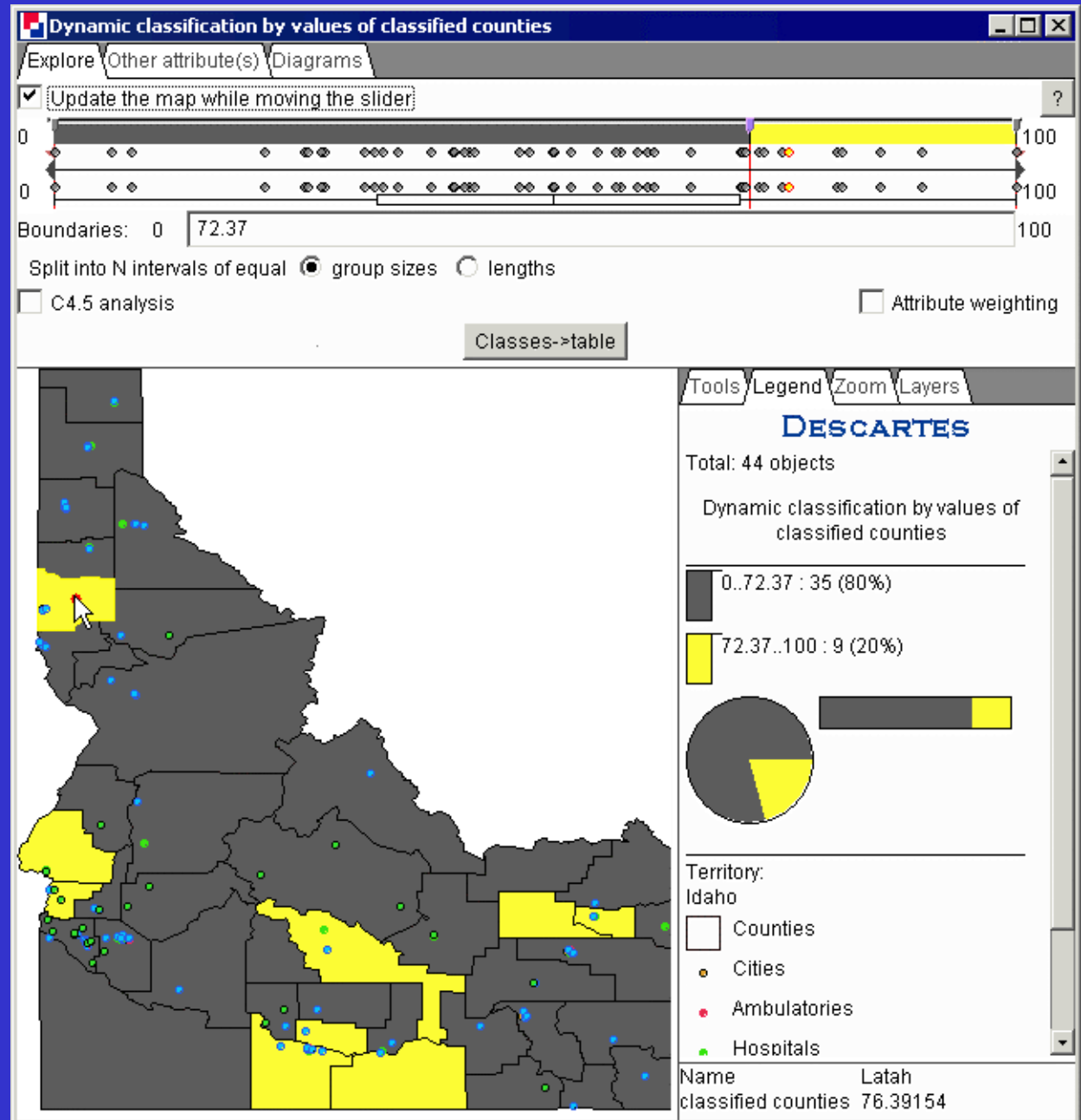


- 0 1 0.10
 - Number of estimated unmet visits
 - 0 1 0.10
 - Percent of population on medicare
 - 0 1 0.10
 - Fertility rate
 - 0 1 0.10
 - Low-weight birth rate
 - 0 1 0.10
 - Availability of emergency medical services
 - 0 1 0.10
 - Availability of obstetrical care
 - 0 1 0.10
 - Burden on on-call providers
 - 0 1 0.10
 - Population farther than 35 miles from the nearest hospital
 - Emergency room visits
 - 0 1 0.10
 - Poverty rate
 - Compute final scores
- Add to table



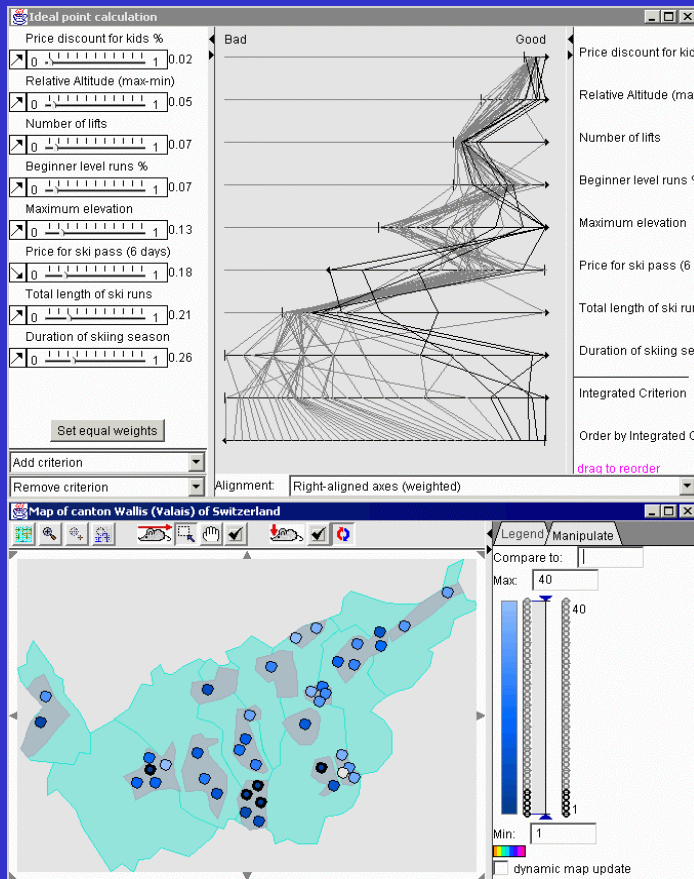
Name	Twin_Falls
Number of estimated unmet visits	14733
Percent of population on medicare	17.80
Fertility rate	88.94
Low-weight birth rate	6.63
Availability of emergency medical services	0.0003
Availability of obstetrical care	0.0009
Burden on on-call providers	2.98
Population farther than 35 miles from the nearest hospital	100
Emergency room visits	18115.0
Poverty rate	13.83

Classification of Ranked Attribute



Spatial Decision Support with CommonGIS

A variety of highly interactive, integrated, computational and visual tools



Multiple Criteria

Cost/Benefit Criteria Priorities

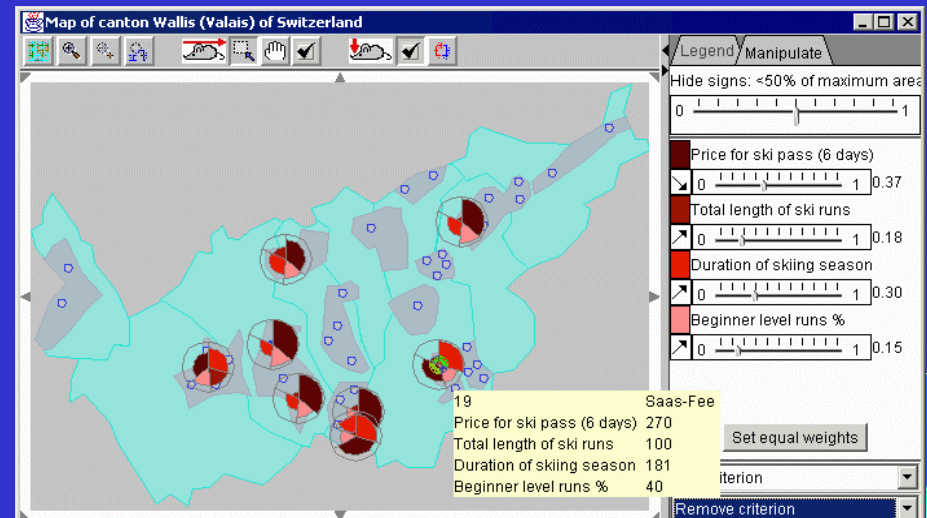
Ranking and Classification of options

Manual editing of ranks

Parallel Coordinate Plots

Utility Bars

Utility Wheels

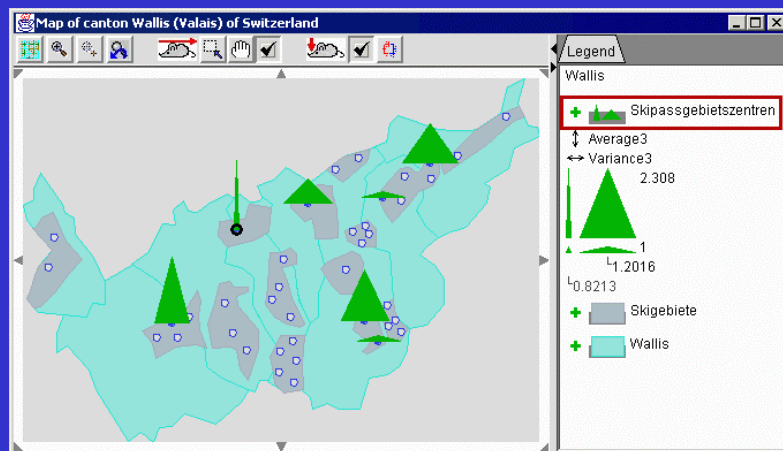
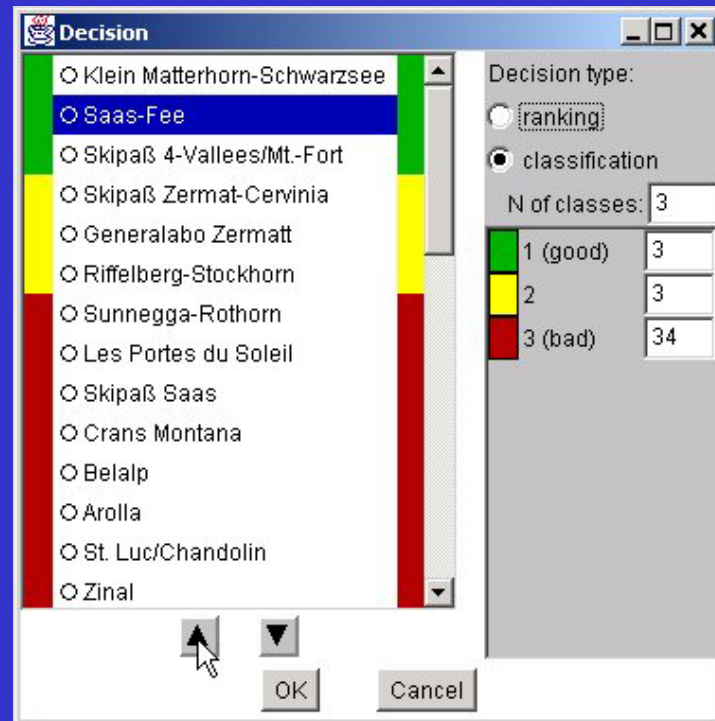


Cooperative Decision Support

Various kinds of voting
procedures

Collection and analysis of
votes

Integration with web-based
groupware tool Zeno



Jankowski, P., Andrienko, N., and Andrienko, G.: *Map-Centered Exploratory Approach to Multiple Criteria Spatial Decision Making*, International Journal Geographical Information Science, 2001, V.15 (2), pp. 101-127

CommonGIS Architecture

