ANALYZE OF USER'S RESPONSE ON 3D CARTOGRAPHIC PRESENTATIONS

Dr. Dušan Petrovič

UNIVERSITY OF LJUBLJANA
Faculty of Civil and Geodetic Engineering
Chair of Cartography, Photogrammetry and Remote Sensing;
Geodetic Institute of Slovenia;
Jamova 2, 1000 Ljubljana, Slovenia

E-mail: dusan.petrovic@fgg.uni-lj.si

5th ICA Mountain Cartography Workshop
Bohinj, Slovenia
29th March – 1st April 2006

Analyze of user's response on 3D cartographic presentations

Introduction

Questionnaire

Results and analyze

Conclusion

Technological development enables easier preparation of different types of cartographic presentations...

Ones of them are 3D presentations – advanced way of presenting relief, appropriate recognition of landscape as third dimension...

But, ... are they only research experiments or they have any practical importance?

The main tasks of map?

- presentation of spatial information,

- communication between cartographer and user.

Cartographer has to recognize user groups, user's needs, their cartographic knowledge, expectations, and preferred medium.

The whole project consisted of five steps:

1. definition of target user groups
2. questionnaire design
3. internet inquiry
4. analysing the answers
5. evaluation of results, suggestions to further 3D map presentations

1. definition of target user groups

- surveyors
- spatial planners
- mountaineers
- scouts
- orienteering runners

2. questionnaire design

In general users use map for:

- recognition of presented objects

- general orientation in the surroundings

- map measurements

How efficient these tasks can be achieved using different types of 3D presentations?

2. questionnaire design

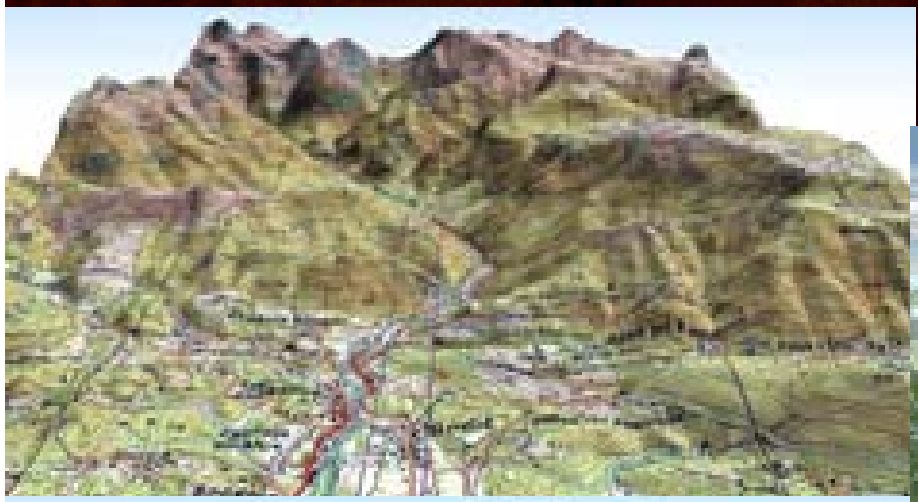
3D cartographic presentations:

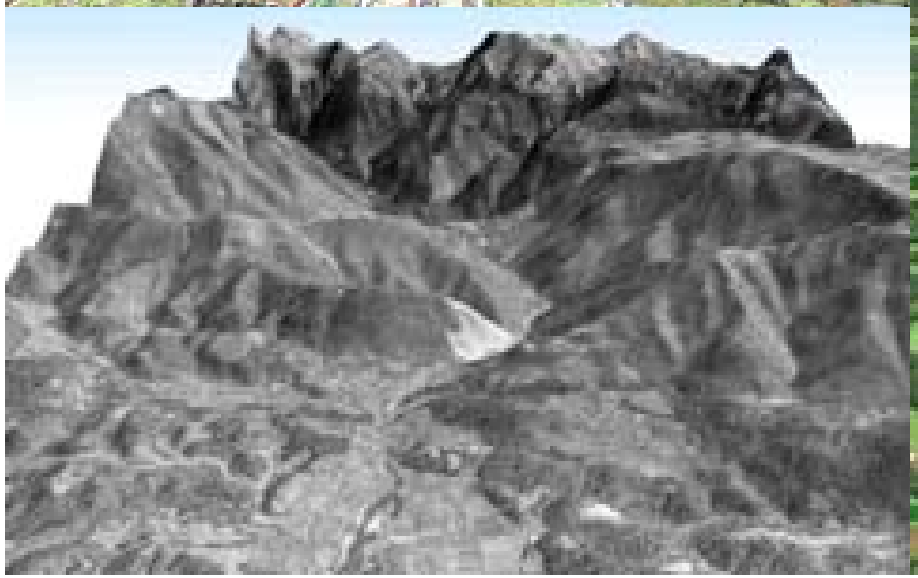
- simple 3D presentations (map, orthophoto over DTM)
- advanced 3D presentation (3D symbolization)
- real 3D presentations (holographs, lenticular)

Dresden

How users see different presentations and how different 3D cartographic presentations (maps) can fulfils user's needs?

2. questionnaire design





2. questionnaire design

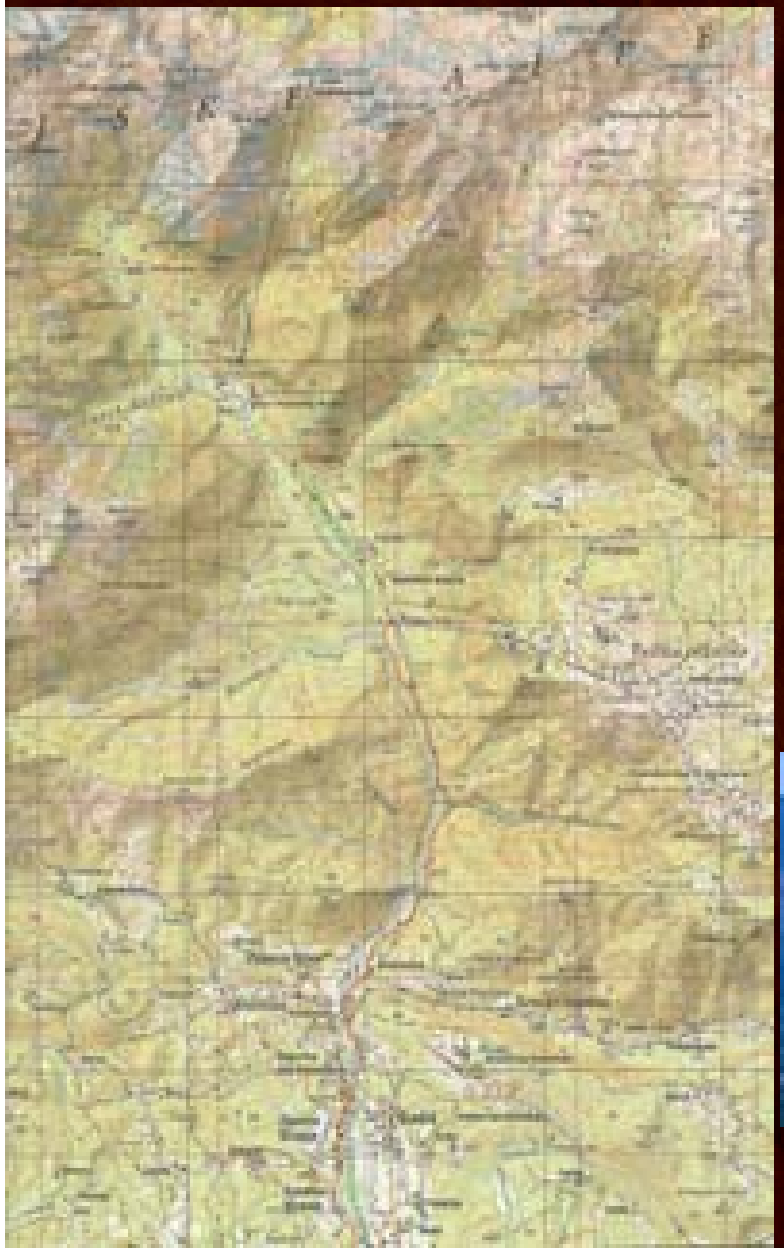
DTM used for 3D presentations was 25 m grid DEM, made from SAR, European space agency (ESA). Accuracy in mountain areas is 13.8 m, but it is homogenous and therefore very suitable for our research.

2. questionnaire design

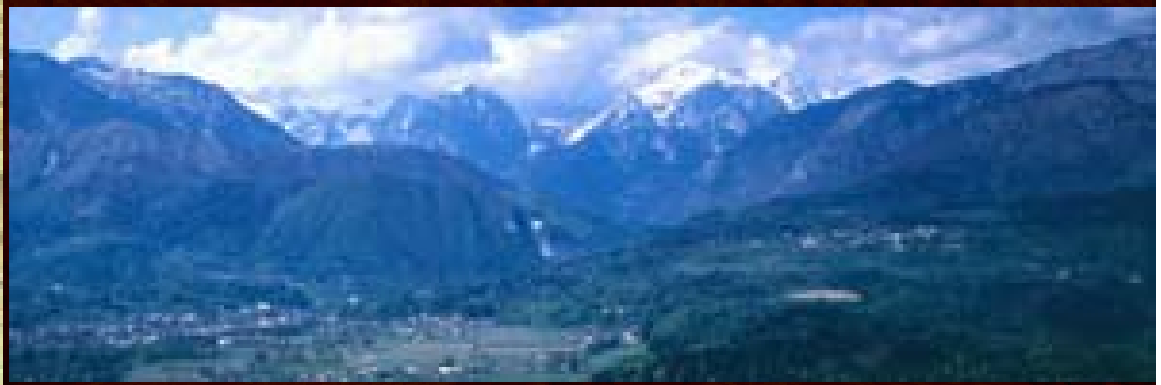
Questionnaire consisted of three parts. In the first one we asked for:

- user's user group (spatial planner, mountaineer, scout, others)
- occupation (surveyor, civil engineer, geographer, architect, geologist, sportsman, other)
- which maps and how often does he use
- does he use maps at job (professional use) or in free time (leisure use)

2. questionnaire design

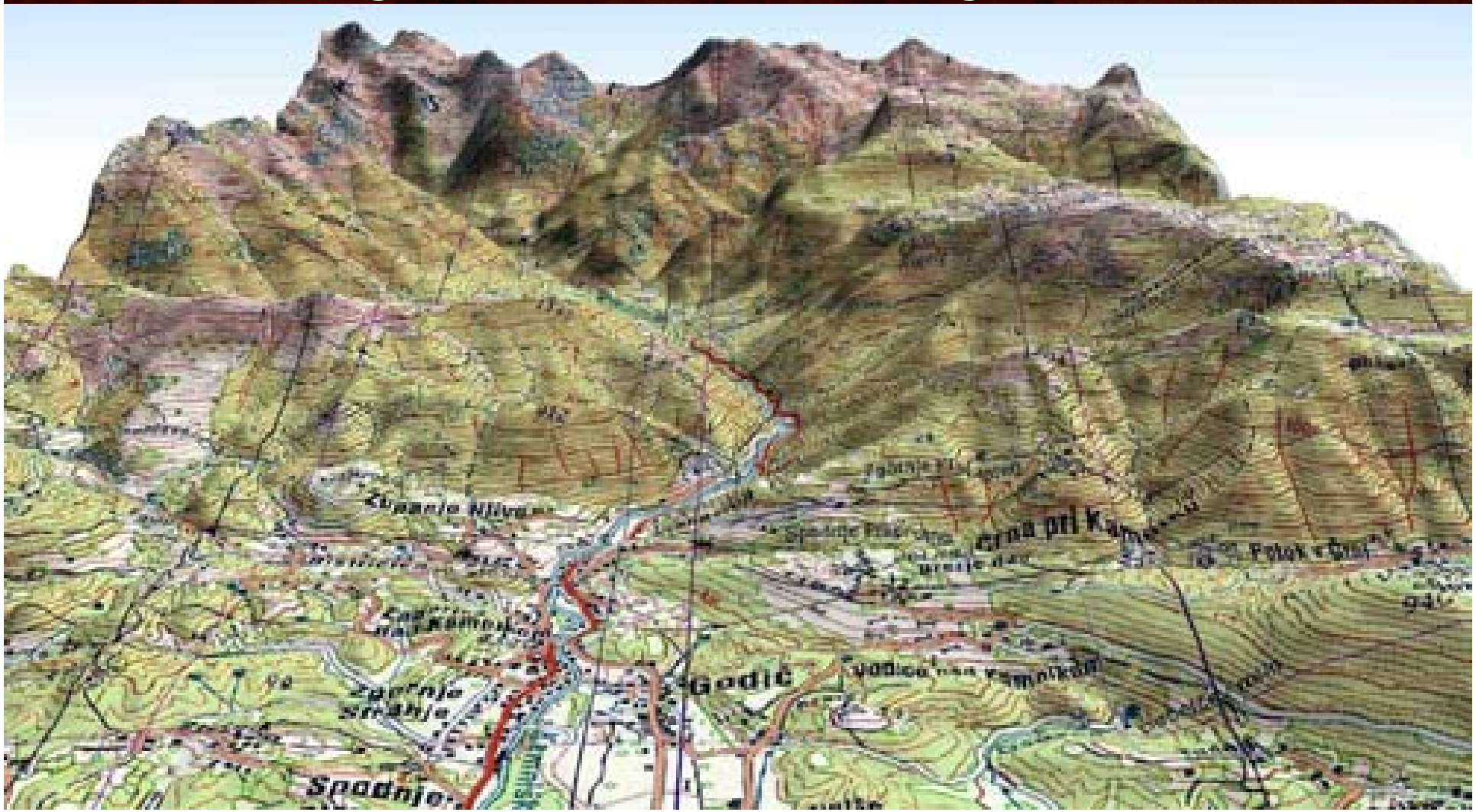


short DTM description,
2D map and photography
of the area for better and
easier comparison



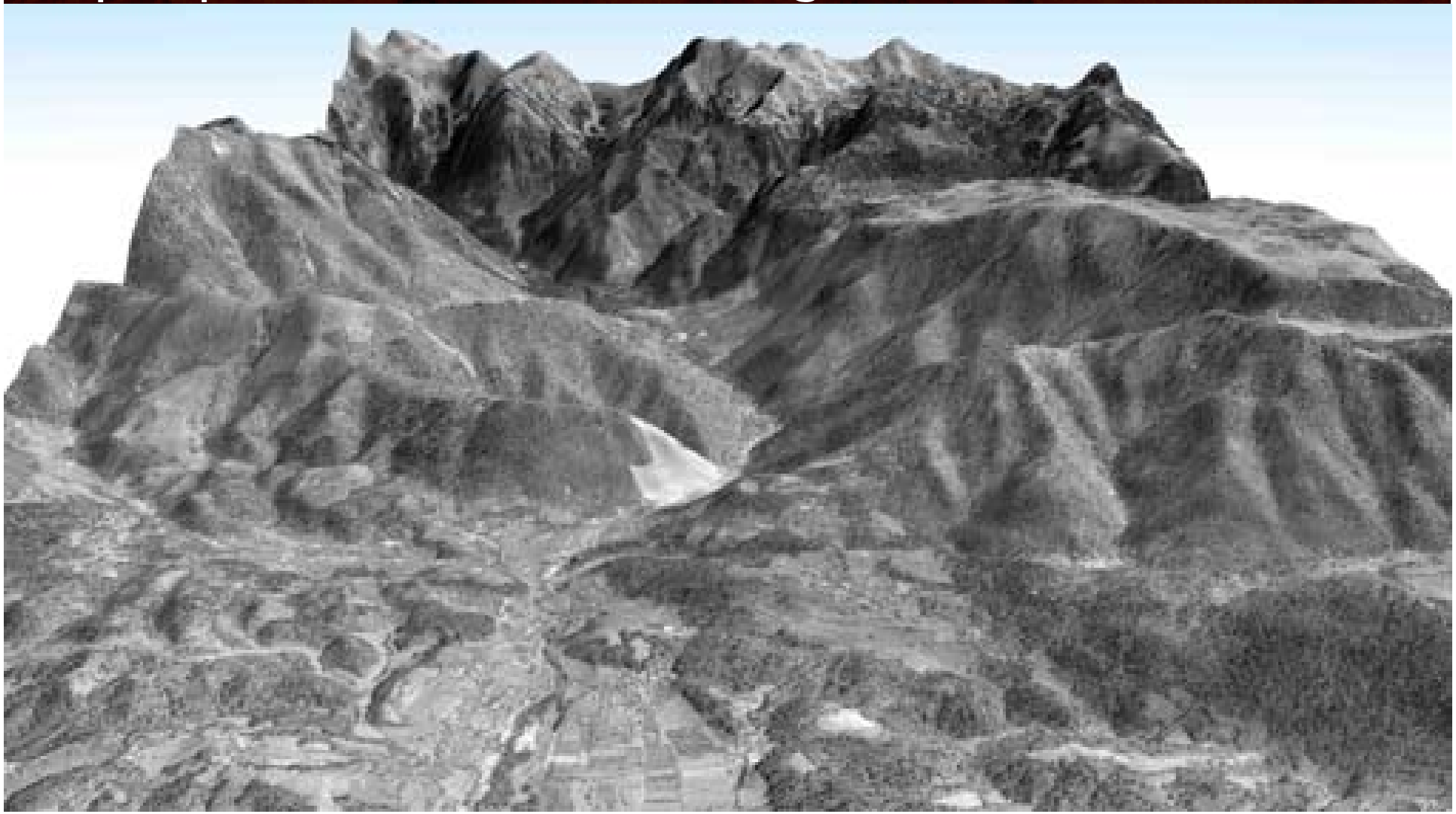
2. questionnaire design

topographic map, draped over DTM, perspective view, hill-shading added, contours and grid



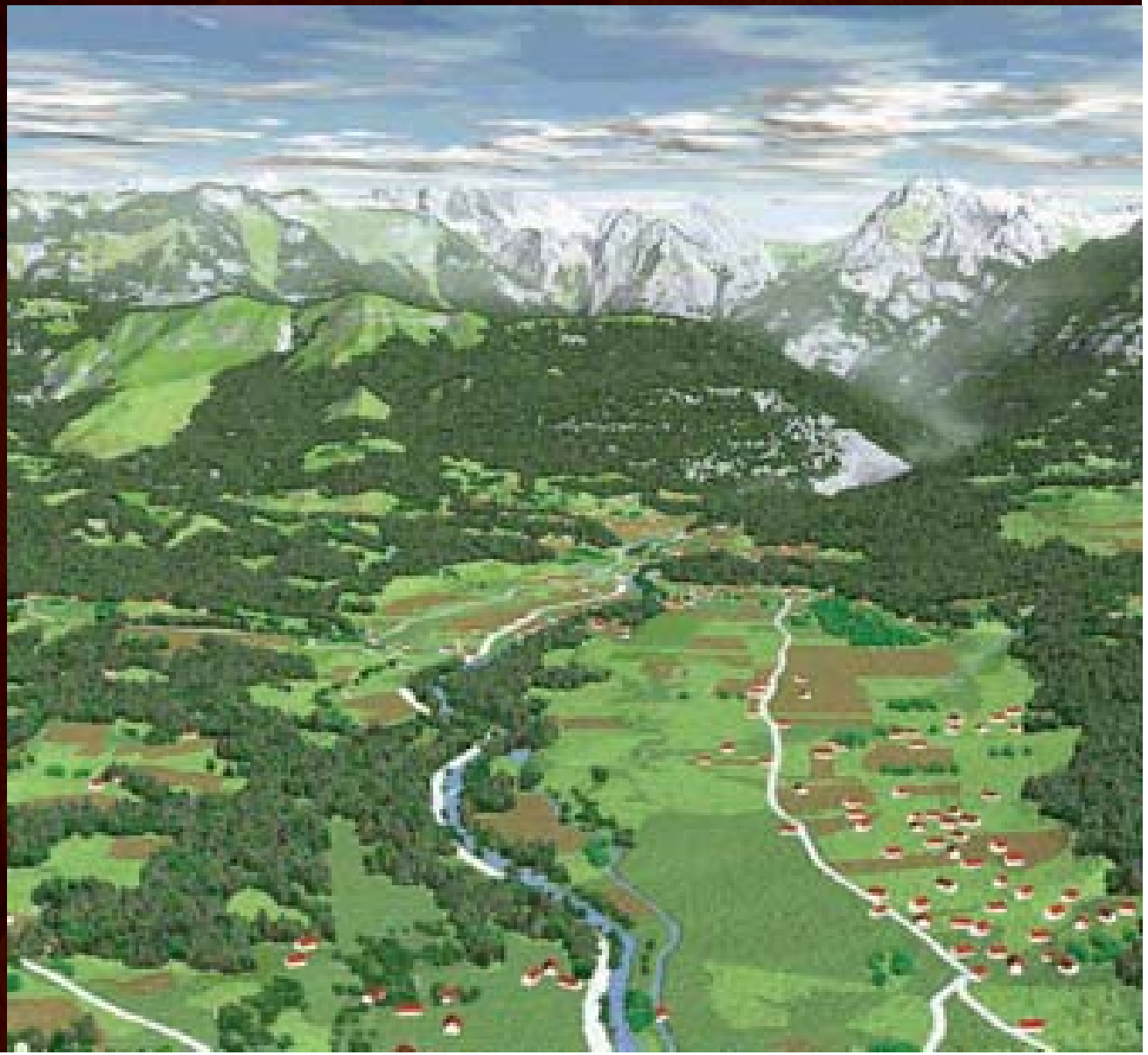
2. questionnaire design

black/white orthophoto image, draped over DTM, perspective view, hill-shading added



2. questionnaire design

3D symbolic presentation, perspective view, atmospheric phenomena



2. questionnaire design

We have asked map users, how they could use three different types of perspective view for similar purposes like they use 2D maps:

- getting numeric data (defining distance and height difference between two points, defining North direction),
- recognition of particular point, linear and area-type objects (building, church, forest, rocks, road, stream and to get adequate impression about the route between two points)

2. questionnaire design

The third part:

- Which 3D presented map would they prefer for their use? ...and Why?
- advantages and disadvantages of 3D presentations!
- Which geographic elements, presented over the DTM are for them the most important?
- Do they prefer 3D map on paper or on digital media?

3. internet inquiry

+ The cheapest and the easiest way

+ Possibility for automated analyse

- Such way of getting user's opinion had indeed some doubts:

- The questionnaire was available only for map user with internet access.

3. internet inquiry

- We didn’t know how many map users were informed about the questionnaire and furthermore how many of them would participate in it.

- And we didn’t know who would fulfill the questionnaire.

- Therefore we decided for short questions, with mostly closed and half-closed questions.

3. internet inquiry

We have asked (by mail) different users and organizations to encourage their members to take part in this questionnaire.

Same appeals were published at some internet pages of organizations, like Mountain Association, Orienteering Association, Scout Association…

3. internet inquiry

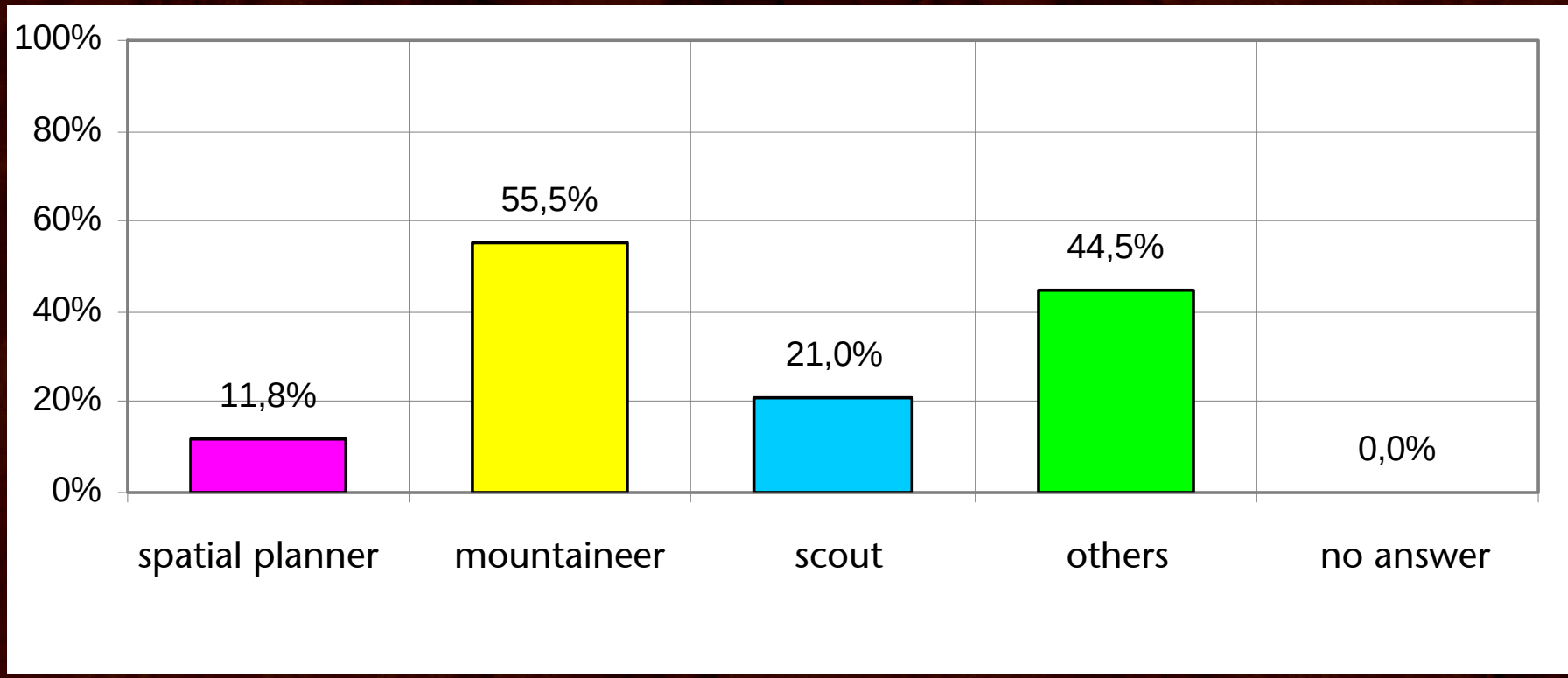
In twenty days (autumn 2004) 420 visits of web page have been recorded, while 119 different map users answered to questions.

An average time for answering the questionnaire was 6 minutes.

All answers have been automatically written in txt file and therefore an automated analyse was performed.

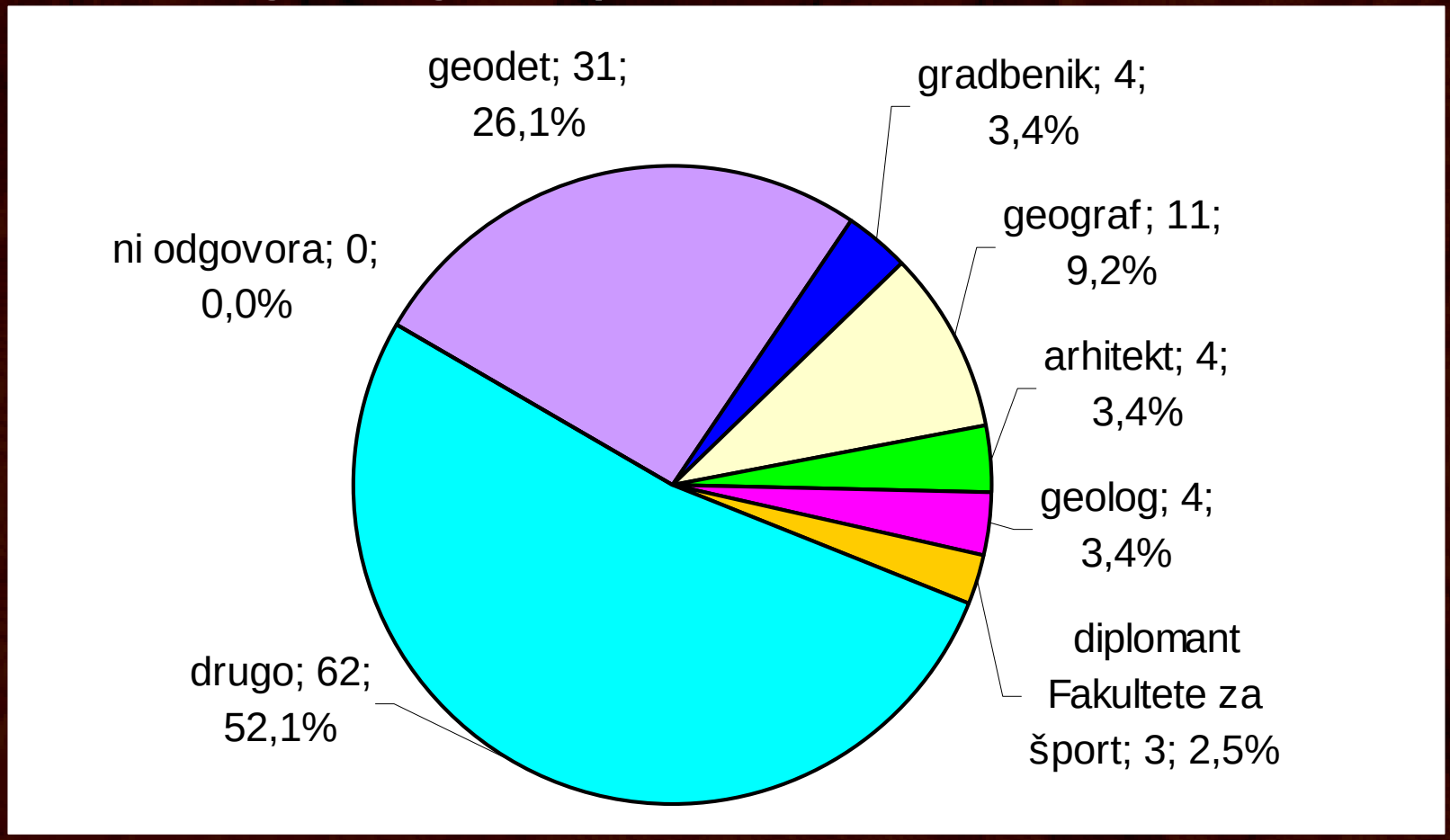
4. results

Map user groups



4. results

occupation (surveyor, civil engineer, geographer, architect, geologist, sportsman, other)



4. results

They were asked which maps do they use and how often. Users uses the most:

National topographic map 1: 25,000
Mountain maps
Road map
City map,
General map
Meteorological map
National and military topographic map 1: 50,000
gap
Tourist maps, basic topographic map 1: 5000, orthophoto maps, orienteering maps, panoramic maps, and satellite image maps.

95% in spare time,
57% at job

4. results

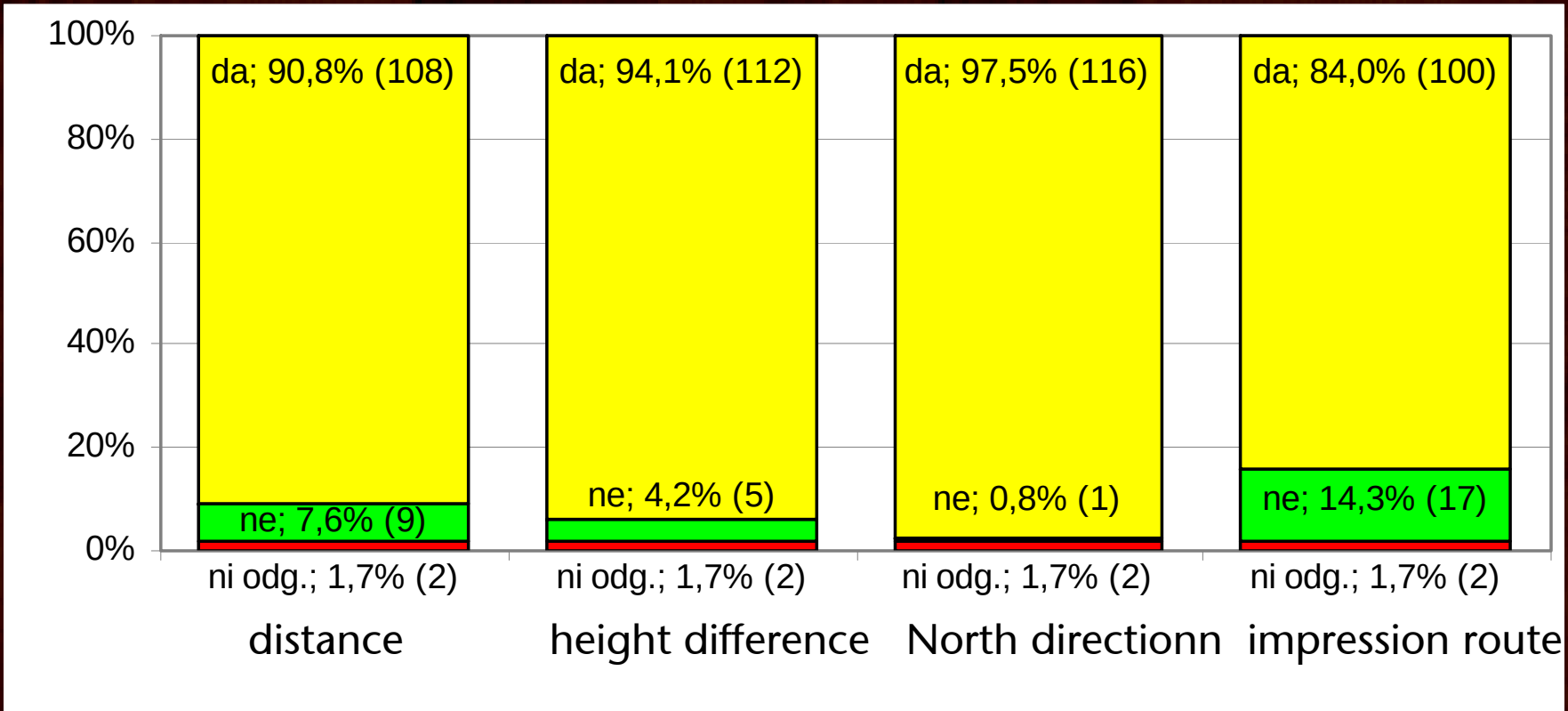
1. could you measure the distance between two points

2. could you measure the height difference between two points

3. could you define North direction

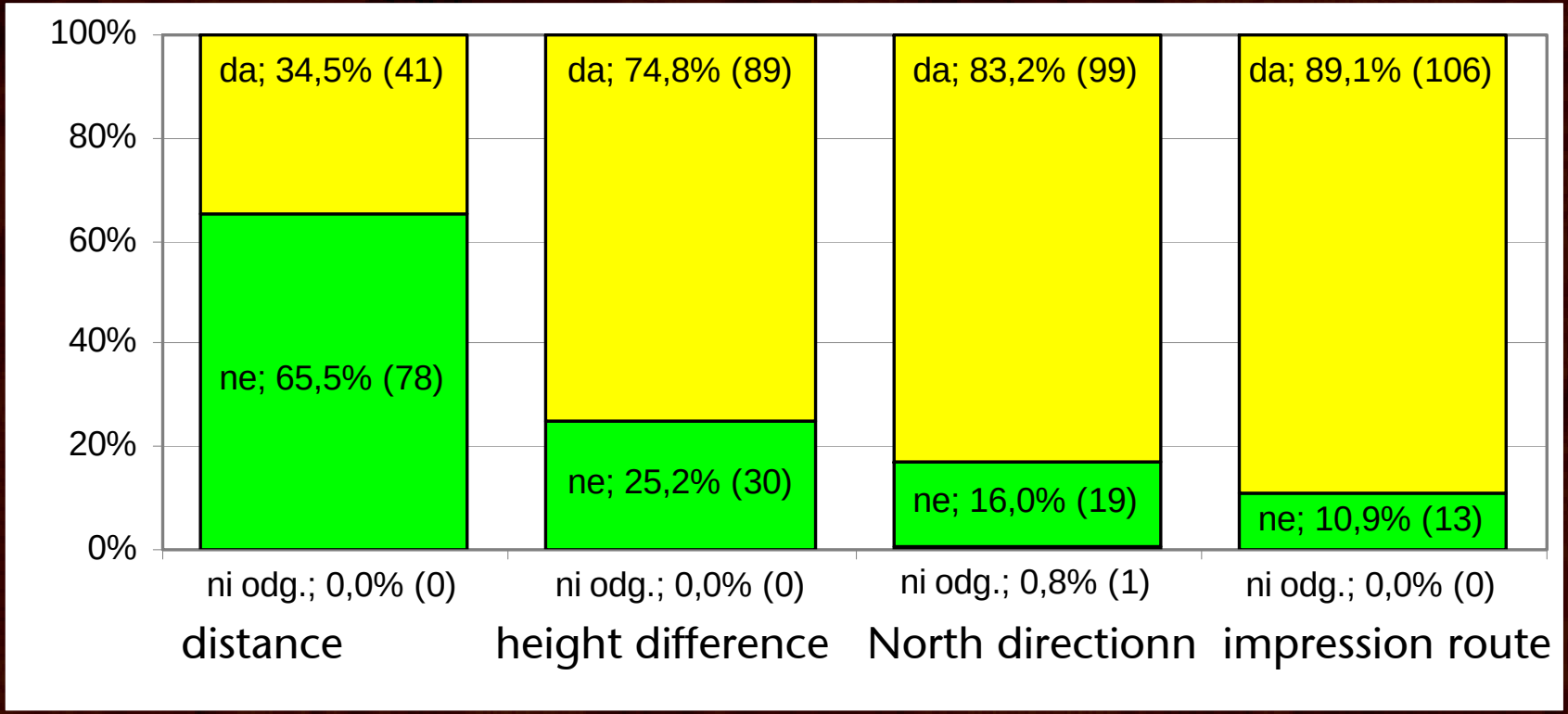
4. could you get adequate impression about the route between two points

4. results – ground plan map



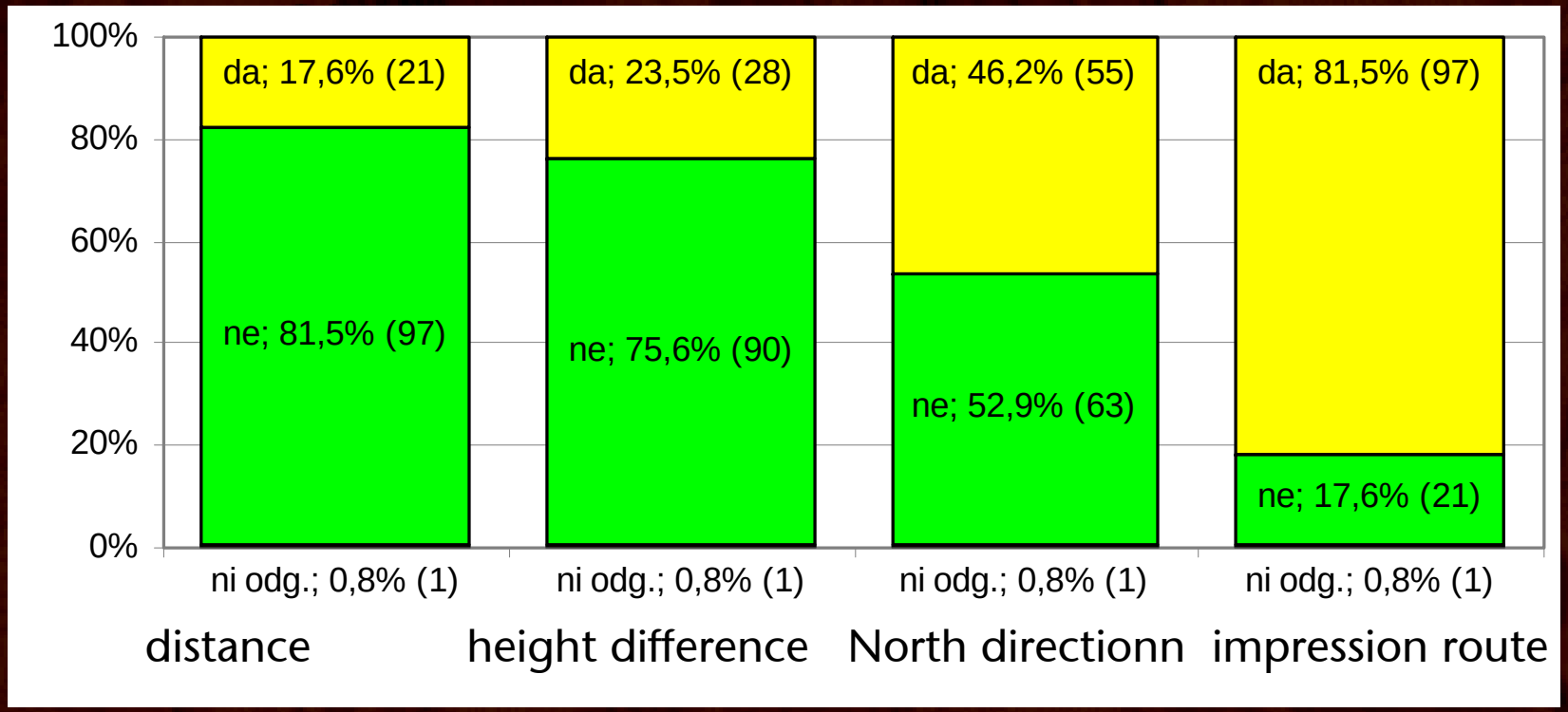
Very good results – user are used to use that kind of maps

4. results – topographic map over DTM, hill-shading, contours and grid

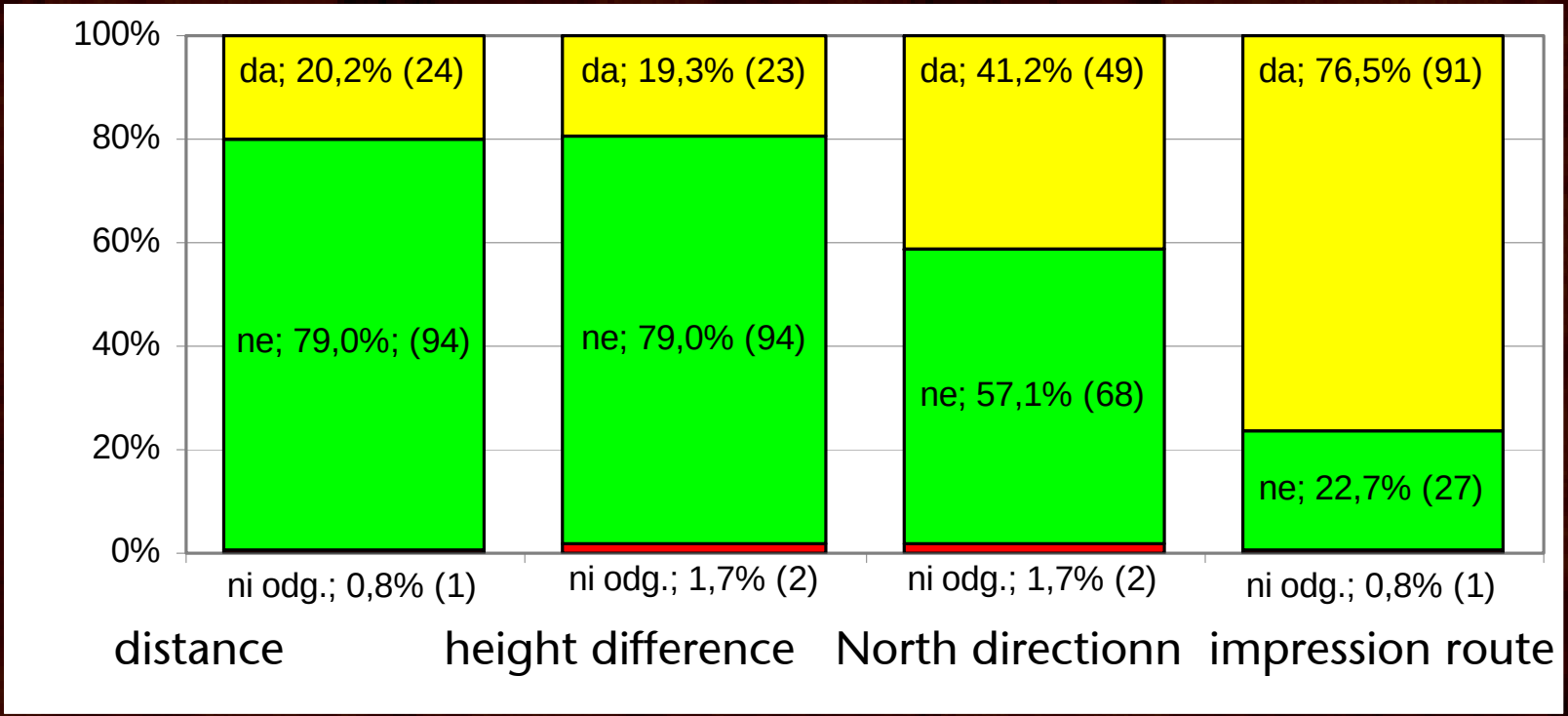


Quite good results – contours and grid helps

4. results – black/white orthophoto image over DTM, perspective view, hill-shading



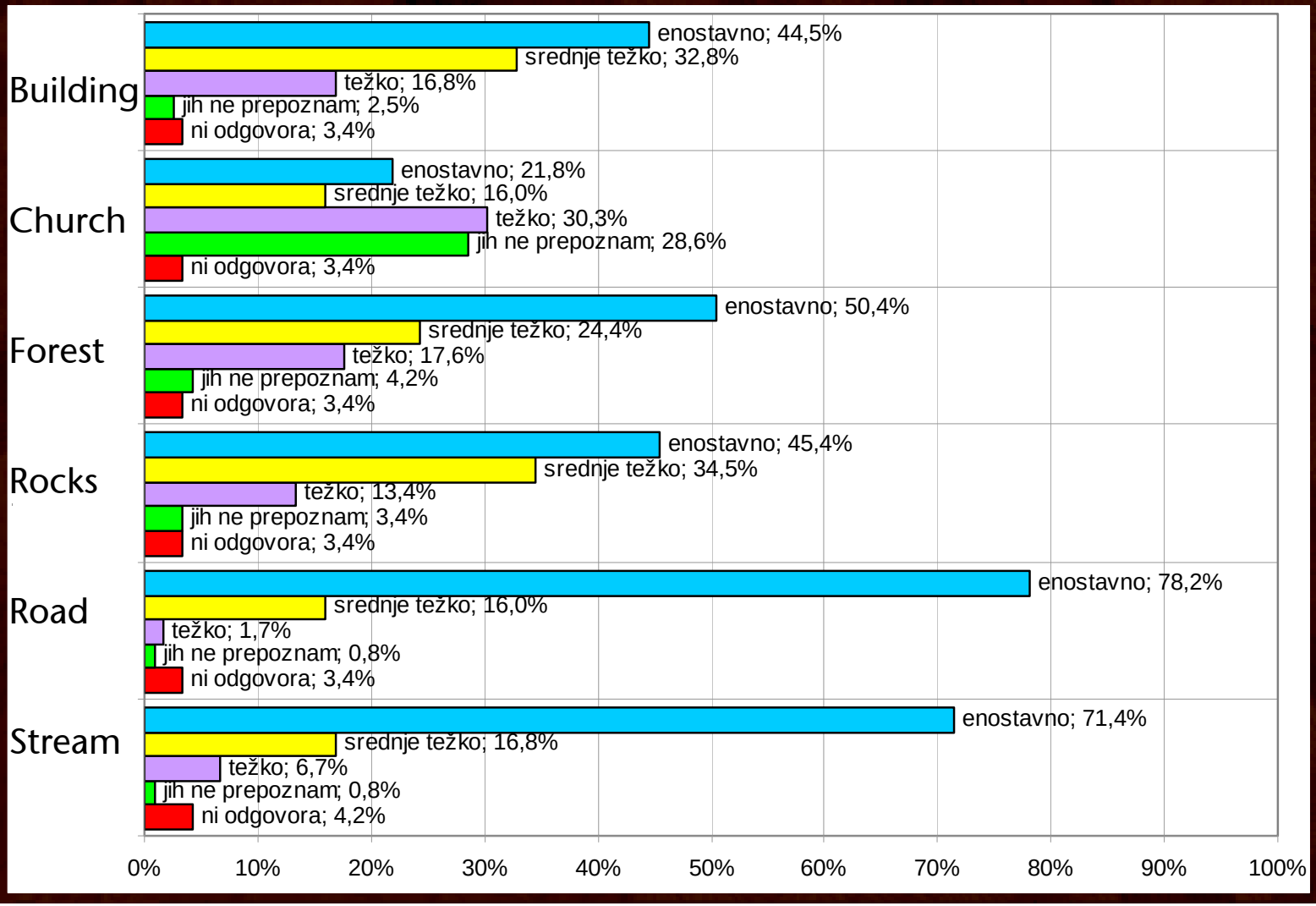
4. results – 3D symbolic presentation, perspective view, atmospheric phenomena



Almost no difference between orthophoto and 3D symbolic presentation, but users favours draped topographic map.

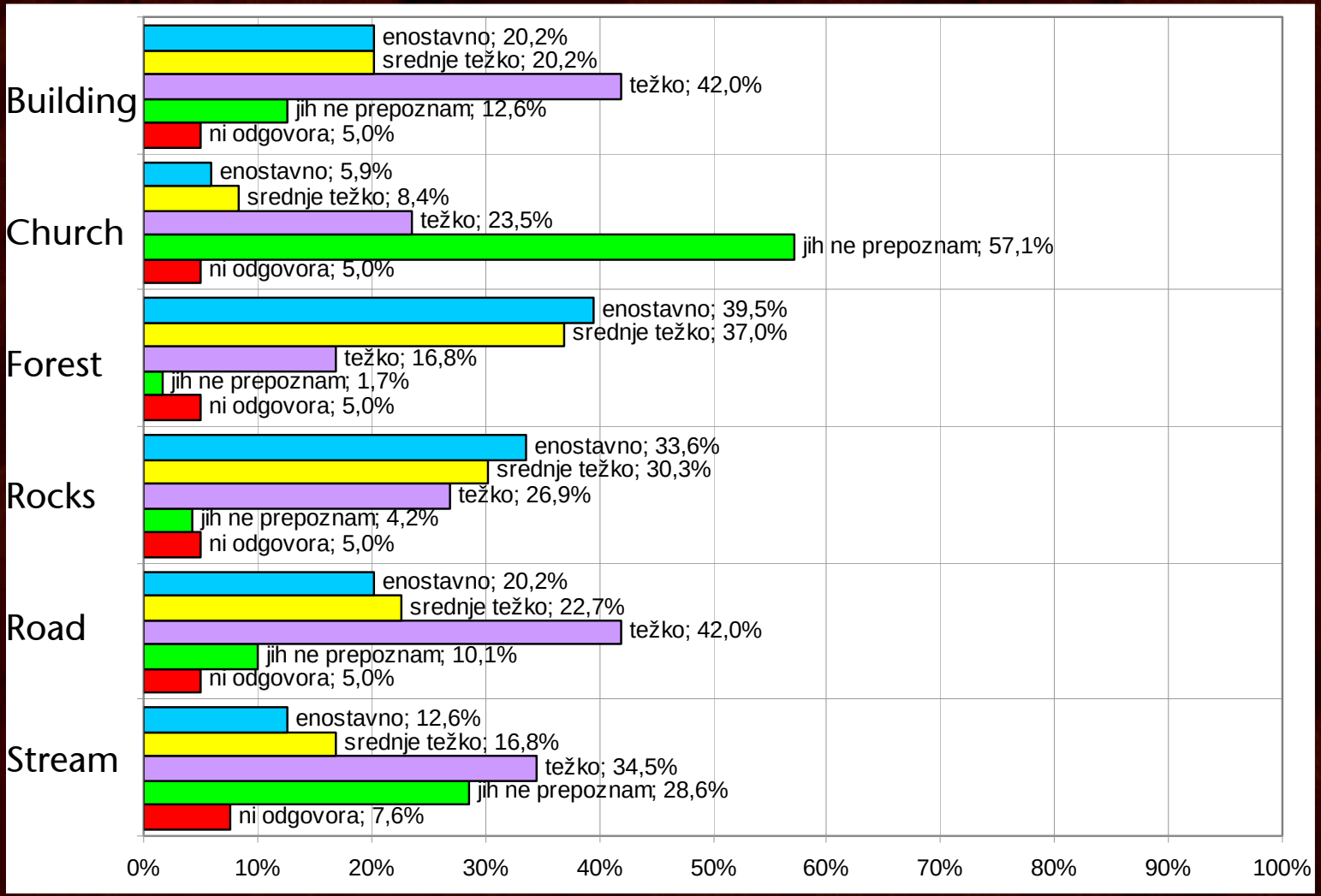
4. results - recognition of some selected objects

topographic map over DTM - legend was not available, recognition based under familiarity with topographic map



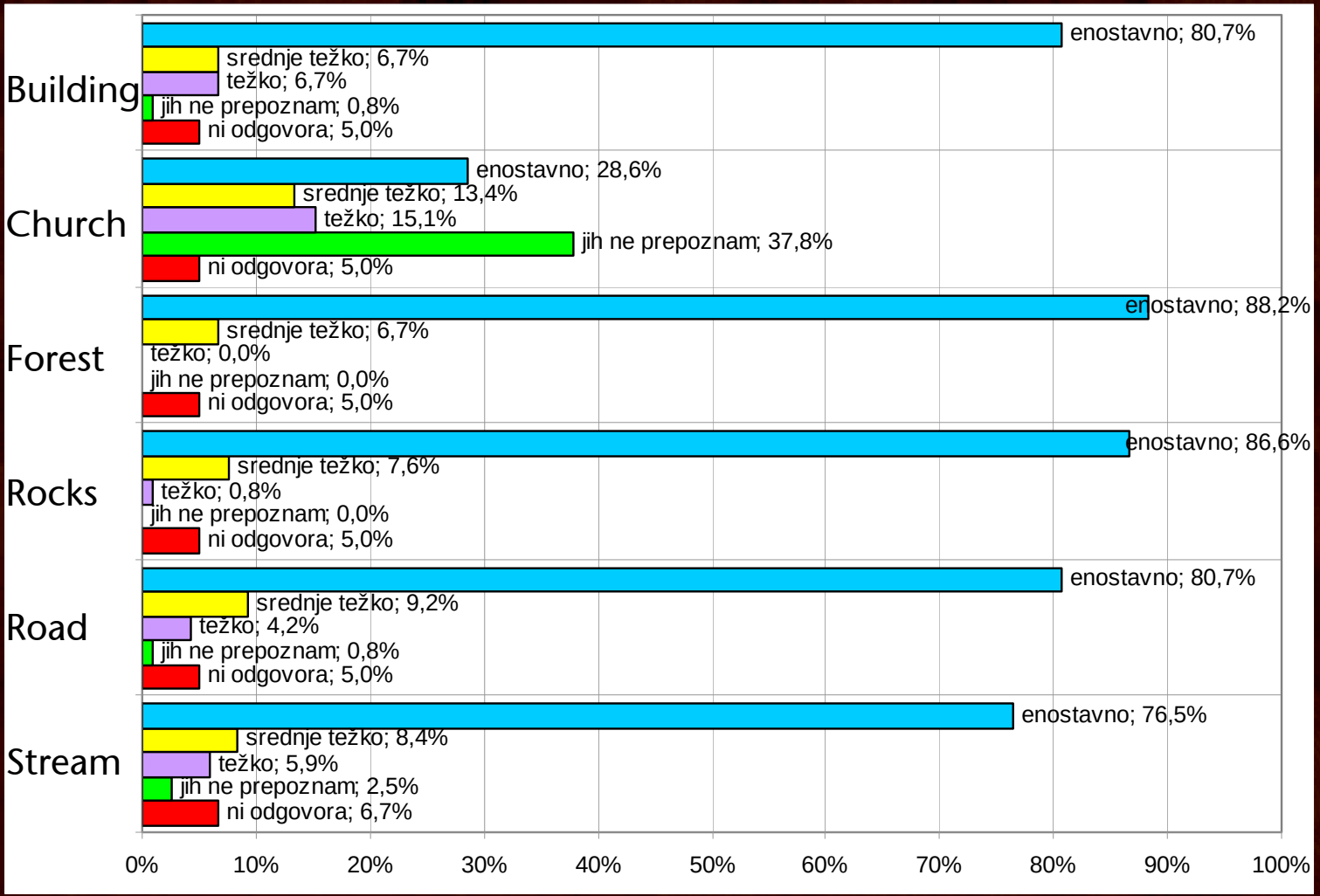
4. results - recognition of some selected objects

orthophoto map – surprise! bad recognition (too small scale)



4. results - recognition of some selected objects

3D symbolic map – surprise again! Even better than topographic map! 3D symbols are very associative!



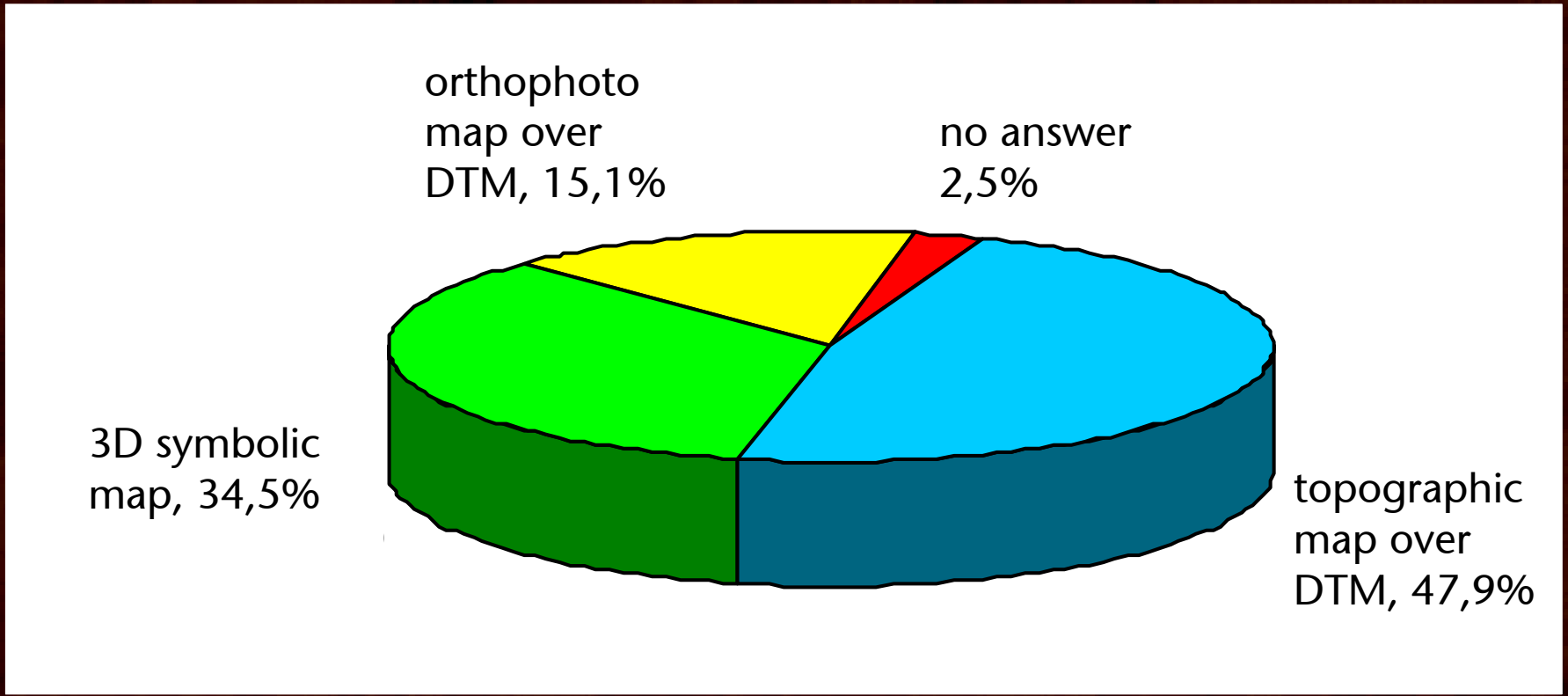
4. results - summary

Draped topographic map has been recognized almost as adequate for height or direction measurements as traditional 2D topographic map, while distance measurements bring more problems. The other two examples were evaluated nearly equally, they gave only limited accessibility for proposed measurements.

4. results - summary

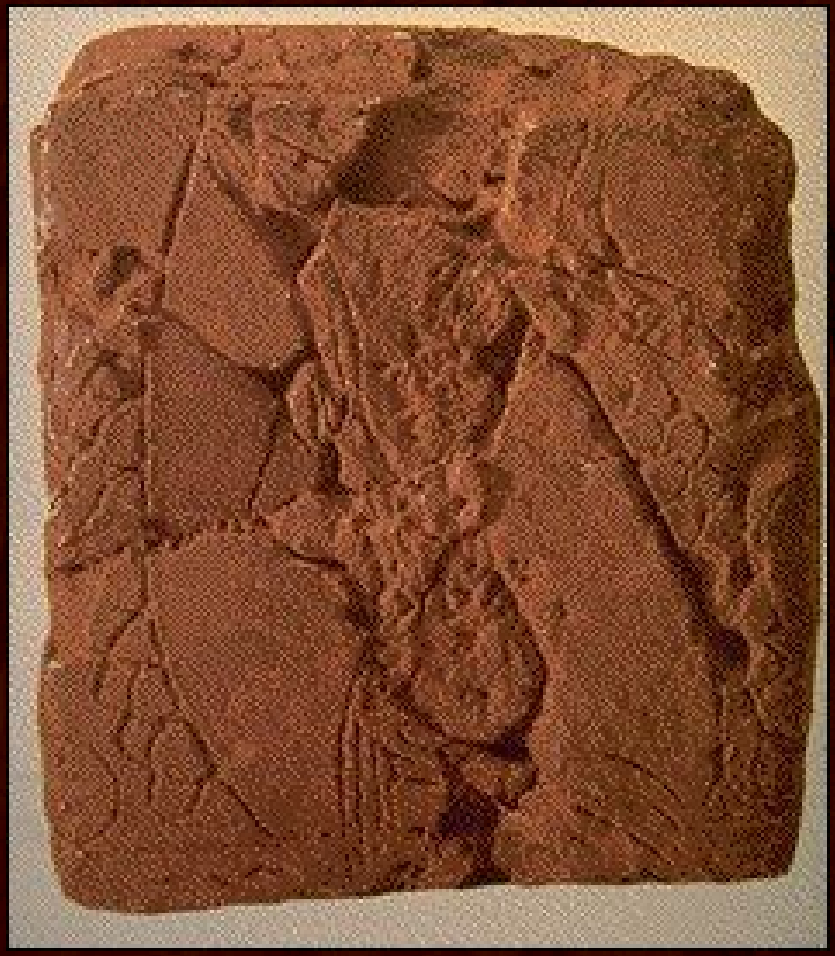
Possibilities of recognition particular objects gave different order. Although the users are familiar with 2D topographic maps and therefore they know symbols presenting particular objects in draped topographic map, users found 3D symbolic presentation as much suitable for recognition majority of proposed objects.

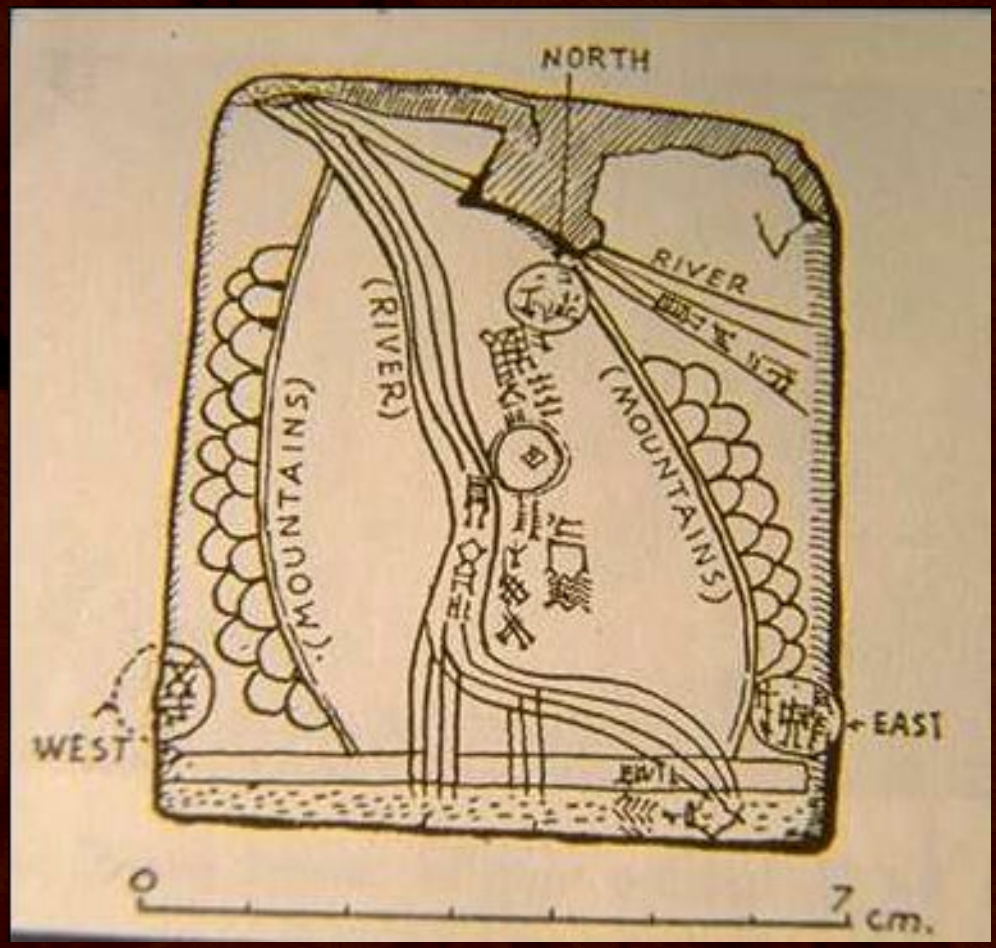
4. results - Which 3D presented map would you prefer for your use?



Do this mean that 2D relief presentations (with contours) are the most usable ones?

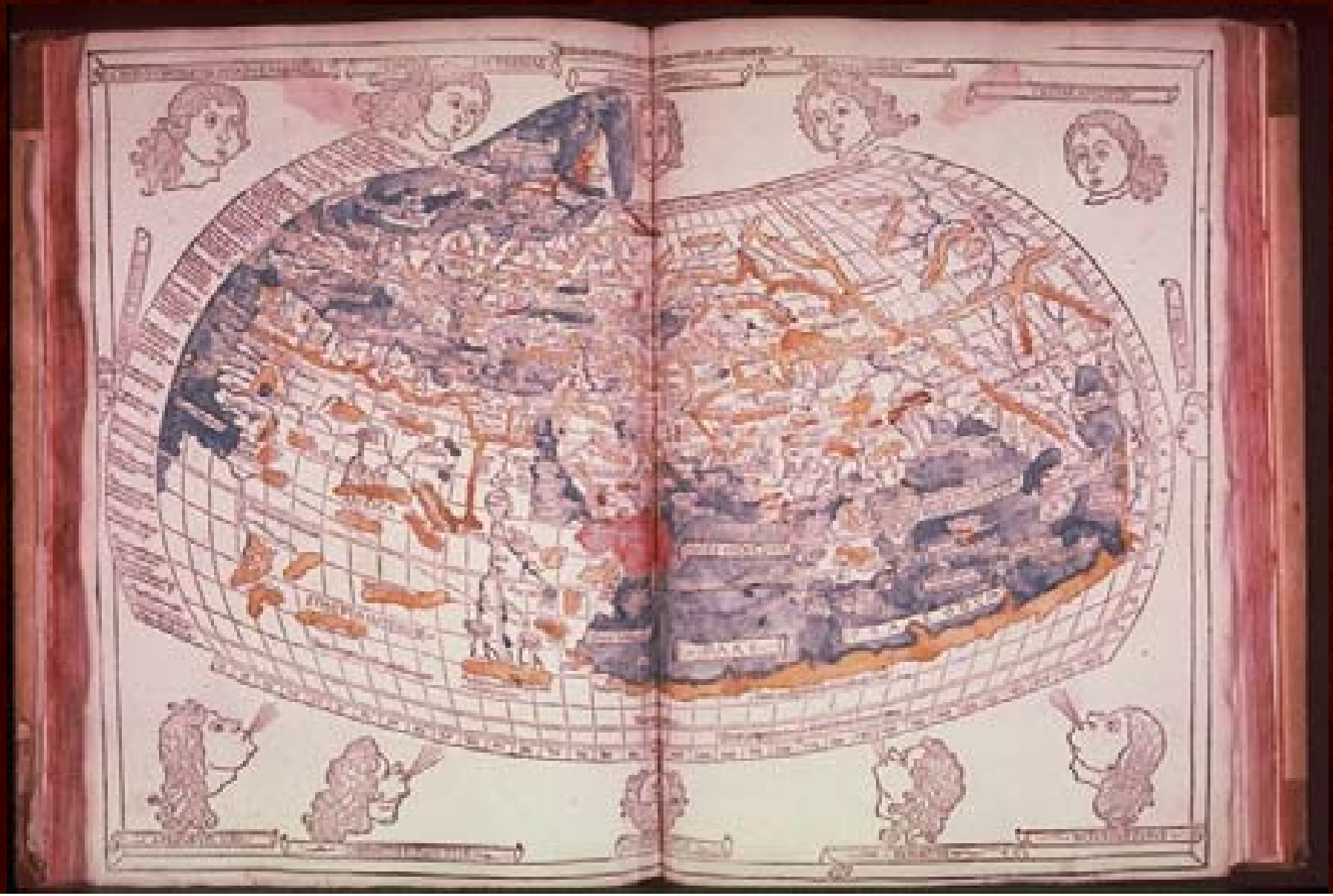
Historical overview:





We all can recognise this map.
First known maps were 3D maps like!

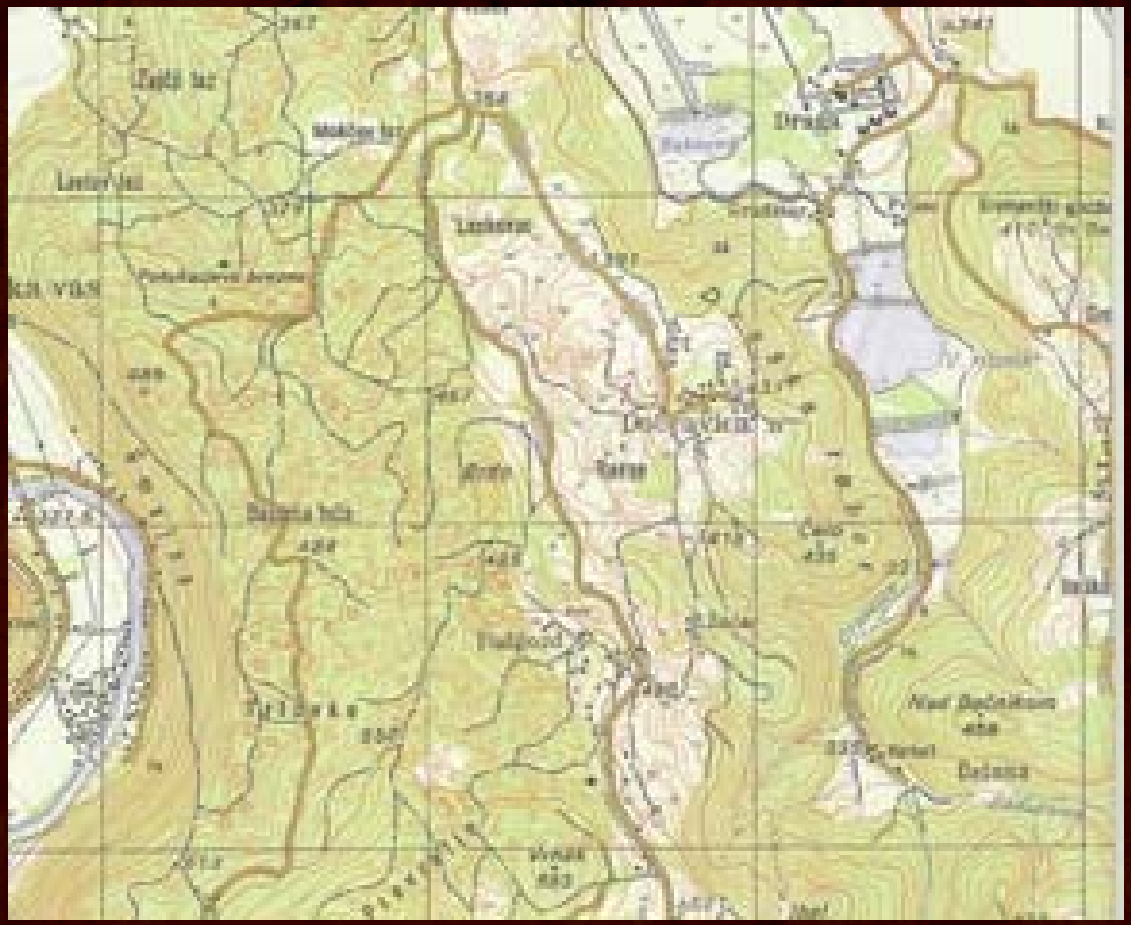
Historical overview:



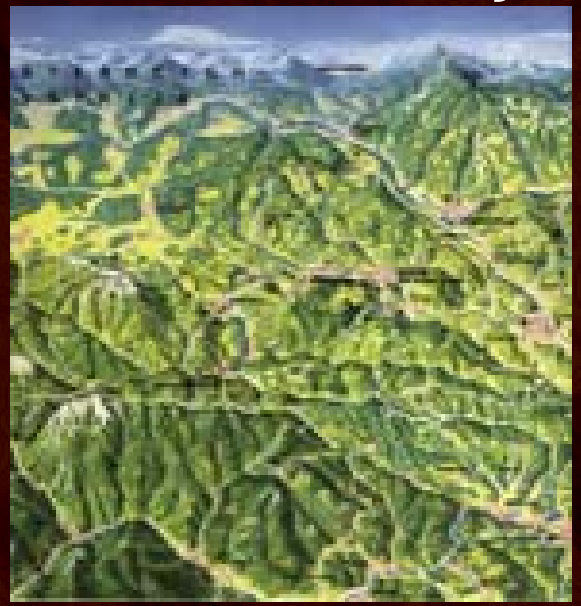
Historical overview:

Historical overview: Relief was represented in 3D way until 18th cent.

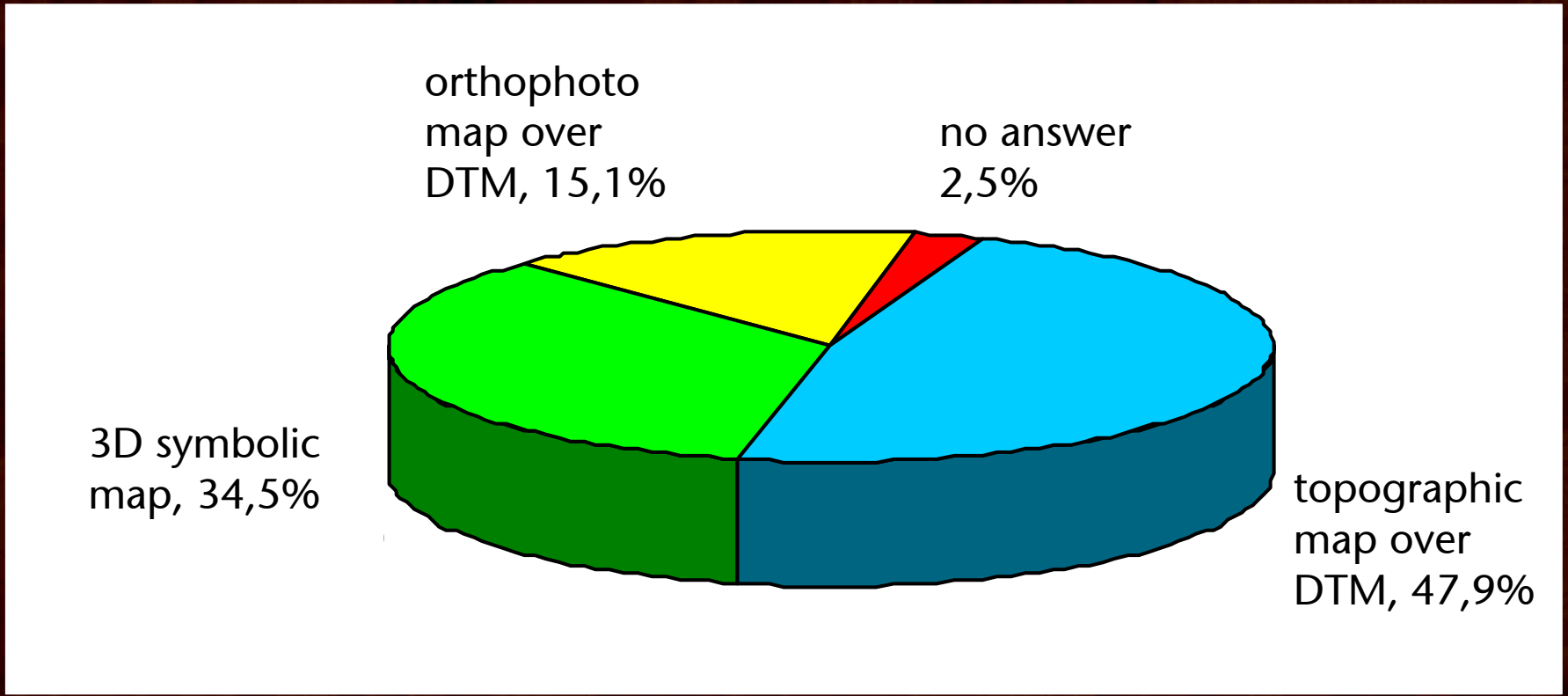
Historical overview:
last two cent. – ground plan maps with 2D relief presentation (contours) are prevalent



panoramic maps are in minority



4. results - Which 3D presented map would you prefer for your use?



Since users mostly use topographic and other 2D maps it is natural that topographic map is the most wanted one. ... ???

Conclusions

Evaluation of results, suggestions to further 3D map presentations ???

Cartographer have to
partly consider user wishes and
partly teach them to use new types of maps and other presentations.