The issue of time pressure in map-based decision making

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Problem statement

In many situations in life, decisions are taken based on maps and under time pressure. Examples include activities in life-threatening situations such as search and rescue, evacuation, orienteering, military operations, or leisure activities such as orienteering competitions or handling complex traffic situations. In emergency situations, map-based decisions under high time pressure can even decide between life and death. For these situations, it is crucial to have a map at one's disposal which supports efficient decision-making.

However, very few empirical map use studies in geovisualization have considered the issue of time pressure so far. While in previous studies about the efficiency and effectiveness of map-based decisions some conclusions could be drawn about the influence of different map display types, individual or group differences, or interactivity, very little is known about the effect of time pressure on map-reading in general, and which interaction effects exist between time pressure and other factors. We have tried to fill this research gap by a set of experiments about map-based decision making under time pressure, in which we have used time pressure as a controlled variable.

Experimental work conducted

So far, we have conducted four controlled user experiments about the effect of time pressure in map-based decision making on desktop computer screens. In the first experiment, we have assessed the effect of time pressure on map use preferences for different map types and interactivity tools in a road selection scenario. One of our findings was that participants preferred satellite images more when not under time pressure, while preferences for other map types were not significantly influenced by time pressure.

In the second experiment, we measured response accuracy and confidence of participants in a road selection task with road maps and satellite images. We found an increase of overall confidence with more available response time, but no significant increase of accuracy. In general, participants took more accurate decisions under time pressure with the road maps, but were more confident in the decisions taken with satellite images.

The scenario of the third experiment was slope detection with 2D- and 3D-looking maps. In this experiment, both overall accuracy and confidence increased with more than 20 seconds response time, but decreased significantly with more than 40 seconds available response time. However, accuracy and confidence were also dependent on the different map types tested (slope maps, topographic maps, shaded relief maps).

In a fourth and final experiment with virtual globes, we found that several interactivity tools were used significantly more without time pressure, but their usage did not lead to higher accuracy or confidence.

Further work

In this workshop, we would like to discuss the possibilities to further investigate this aspect of time pressure in map-based decision making and other areas of geovisualization, in order to find out how robust the patterns of speed-accuracy and speed-confidence trade-offs actually are. Areas of possible further research include particular map-based decision making under time pressure with small-sized mobile devices, which might become the new standard for map-based decisions under time pressure in the next years, or a stronger focus on different user groups (experts / novices).