EVALUATING THE INFLUENCE OF TWEENING ON HUMAN CHANGE PERCEPTION IN ANIMATED CHOROPLETH MAPS

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Introduction

Animated maps and dynamic graphics have become more prominent in recent years. Computer animation enables cartographers to visualize time-series data as never before; we can build dynamic sequences that congruently depict change over time. However, recent research has found that readers have difficulty comprehending changes within these animations, and that viewers of animation often fail to detect important changes between adjacent scenes. One inherent problem with these displays is that they require users to 1) notice, 2) attend to, and 3) decode simultaneous change signals during rapid scene transitions. These potentially overwhelming perceptual requirements threaten the effectiveness of animated maps because several important changes can occur simultaneously throughout the display during a single scene transition.

Objectives

One potential cartographic solution for this problem involves graphic interpolation between display frames, also known as "tweening." Tweening enables cartographers to 1) smooth and 2) lengthen the duration of transitions in animations. By reducing the rate of change, as defined by DiBiase et al. (1992), between adjacent display frames, tweening may reduce some of the difficulties with animated map reading. This research evaluates the influence of tweening on map-readers' abilities to comprehend changes within animated map displays. Our preliminary research has demonstrated that tweening reduces the rate of change by increasing transitional durations, but whether this reduction enables map-readers to comprehend more changes remains unknown.

Methods

An experiment with human-subjects was conducted where subjects viewed tweened and non-tweened animated choropleth maps. The subjects viewed two scenes of an animated choropleth map series. Subjects viewed the first scene for three seconds followed by the second scene after a tweened or non-tweened transition. In the second scene, an enumeration unit was highlighted and subjects were asked to indicate whether the unit had changed or remained the same. Subjects were then given more complex questions asking not only, whether the unit changed, but were asked to indicate the original state of the enumeration unit.

Results

The results of this study indicate that elongating the duration of change reduces the rate of change, and tweening can be employed to stabilize the appearance of animated maps. In this study, the reduction of the rate of change due to tweened transitions helped to reduce the perceptual difficulties, including change blindness, associated with apprehension of animated maps.

Conclusions

Our findings provide feedback on several levels. With this study we hope to provide a better understanding of how humans are affected by adjustments in the duration of change in animated choropleth maps through tweening. Empirical results will allow cartographers to create more effective animated maps with tweened transitions allowing map users to better perceive changes in the map display. In this way, we cartographers can generate more effective animations and reduce change blindness in animated choropleth maps.

References
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