ABSTRACT

Perceptual-Cognitive Assessment Of Animated Mapping Techniques For Geovisual Analytics

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Animated maps are important geovisualization tools for performing exploratory spatial data analysis. Novel techniques like animated heat mapping and cumulative animations extend the conventional method for rendering spatial time-series data. However, their utility and effectiveness are greatly impacted by underlying cognitive and perceptual issues, particularly for the visualization of heterogeneous spatiotemporal data. This study presents the results of a performance assessment designed to evaluate the cognitive and usability issues occurring in a) animated dot density and heat maps; and b) standard and cumulative display methods. A within-subjects experimental design was used to perform geovisual analytics on a four-year bivariate crime dataset for Trinidad & Tobago. Cognitive patterns of the sampled population and the influence of animation pace and user-control on usability were examined using a mixed-methods approach. The results indicate that spatial cognition is differently affected based on the animation technique and the user's perceptual-cognitive abilities. It was determined that pace and interactivity design are vital to the effectiveness of map animations as they cater to the needs of users with diverse cognitive abilities and viewing objectives. Overall, the study established that the use of animated maps for spatial decision support is enhanced through prudent map design and visuospatial skills development.

Keywords: Dina Khadija Benn; animated maps; geovisualization; cognition; spatiotemporal heterogeneity.