

Relevance of 3D in Scientific Visualization: A Geodesign Focus

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Position paper

Three dimensional (3D) visualizations appear to be attractive for public use given that Google Earth has been reportedly downloaded one billion times as of October 2011 (BOOKEY et al. 2012) and non-expert individuals declare that they use it for various purposes (BOER et al. 2013). Scientists also commonly employ 3D; e.g. for education, analysis and communication and in diverse tasks such as simulations, visibility analysis for urban planning, climate change monitoring, crime scene analysis, observing star formations, or insilico drug discovery (YANG et al. 2007; DENZER et al. 2011; MCDONOUGH 2012; WISHART et al. 2006; BORKIN et al. 2008; GOODMAN et al. 2009; BODUM 2006; WISSEN HAYEK 2011). However, despite its popularity, recent user studies provide mixed evidence on the benefit of 3D visualizations. For example, BORKIN et al. (2011) demonstrate that doctors diagnose coronary artery disease significantly better with a 2D visualization when compared with a 3D alternative. Similarly, HEGARTY et al. (2009) demonstrate that people's intuitions and performances regarding realistic 3D geovisualization displays do not match; i.e., people like realistic 3D and estimate that these type of displays are good for the task, but in some cases they are simply wrong. There are also studies demonstrating the opposite, e.g., visualizing information in 3D can be critically helpful in identifying anomalies (LI et al. 2010). These findings urge us to rethink on the role and relevance of realistic 3D representations across domains and tasks. In this position paper, we review the current user studies on 3D visualization and based on this review, discuss the directions of future research to establish exactly for what kinds of tasks we can recommend 3D and when we should possibly avoid it or support it with a linked 2D view.

These questions are relevant to all disciplines that work with visualizations, and clearly apply to geodesign. As a young discipline, perhaps "geodesign" is still establishing an identity as a bridge between various related scientific branches; most prominently perhaps between geographic information sciences and (urban or landscape) planning (FLAXMAN 2010). While there seems to be enthusiasm for 3D and realism (understandably, planning tasks appear to make the "walk-through" or "sense of presence" desirable features to better understand the consequences of the plan), we ought to reflect on precisely when (for which task) these choices are the correct ones. In this study, the findings from user studies in related domains in the current body of knowledge are projected in geodesign related tasks and a critical approach is proposed.

Keywords: 3D visualization, realism, user studies

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