
Tangible Landscape

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Abstract

Tangible interfaces for spatial modeling combine embodied, kinaesthetic interaction with spatial computations. Theoretically this should enable users to intuitively interact with multidimensional digital models of space, offloading challenging cognitive tasks onto the body and computationally enhancing how they think about space. We have designed Tangible Landscape – a tangible interface powered by a geographic information system (GIS) that gives 3D spatial data an interactive, physical form so that users can naturally sense and shape it. Tangible Landscape couples a physical and a digital model of a landscape through real-time cycles of physical manipulation, 3D scanning, spatial computation, and projected feedback. Through a series of 3D modeling experiments assessed using both quantitative and qualitative methods we determined that Tangible Landscape can improve 3D spatial performance. Participants produced more accurate models that better represented morphological features with tangible modeling than they did with either digital or analog, hand modeling.

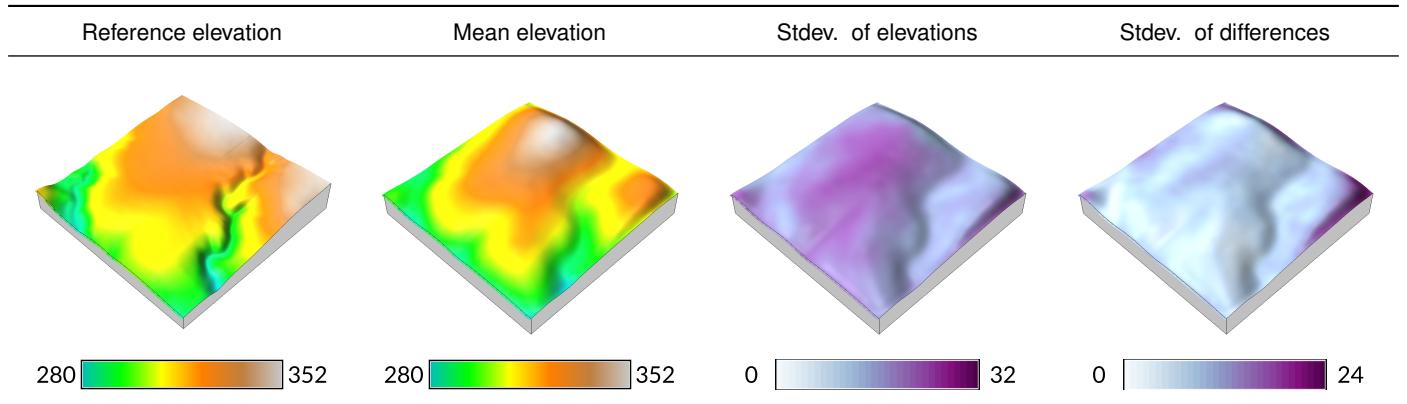
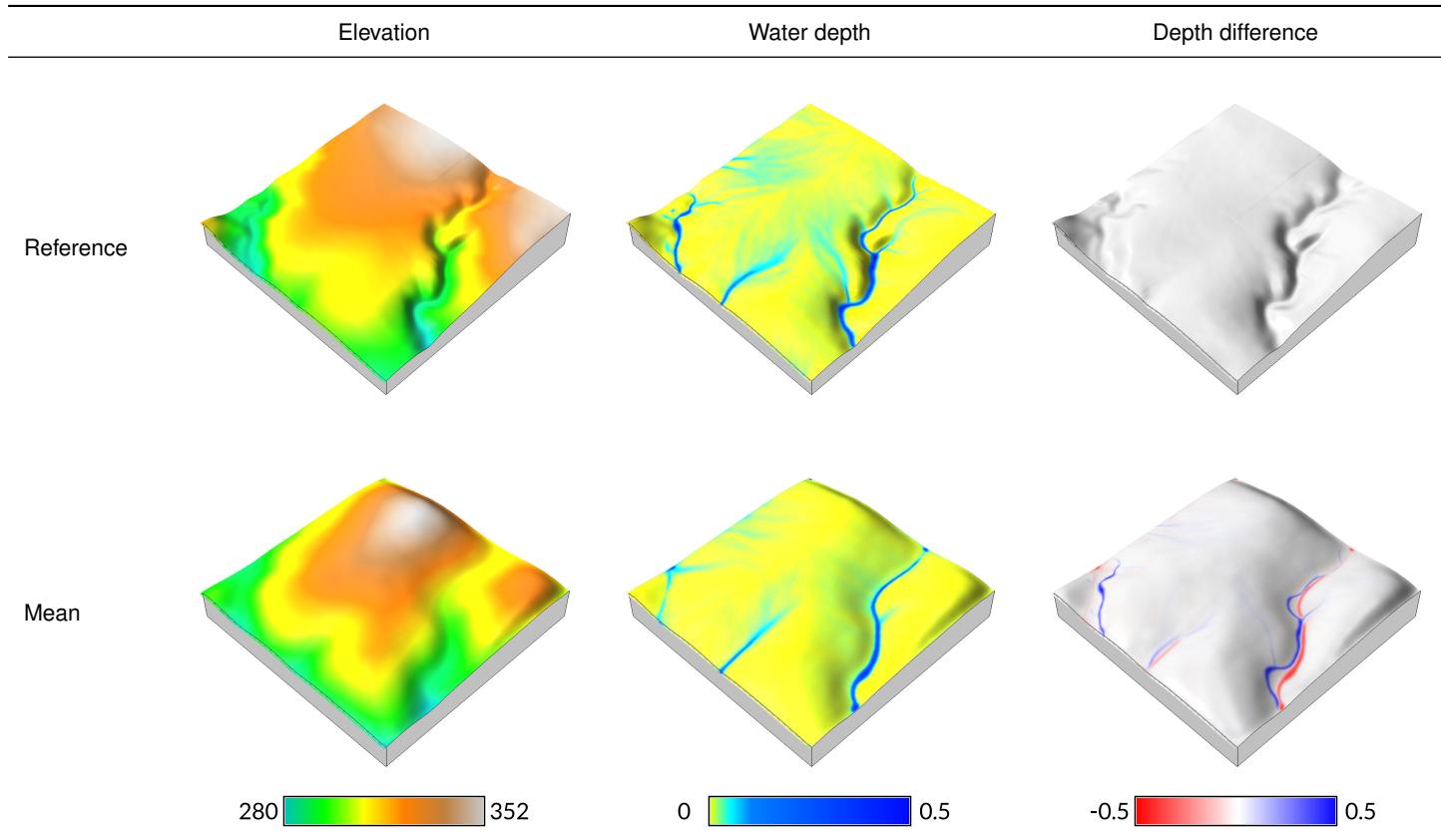
Keywords

Human-computer interaction, tangible interfaces, interaction design, physical computation, embodied cognition, spatial thinking, geospatial modeling

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Figure 1. ...**Table 1.** Water flow experiment: maps of per-cell statistics draped over a 3D rendering of the topography for all participants.**Table 2.** Water flow experiment: maps of geospatial analyses draped over a 3D rendering of the topography for all participants**Table 3.** Water flow experiment: percent cells

method	concentrated flow		ridges		valleys	
	reference	mean	reference	mean	reference	mean
water flow	3.28	2.26	1.18	2.99	4.77	3.70

Table 4. Water flow experiment: comparison of 3D modeling novices and experts