Tangible Topography: A Haptic Mapping Interface

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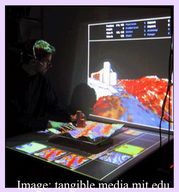
Project Aim

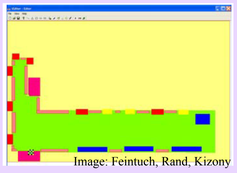
The aim of this project is to give users a greater understanding of geographic regions by augmenting traditional maps with new sensory information. Traditional maps offer visual information alone; our haptic map allows users to trace the contour of an elevation profile of a region displayed on a computer screen using the stylus of the Phantom Omni haptic device.

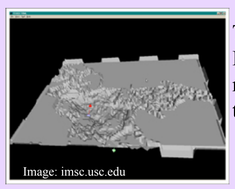
Background



The Tangible Media Group at MIT explores landscape design using a physical tactile interface made of clay (Ishii 2004).

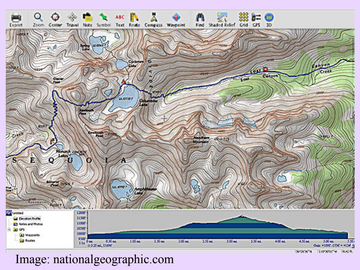
Researchers at the University of Haifa, Israel performed a study of the feasability of using haptic maps for clinical research and intervention.

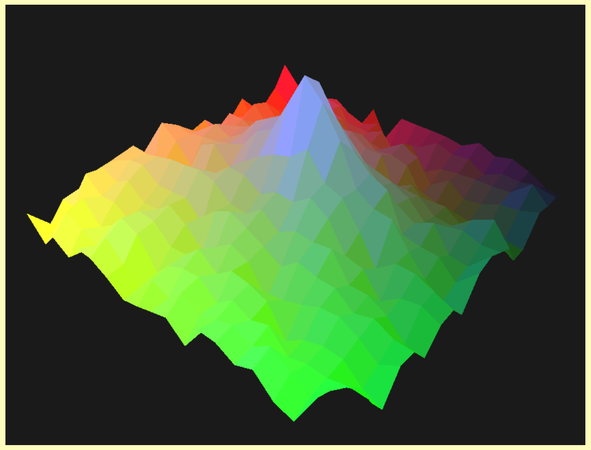




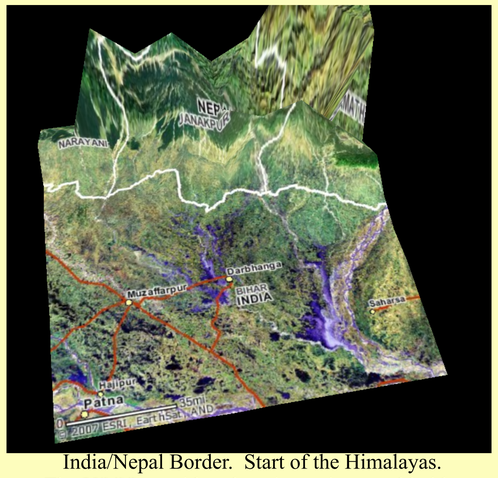
The Haptics and Virtual Environments Laboratory at USC rendered a map of seismic data to the tip of the Phantom Omni.

Elevation is visually represented by topographic maps and elevation profiles.



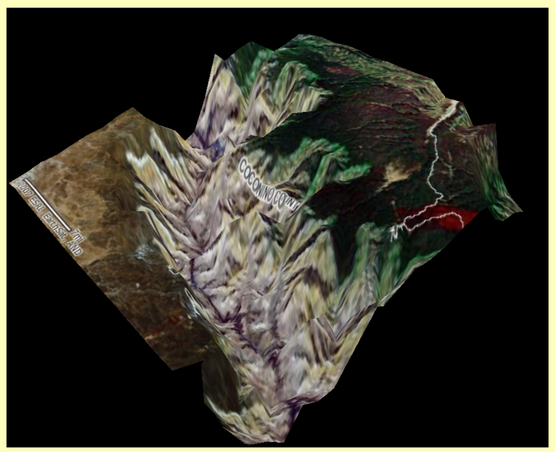


Mount Rainier. This image shows the polygon rendered surface. Surface polygons are triangles with 3-D vertices specified in (latitude, longitude, elevation). Haptic rendering is by the HL Library.



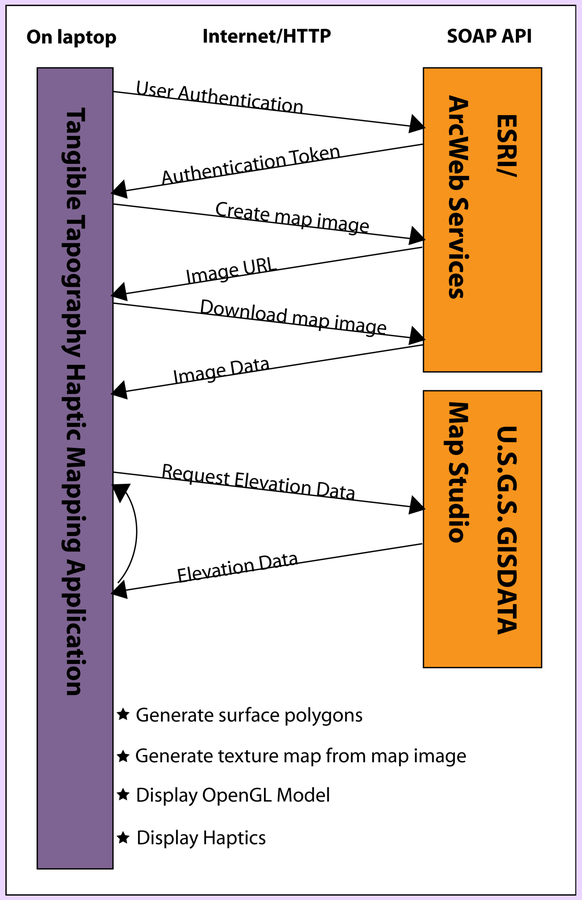
India/Nepal Border. Start of the Himalayas. The USGS provides elevation points worldwide. The Tangible Topography App allows us explore the world in a new way.

Grand Canyon, Arizona. See the wonders of the world!



Seattle, University District Area. Haptic maps let you understand familiar places in a new way.

Methodology



This application makes extensive use of Internet GIS service APIs by ESRI (makers of ArcGIS) and the U.S. Geological Survey. Map extents are specified in latitude and longitude, and a grid of elevation points is retrieved for this map area. The lat-lon grid and elevation points comprise the haptic object surface.

Conclusions and Future Work

The synthesis of haptics technology with GIS data enables many new applications. The tangible technology app is a starting point for further development of haptic maps. The following would be great future projects:

* Use the sense of touch to comprehend GIS data
* Familiarize yourself with terrain before you go there
* Explore planet earth in a new way
* Augment tactile exploration with auditory information

References

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Ishii, Ratti, et. al., Bringing clay and sand into digital design-continuous tangible user interface. BT Tech Jnl, 22.4. Oct 2004. 287=299.

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