SPHERICAL METAPHOR (SPHERIPHOR) FOR GEOSCOPE MULTI-DIMENSIONAL DATA VISUALIZATION

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This technology demonstration offers a innovative method for visualizing multi-dimensional data on a half-sphere (full-dome) Geoscope. The intent is to realize the Geoscope vision of R. Buckminster Fuller as stated in his *Critical Path*, "With the Geoscope humanity would be able to recognize formerly invisible patterns and thereby to forecast and plan in vastly greater magnitude than heretofore."

While Virtual Globe technology has advanced considerably, Fuller's original Geoscope design for a suspended, computer-controlled, globe for large audiences remains mostly unfulfilled.

There are more than 100 digital dome planetarium theaters worldwide. Their inside-out viewing and computer-driven capabilities are inspiring. Complete digital dome systems can be obtained for a fraction of the cost estimated by Fuller for a large-scale Geoscope (1962). However, an outside-in viewable, suspended Geoscope awaits practical realization.

At the Intel Rio Grande Innovation Centre, where I am Director, we have on display a nine LCD screens controlled by a single powerful desktop computer using off-the-shelf components at a nominal cost. Similar components can be adapted to create a small Geoscope.

3D animation demonstrates a portable Geoscope design which includes a full-dome projection system. Small, powerful projectors are arranged symmetrically around the outside of a translucent dome. The dome, approximately 3.4 meters in diameter, is hung from a frame which also supports the projectors. Combined image resolution is 8-10 megapixels. The ephemeral frame is 10.6 meters in diameter and can itself be floor-mounted or hung by cables.

The Geoscope is shown being erected in a high-school gymnasium. A large audience on bleachers views a hemi-spherical projection of the Earth nearly unobstructed. Because projectors are outside of the dome projecting inward, the interior of the dome is completely unobstructed for a small number of occupants to participate in a 360-degree immersive experience.

Projection areas are arranged around the dome based on a polyhedral design providing several benefits: simplified UV mapping, minimal projection area overlap feathering, and optimized pixel resolution.

Lastly, the demonstration unveils a novel spherical metaphor for multi-dimensional data visualization on the Geoscope. This spherical metaphor, or to coin a term "Spheriphor," addresses the need for displaying data that is not necessarily geo-referenced.

Significant benefit accrues from visualizing geo-referenced data overlaid on global Earth maps. In addition, using a Spheriphor, the Geoscope offers an opportunity to visualize high-density, multi-dimensional data with non-GIS metaphors. Virtual Globes may also use the Spheriphor to display non-GIS data.

3D animation demonstrates how the metaphysical Spheriphor design is implemented on a physical Geoscope to enable a cognitively empowering environment. The intent is to enhance humans' ability to interface with multi-dimensional data sets using a fully-immersive, full-dome, outside-in, projection system.

The Spheriphor departs from the way that spreadsheets and charts use mostly rectangular, flat display formats. With the Geoscope we are no longer constrained with thinking about data inside a box; using the Cartesian framework to visualize data. The Spheriphor opens a door into a new universe of rich visual metaphors based on spherical geodesic geometry and a Whole Systems Framework.

As an example of a Spheriphor application, the Buckminster Fuller Institute (BFI) Design Revolution Project Library is given a project tracking interface on the Geoscope. BFI tracks a large number of projects with design artifacts ranging from micro-cosmic nanostructures to macro-cosmic global infrastructure solutions. The Spheriphor promises to aid the Design Science Revolution and the Design Science Planning Process by making visible the patterns of rapidly advancing technology.

The Spheriphor uses spherical coordinates to visualize multi-dimensional data on the Geoscope. In this demonstration, phi φ (zenith angle, or latitude) represents the Design Science Planning phase. The Define Problem phase is close to zenith and the Develop Artifacts phase is close to the horizon. Theta θ (azimuth angle, or longitude) represents the macro-to-micro scale of the design artifact.

3D animation demonstrates the Spheriphor use-case scenario in detail. Click on a project and it rises to the zenith of the dome. Geodesic lines connect this project with other designs showing the macro-to-micro inter-dependencies of components and systems. In this way, Buckminster Fuller's principle of Synergetic Advantage may be visually detected.

Technical Requirements: The entire demonstration is played from a single Quicktime movie file. The 3D animation is developed with POV-Ray. All POV-Ray scene description language source code for the 3D animation, Spheriphor and Geoscope design is available from my personal website at: www.karmatetra.com/isde5/ Attendees may also view examples of my past work on this website.