

2003 Fall Meeting  
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**Using 3D Glyph Visualization to Explore Real-time Seismic Data on Immersive and High-resolution Display Systems**

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The study of time-dependent, three-dimensional natural phenomena like earthquakes can be enhanced with innovative and pertinent 3D computer graphics. Here we display seismic data as 3D glyphs (graphics primitives or symbols with various geometric and color attributes), allowing us to visualize the measured, time-dependent, 3D wave field from an

earthquake recorded by a certain seismic network. In addition to providing a powerful state-of-health diagnostic of the seismic network, the graphical result presents an intuitive understanding of the real-time wave field that is hard to achieve with traditional 2D visualization methods. We have named these 3D icons 'seismoglyphs' to suggest visual objects built from three components of ground motion data (north-south, east-west, vertical) recorded by a seismic sensor. A seismoglyph changes color with time, spanning the spectrum, to indicate when the seismic amplitude is largest. The spatial extent of the glyph indicates the polarization of the wave field as it arrives at the recording station. We compose seismoglyphs using the real time ANZA broadband data (<http://www.eqinfo.ucsd.edu>) to understand the 3D behavior of a seismic wave field in Southern California. Fifteen seismoglyphs are drawn simultaneously with a 3D topography map of Southern California, as real time data is piped into the graphics software using the Antelope system. At each station location, the seismoglyph evolves with time and this graphical display allows a scientist to observe patterns and anomalies in the data. The display also provides visual clues to indicate wave arrivals and ~real-time earthquake detection. Future work will involve adding phase detections, network triggers and near real-time 2D surface shaking estimates. The visuals can be displayed in an immersive environment using the passive stereoscopic Geowall (<http://www.geowall.org>). The stereographic projection allows for a better understanding of attenuation due to distance and earth structure, source directivity and seismic hazard estimation. Wall sized displays like the 3.2 mega pixel CRT projection based Panoram (<http://www.siovizcenter.ucsd.edu>) and tiled LCD displays such as the Geowall2 can also be used for high-resolution display of the data. This work was started at the Electronic Visualization Laboratory and received funding from the IRIS Consortium and the National Science Foundation.

<http://www.eqinfo.ucsd.edu/~atul/research/seismoglyphs>

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