Interpretation, Visualization and Presentation of Digital Well-Log Data in 3-D Virtual Reality Space: Application to Mapping of Coals

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Through a collaborative effort between computer scientists and geologists we have developed an immersive, stereo 3D Virtual Reality (3DVR) system within which geological data are imaged. Digital well-logs are hung from Shuttle Radar Topography Mission (SRTM) surfaces. We have created interactive interpretation tools which allow us to interpret, in real time, while immersed in the data volume.

Interactive interpretation of well-logs is particularly effective when the strata being investigated are sampled by wells at a spatial frequency at, or greater than, the Nyquist frequency of the time correlative depositional environments within the strata. With Nyquist sampling the environments are sufficiently represented in the imaged well-logs to allow visual recognition and correlation of the synchronous depositional environments throughout the 3D volume. That is, the immersed interpreter may move about within the subsurface data and follow a log facies much as one might walk along a stream, through a backswamp or along a littoral facies in the real world.

Drilling programs for coal development by mining or coalbed natural gas (CBNG) production are often spatially dense enough to satisfy the Nyquist criterion. 3DVR systems for interpreting well-log and other data sets will be particularly useful in coal and CBNG development programs. Through a multi-year effort studying the CBNG potential of the Wilcox strata of northern Louisiana we have created a database containing more than 1000 digital well-logs which may be displayed and interpreted in this system. We will show and explain the utility of the system with a subset of these well-logs from areas where the well-log density is sufficient to satisfy the Nyquist condition.