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SEISVIZ3D: Stereoscopic system for the representation of seismic data - Interpretation and Immersion

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The seismic method is a valuable tool for getting 3D-images from the subsurface. Seismic data acquisition today is not only a topic for oil and gas exploration but is used also for geothermal exploration, inspections of nuclear waste sites and for scientific investigations. The system presented in this contribution may also have an impact on the visualization of 3D-data of other geophysical methods.

3D-seismic data can be displayed in different ways to give a spatial impression of the subsurface.They are a combination of individual vertical cuts, possibly linked to a cubical portion of the data volume, and the stereoscopic view of the seismic data. By these methods, the spatial perception for the structures and thus of the processes in the subsurface should be increased.
Stereoscopic techniques are e. g. implemented in the CAVE and the WALL, both of which require a lot of space and high technical effort. The aim of the interpretation system shown here is stereoscopic visualization of seismic data at the workplace, i.e. at the personal workstation and monitor. The system was developed with following criteria in mind:
• Fast rendering of large amounts of data so that a continuous view of the data when changing the viewing angle and the data section is possible,
• defining areas in stereoscopic view to translate the spatial impression directly into an interpretation,
• the development of an appropriate user interface, including head-tracking, for handling the increased degrees of freedom,
• the possibility of collaboration, i.e. teamwork and idea exchange with the simultaneous viewing of a scene at remote locations.

The possibilities offered by the use of a stereoscopic system do not replace a conventional interpretation workflow. Rather they have to be implemented into it as an additional step. The amplitude distribution of the seismic data is a challenge for the stereoscopic display because the opacity level and the scaling and selection of the data have to fit to each other. Also the data selection may depend on the visualization task. Not only can the amplitude data be used but also different seismic attribute transformations.

The development is supplemented by interviews, to analyse the efficiency and manageability of the stereoscopic workplace environment. Another point of investigation is the immersion, i.e. the increased concentration on the observed scene when passing through the data, triggered by the stereoscopic viewing. This effect is reinforced by a user interface which is so intuitive and simple that it does not draw attention away from the scene.

For the seismic interpretation purpose the stereoscopic view supports the pattern recognition of geological structures and the detection of their spatial heterogeneity. These are topics which are relevant for the actual geothermal exploration in Germany.