Advanced Flux Visualization and Virtual Reality for Reservoir Engineering

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Project Summary

An interdisciplinary team of scientists and engineers from industry and LBNL is collaborating to identify efficacious techniques for the visualization of flux data and the use of advanced user interface technology as applied to flux visualization. The goal of the project is commercially available software which may be used by reservoir engineers for planning production strategies which maximize oil and gas production.

Use of the Product

At the commencement of this project, there existed no commercially available software (from a US software company) which offered a set of tools for visualizing flux data. Visualization software is a key component of the cyclic process of production formulation. First, a reservoir engineer formulates a production strategy based upon available data. Next, a simulation, is carried out to predict production based upon the proposed strategy. Finally, simulation results are analyzed using software tools. This cycle is repeated as the proposed strategy converges toward optimal.

Potential Impact

In the domestic oil industry, it is estimated that there are perhaps as many as two thousand persons involved in reservoir engineering - formulating production strategies and making recommendations for reservoir production. In software sales, this represents roughly 20 million dollars in revenue. These numbers represent only one market segment. The same software is used by those who perform similar tasks in the area of environmental remediation.

While revenue from software sales is important, as is the development of this technology within the United States, a greater potential benefit can be realized by producing unswept areas in existing reservoirs. Experts estimate (http://www.nttc.edu/oil/p1.html) that there are 90 billion barrels in the United States reserves of moveable, unswept oil, or roughly two trillion dollars of potential gross revenue.

Federal Involvement

Initially, this project was designed pursuant to the guidelines put forth by ACTI (Advanced Computational Technology Initiative). ACTI called for the use of computing resources within the National Laboratories to be applied to domestic energy problems, specifically within the Oil & Gas Industry.

This resources from the National Laboratory system being brought to bear on this project are not available in industry. In recent years, the oil industry has cut research, particularly in the area of applied research of software design and development. Programs within DOE directly promote multidisciplinary teams involved in this type of applied research, such as the Human Genome project. Although interdisciplinary teams are not uncommon in industry, the Laboratory involvement has synergized interaction between members across industrial boundaries in new and exciting ways, bringing to bear extensive experience in general scientific visualization methodologies. The result is a better overall product which has the involvement and support of both the product designers as well as the end users.

In addition to personnel, the computational facilities at LBNL far exceed that available to the industry participants. The computing environment has been crucial to the success of this project as software prototypes are built and tested at LBNL.

Project Progress

The primary milestone for this project is the annual product release cycle of the industrial participants. At the passing of the first such milestone, new features supporting flux visualization appeared in the software. This software is commercially available now. Unlike many collaborative projects, this particular one has a short gestation period, resulting in timely, tangible, commercially available products.