A Sea Floor Layout Design Using Virtual Reality

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ABSTRACT

This paper shows application results of virtual reality (VR) techniques for construction of a sea floor layout prototype design in petroleum fields. The use of VR allows the integration and interaction (visualization, navigation and manipulation) with massive database in an unique graphic model which represents the real situation, a problem until now without a satisfactory 3D solution.

KEYWORDS: Virtual Reality, Sea Floor Layout, Visualization, Deep Waters, Petroleum Exploitation, Design Prototype, VRML.

INTRODUCTION

Brazil is a Country endowed with large potential reserves, like, gold, iron ore, petroleum,... PETROBRAS has accomplished new findings of petroleum natural deposits in brazilian soil, almost all of them were found in maritime continental platform.

When the first exploitation (exploration on economic form) projects arised, named OFFSHORE Project1 (Ferrante, A. J., Ebecken, N. F. F., Lima and E. C. Prates, 1977), the challenge frontiers restricting to distances between the sea bottom and the sea surface were not greater than 160 meters. At the present, the challenge is the same, but the still water level, now goes to the frontier of 3.000 meters of deepness (deep waters).

Due to the physical nature of this project, the greater the still water level, the higher is the action of maritimes agents (current, tide, soil,...), what requests more volumes of information, as oceanographic, geological, stress, relieve, equipment locations (ships, wells, ...). Besides, more precision is fundamental when working with these limits of depth, whereas the regular investment of this nature stays around millions of dollars. The safety item also appear important, because one project with this largeness improperly realized can provoke environmental accidents of great proportions.

"...One image values much more than a thousand words..." says the famous chinese proverb and the Virtual Reality (VR) reflects exactly the core of this question, showing graphically and in a intuitive way large amounts of complex data.

The arising of visualization techniques more and more sophisticated has been a great ally in this constant evolution of offshore technology. To become possible so much for computational resources evolution (hardware), what allows to execute more and more instructions in lesser time, whatever to increase for equipment capabilities that have advanced techniques of graphical processing, like, Z-buffer, Ray-tracing, Shading,... Besides, the development of specialized peripherics (gloves, HMD - head mount display, ...) and his perfect integration, not only between them, but also in network environment, has estimilated this research field.

The VRML (Virtual Reality Modeling Language) shows one beautiful choice to this kind of project, because incorporates innovations in 3D visualization, in animation and in simulation field (Hollands, R., and Mort, 1994), allow full user participation and exploration (Carey and Bell, 1997), over there to be independent of operation system and computer plataforms.

WHY USING VR IN THIS APPLICATION

"...The application of VR techniques become available when to put an user in a simulated ambient is cheaper than putting him in the real place, or when the ambient is not easily accessible ..." (Locke, 1995).

A simulation over there gives one general insight of system it desires to represent, must be able to point his evolution at a determined instant of time. Some factors who generate needs to create simulations systems are as follows:

- Experiment may be too dangerous, for example, putting operators at risk;
- The real system may be too slow. Some real process can last for hours, days or even months, while in a simulation they can take a few seconds;
- The system may not exist;

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