CART-BASED PROXY FLOW SIMULATION PROCEDURE FOR RANKING GEOSTATISTICAL REALIZATIONS OF ROCK PROPERTIES

BACKGROUND

[0001] Computational and simulation processes for estimating natural resource reserves and production have improved significantly in recent years. In many cases, Earth models are first generated for a target area. For example, the earth model may represent reservoir characterization for an oil field. A geo-cellular models may then be applied to the earth model for the target area to estimate how fluid may move through the earth model. The geo-cellular model may be utilized to make production predictions for estimating reserves, production capabilities, and improving production schemes.

[0002] A large amount of data is required to perform the different types of modeling. In addition, there are a number of properties, parameters, and uncertainties that affect both the Earth models and flow simulations that may be created. In order to properly characterize the impact of each parameter and uncertainty that may affect natural resource production, the largest possible number of scenarios is typically simulated. As a result, flow simulations may require extensive data, user and computing time, and computational resources to arrive at accurate results.

SUMMARY

[0002a] According to a first aspect of the present disclosure, there is provided a computer-implemented method for performing classification and regression tree (CART) flow simulations for a reservoir, the method comprising: performing a partial flow simulation; storing dynamic properties associated with the partial flow simulation for each time step; and utilizing CART to predict changes in the dynamic properties utilizing the stored dynamic properties determined by the partial flow simulation.

[0002b] According to a second aspect of the present disclosure, there is provided a non-transitory computer readable medium comprising computer executable instructions for performing classification and regression tree (CART) flow simulations for a reservoir, the computer executable instructions when executed causes one or more machines to perform operations comprising: perform a partial flow simulation; store dynamic properties associated with the partial flow simulation for each time step; and utilize CART to predict changes in the dynamic properties utilizing the stored dynamic properties determined by the partial flow simulation.

[0002c] According to a third aspect of the present disclosure, there is provided a system for performing classification and regression tree (CART) flow simulations for a reservoir comprising: one or more computing devices configured to receive input from a user; a server in communication with the one or more computing devices through one or more networks; a database in communication with the one or more server through the one or more networks, wherein the server is performs a partial flow simulation, wherein the server stores dynamic properties associated with the partial flow simulation for each time step in the database, and the server utilizes CART to predict changes in the dynamic properties utilizing the stored dynamic properties determined by the partial flow simulation.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] Illustrative embodiments of the present system and method are described in detail below with reference to the attached drawing figures, which are incorporated by reference herein and wherein:

[0004] FIG. 1 is a flow simulation environment in accordance with an illustrative embodiment;

[0005] FIG. 2 illustrates multiple earth formation horizons which are penetrated by a wellbore in accordance with an illustrative embodiment;

[0006] FIG. 3 illustrates multiple earth formation horizons for flow simulation in accordance with an illustrative embodiment;