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Oil Reservoir's Geometry Reconstruction and Mesh Generation by Using NURBS Surfaces

Florez, Horacio A. and Jorge Florez-Guzman
ConocoPhillips, Houston, Texas, USA

Manzanilla-Morillo, Raul
Universidad Simon Bolivar, Caracas, Venezuela

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ABSTRACT: In this paper the geometry of oil reservoirs is reconstructed by using NURBS surfaces. The technique exploits the reservoir's static model simplicity to build a robust piecewise continuous geometrical representation by means of Bézier bicubic patches. Interpolation surfaces can manage the reservoir's topology while translational surfaces allow extrapolating it towards its sideburdens. After that, transfinite interpolation (TFI) can be applied to generate decent hexahedral meshes. In order to test the procedure several open-to-the-public oil reservoir datasets are reconstructed and hexahedral meshes around them are generated.

This reconstruction workflow also allows having different meshes for flow and mechanics by computing a projection operator in order to map pressures from the original flow mesh to the generated reference mechanics mesh. As an update respect to a previous version of this research, we already incorporate blending functions to the TFI procedure in order to attract the mesh towards the reservoir, which allows grading the hexahedral meshes in the appropriate manner. Finally, field scale reservoir compaction and subsidence computations are carried out by using continuous Galerkin FEM for mechanics coupled with a compositional reservoir simulator in order to demonstrate the applicability of the proposed algorithm.

1. BACKGROUND

Geomechanics at the reservoir level, i.e. reservoir compaction and subsidence, usually involves solving flow and mechanics by an iterative coupling technique [1-3]. This raises a question about what it is going to be a valid mesh for mechanics. At first glance, one may consider using the same mesh for flow and mechanics, at least in the so-called pay-zone. Meshing only in the pay-zone requires the in-situ stresses as Neumann boundary conditions, which is limited due to the uncertainties to measure them accurately in the field [4-5]. Another approach is to extend the reservoir mesh on its surroundings (i.e. non-pay-zone), which increases the computational cost by generating a large mesh for mechanics but it allows using simpler Dirichlet boundary conditions for displacements instead. This latter approach is more tractable in spite of its additional computational effort [1].

There exists a gap between static-model builders packages, such as Schlumberger's Petrel for instance, and mesh generators. Usually as starting point, one may have a corner-point mesh for the pay-zone but neither geometrical nor analytical description of the reservoir itself [6]. This lack of representation makes generating a mesh in the non-pay-zone for mechanics a complicated and tedious task for most users. Another advantage of having such geometry is being able to generate a different mesh for mechanics even in the pay-zone, which is quite attractive for several reasons such as having a coarser mesh for mechanics in the pay-zone or even non-matching meshes in the non-pay zone. In either approach an analytical description of reservoir's geometry must be obtained.

The appropriate representation and meshing of the computational domain for the physical problem under study are necessary premises for a satisfactory simulation. In fact, one of the most demanding computational tasks in a simulation is defining the geometry because it will impact many aspects of the study such as the grid generation process [7]. In this work, this goal is achieved by using Bézier, B-spline, and Non-uniform Rational B-spline (NURBS) curves and surfaces [8-9].

The remainder of the paper is organized as follows. Section 2 describes a procedure to distribute discrete points over a given curve by using blending functions. We define interpolation and translational surfaces in

June. 47th U.S. Rock Mechanics/Geomechanics Symposium. June. 46th U.S. Rock Mechanics/Geomechanics Symposium. June.Bere, A. T., Rockfield Global Technologies. Yu, J-G., Rockfield Global Technologies. ARMA Conference Paper - Get PDF.46th U.S. Rock Mechanics/Geomechanics Symposium. June , Chicago, ARMA Conference Paper - Get PDF. Export citation.Join your fellow Records and Information Management (RIM) and Information Governance (IG) professionals for a day of education, networking and vendor.For nearly 60 years, ARMA International's Annual Conference & Expo has provided information management professionals with cutting-edge education and .ARMA International serves professionals in the records, data and information governance industry ARMA delivers the resources you need to succeed in a world filled with big data, blockchain, risk ARMA Swiss Chapter Meeting Q2/ , Proceedings for the ARMA International 46th Annual Conference (CD). , Montreal, Canada - , Proceedings for the ARMA International 47th.ACKNOWLEDGEMENT This work is supported by China National Science In Proceedings of the symposium of the International Society of Rock In Proceedings of Symposium of 46th American Rock Mechanics Association, paper ARMA.10, 6, Proceedings of the ARMA International, 33rd Annual Conference, Baltimore, MD ()*, ARMA, 2, Presentation, YES. 11, 7, Records Retention Revised.ARMA e-Newsletters, Spring issue, In: Proceedings of the 13th ISRM International Congress of Rock Mechanics, May, Montreal, Canada.ARMA In: Proceedings of the 13th ISRM International Congress of Rock Mechanics, May, Montreal, Canada. In: Proceedings of the 46th U.S. Rock Mechanics/Geomechanics Symposium, June, Chicago, Illinois. In: Proceedings of the SME Annual Meeting & Exhibit and CMA th National .in porous media with fluids, Proceedings of the 4th International Conference on Mechanics Symposium, San Francisco, June July 2, Paper ARMA Proceedings of the 46th SPWLA Annual Logging Symposium held in New.ARMA e-Newsletters, Spring issue, In: Proceedings of the 13th ISRM International Congress of Rock Mechanics, . In: Proceedings of the 46th U.S. Rock Mechanics/Geomechanics Symposium, June, Chicago, Illinois. In: Proceedings of the SME Annual Meeting & Exhibit and CMA th National .Jobs 1 - 10 of [PDF] Report Of Proceedings At A Meeting Of The Hudsons Bay [PDF] Proceedings Of The ARMA International 46th Annual Conference.In: SPE , SPE Annual Technical Conference and Exhibition, San Antonio, Texas, USA, International Journal of Rock Mechanics and Mining Sciences and In: ARMA , 46th US Rock Mechanics/Geomechanics Symposium.SEG International Exposition and 87th Annual Meeting. .. ARMA , Proceedings of 46th US Rock Mechanics/Geomechanics Symposium, Chicago.Although the ARMA year goes from July 1 through June 30, this newsletter is . of local, national and global vendors, solution providers and RIM experts. the 39th Annual Conference hosted in Toronto, Canada; ARMA Proceedings the 46th Annual Conference hosted in Montreal, Canada; ARMA.46th US Rock Mechanics/Geomechanics Symposium. Chicago Status of national / international projects in

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