The purpose of this paper is to illustrate how Fuzzy Decision Tree (FDT), which is an automatic method of generating fuzzy rules, can predict the flow rate, as a vital parameter in order to design the necessary wellhead production facilities, of an under saturated Iranian petroleum reservoir. Because of the special thermo dynamical conditions of the supposed
reservoir, two very important variables consist of Temperature and Pressure, were selected as input factors. In order to develop the model of FDT, firstly, 1600 series of data were gathered and divided to two main parts which 1100 of them were utilized to build the model and the rest of them to test it. As the FDT method is strongly based on applying widely and effectively the concept of ambiguity and furthermore, to do this project more accurately and less dependent on experts' knowledge, it was decided to gain from piecewise linear membership functions (MFs) whose parameters have automatically been dedicated through calculating a very special method of possibility density function (pdf). When the process of developing the FDT was finished, there were five rules available to measure the rate of compatibility and flexibility of the model by applying the rules on testing set. The model result, 0.898 of R-square for testing set, shows that the FDT yields an acceptable result compared to other methods either practical or theoretical. In conclusion, according to the calculated result, it is possible to exploit this method for flow rate prediction field wide.

References


- Fazlali, A.,1999. The asphaltene precipitation in crude oil of Iran, PhD Thesis , Amir Kabir University, Iran,
- Malik Shahzad Kaleem Awan, Mian Muhammad Awaı̂s. Predicting weather events using
- P. P. Angelov, R. A. Buswell. Automatic generation of fuzzy rule- based models from data
- Yufei Yuan, Michael J. Shaw. Induction of fuzzy decision trees. Journal of Fuzzy Sets and
- Hui-June Park, Jong-se Lim, Jeongyoung Roh, Joo M. Kang and Bae-Hyun Min.
  Prediction-System Optimization of Gas Field Using Hybrid Fuzzy/Genetic Approach. SPE
  100179 Presented at the SPE Europec/EAGE Annual Conference and Exhibition, Vienna.
  Austria, 12-15 June 2006.
- Liliana, P. M., Hughes, R. G., and Wiggins, M. L.: "Identification and characterization of
- Mohaghegh, S.: "Virtual Intelligence Applications in Petroleum Engineering: Part 3-Fuzzy
  Logic," JPT (November 2000) 82.
- M. R. Ghafoori, M. Roostaeian, and V. A. Sajjadian.: "A State-of-the-Art Permeability
  Modeling Using Fuzzy Logic in a Heterogeneous Carbonate (An Iranian Carbonate Reservoir
  Case Study)", IPTC 12019 Presented at the International Petroleum Technology Conference
  held in Kuala Lumpur, Malaysia, 3-5 December 2008.
- Malcolm J. Beynon, Michael J. Peel, Yu-Cheng Tang. The application of fuzzy decision
  244.
- Zadeh LA. Fuzzy sets as a basis for a theory of possibility. Fuzzy Sets and Systems
- Parzen E. On estimation of a probability density function mode. Annals of Mathematical
- Thompson JR, Tapia RA. Nonparametric function estimation, modeling, and simulation.
- Medasani S, Kim J, Krishnapuram R. An overview of membership function generation
- Liang Wang, John Yen. Extracting fuzzy rules for system modeling using a hybrid of

Index Terms

Computer Science

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Keywords
Asphaltene  Genetic Algorithm  Kalman Filter
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