Development and Design of Lithology Identification System based on Java

Duan XiaoQiu [(1,2), a] Correspongding Author Liu ShaoHua[(1,2), b] Wang ZhongHao[(1,2),c] and Wu Dong[3,d]

[1]Key Laboratory of Exploration Technologies for Oil and Gas Resource(Yangtze University), Ministry of Education,Jingzhou,Hubei,434023, China

[2]School of Geoscience of Yangtze University WuHan,Hubei,430100,China

[3] R&D Academy of well Logging,CNPC Greatwall Drilling Company ,Beijing,102200, China

[a]893401147@qq.com, [b] lsh811@126.com , [c]71306009@qq.com, [d]403192095@qq.com

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Abstract: Using the theoretical Based on Cross-Plot, Fuzzy-Math to identify the lithology, the logging data processing softwar-e system was prepared, which is the function of data management and lithology identification. Using the basic data from oil data, Results of the correct rate can reach 90%, provi-de guidance for the interpretation service late Oilfield, the system has a certain practical value.

Introduction

Lithology identification belongs to the category of logging project. Lithology identification is the formation evaluation, reservoir description and real-time drilling monitoring and so on one of the important research content. Real-time identification in the process of drilling bit of lithologic information, the current position can be according to the charcteristi-cs of the formation lithology selecting bit types, drilling methods and optimizing drilling parameters of rock fragmentation efficiency and reduction of the drilling cost; which can determine the core position, card coring layer and can be found in a timely and effective manner hydrocarbon reservoir, reservoir protection, correctly evaluating oil and gas layer. Due to the importance of lithology identification technology, in recent years, the technology in both theory and application has achieved substantial development.

The status quo of lithology identification technology

The method currently used in the automatic identification of the lithology of probability and statistics methods [1, 2], clustering analysis method, support vector machine method [4, 6], and artificial intelligence theory, ect., but these methods have some shortcoming in some degree, which are almost linear identification approach, cannot be according to the actual logging data to set up interpretation model automatically.

The principle of lithology identification method

Cross-Plot

In plotting the evaluation data of identifiable graphical chart or figure called Cross-Plot, the method of which is a kind of logging data interpretation technology. It is two kinds of logging data in the church on the floor plan, according to the intersected point coordinates as a request parameter value and scope of the method.

The main mineral composition of the rock has a strong relationship with the content of uranium, thorium and potassium [8]. Conventional logging of natural potential, natural gamma ray, a reflection of acoustic time difference, the resistivity of rock is very sensitive, it is properly to choose from the spontaneous potential(SP) curve, natural gamma curve(GR), sonic time difference curve(AC) and the resistivity curve(RT) to identify lithology[9].

Fuzzy mathematics

It is a theory and method to study and deal with the fuzzy mathematics theory and method of fuzzy system regularity, which take zero or one common set theory in only two values of a particular function to generalize to on [0,1] interval functions belonging to, the absolute belong to or does not belong to extended to more flexible gradient relationship, thus facilitating the intermediary transition fuzzy concepts with mathematical methods for processing. Because there is no an obvious distinguish between rock lithology of lithology classification is based on data index mostly continuity, and fuzzy mathematics to the gradient relationship expressed in mathematical methods, so as to realize the identification of rock lithology.

The Design and Implementation of Lithology Identification System

The design of system

The main goal of system is to use the technology of computer to process logging data automatically and explain the results in the form of a graph or data form intuitive vividaly demonstrated. In the actual process, the inputed data is from different sides to reflect the information characteristics of logging information, which has certain relationship with outputed data. All the drilling logging data warehousing system will be mine, after the influence factor correction on the sample data the standardization process, selection of lithologic responsive logging curve parameter values, to identify the unknown lithology. The structure of system is shown in figure 2.

The key techniques and methods

The system combines javaSE with java mapping technology, using the swing framework, Back-Propagation neural network, and fuzzy mathematics theory knowledge related to design. Using NetBeans development tools, the use of java language development integration of lithology identification system. Involves the main technology has the following points.

Step 1. In view of the desktop development system, using the java language, the swing framework, cross-platform support.

Step 2. Using the basic theory of artificial intelligence ,the establishment of the Back-Propagation neural networdk model to simulate the litholgogy identification, achieve highly intelligent and accurate.

Step 3. On the basis of the theory of matrix and related mathematical, establish evaluation matrix, the fuzzy mathematical model was constructed, the correlation coefficient of formation ligholgoy, realize the identification of lithology.

The implementation of system

In the process of system implementation, first of all to shen 630-H1426 logging data processing, data storage model[7]; Finally, the data stored by selecting the appropriate curve are combined and adopt appropriate methods to realize the identification of lithology.

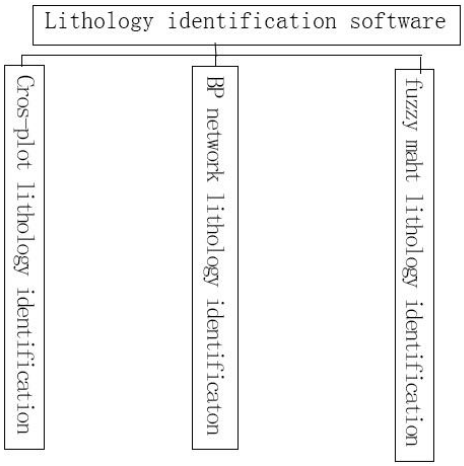

Fig.1 The structure of system

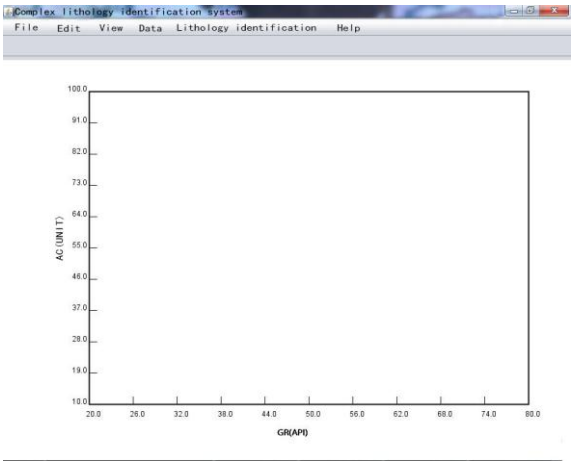

Fig.2 The main interface of system

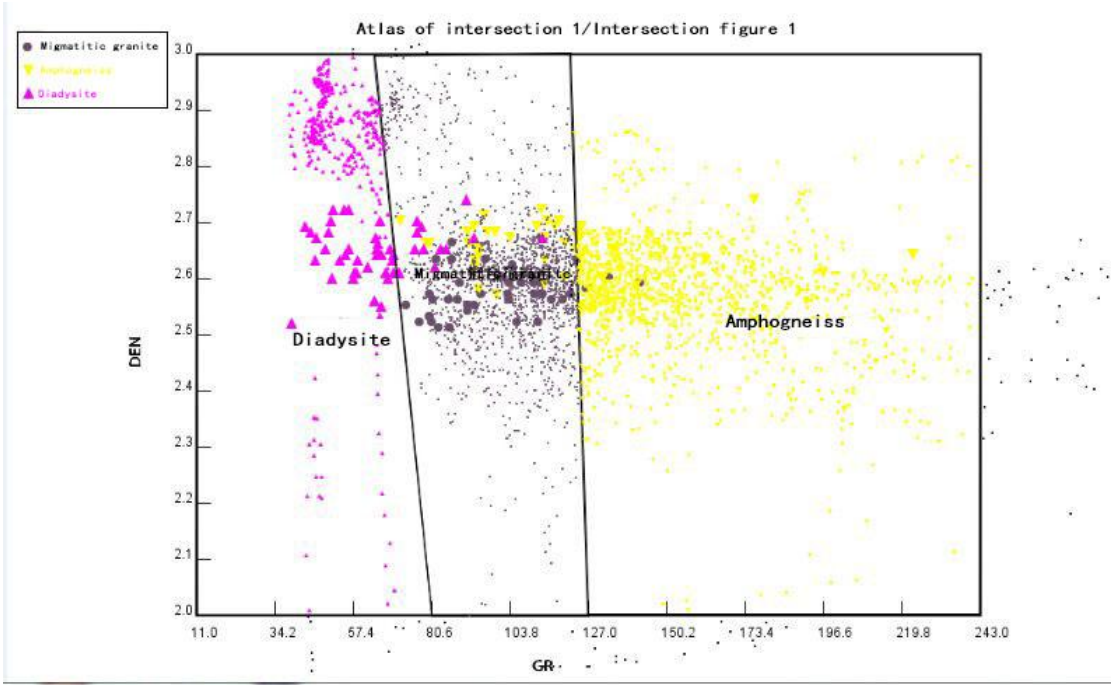

Fig.3 The interface of Cross-Plot

Conclusions

This paper has discusssed the principle of how to use crossplot、BP neural network and the method of fuzzy mathematics to automatic recognition of lithology thchnology, and the data model and the system design of lithology identification of well logging data of protolype system. The system adhibits Java 、NetBeans to realize the orgrnization of rock identification mdules, which also gets lithology identification of well logging data、the basic data management of well logging and data output together.

Friendly intrface, nice stability,exact computer power and strong praticability work for the system , so it should be popularized.

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Reference:

[1]Liu Gujin Liu Guochun. Coalfield well logging data digital processing. Beijing coal industry publishing house, 1993.

[2]Juan-juan li. Probabilistic neural network technology in the application of coalfield seismic inversion study . Progress in geophysics, 2012, 27 (2) : 0715-072

[3]Guo-jian cheng. Probabilistic neural network method in the application of lithology recognition Microcomputer information, 2007, 23 (6) : 288-289

[4]yan-jie song. Complex lithology logging identification method based on support vector machine [J]. Journal of daqing petroleum, 2007, 31 (5) : 18 to 20

[5]Yi-song Chen, Guo-ping wang, shi-hai dong. Submet to the Journal of software, 2003, 14 (3) : 451-460

[6]Mahai, yan-jiang wang, Hu Rui, etc. The new logging lithology identification method research [J]. Progress in geophysics. 2009, 24 (1) : 263-26