

AN ASSOCIATION-ANALYSIS-BASED FUZZY CONTROLLER FOR BALL MILL PULVERIZING SYSTEM

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ABSTRACT. *This paper presents an association-analysis-based fuzzy controller for ball mill pulverizing system and the control rules could be automatically obtained by the control rules generation algorithm. The proposed algorithm is based on association analysis and adopts the antecedent ergodicity and the consequent pruning strategy to ensure the completeness of mined control rules and improve the efficiency of the algorithm. Moreover, the improved fuzzy support and the fuzzy consequent strength measurements are proposed to ensure the accuracy of mined control rules. The experimental results verify that the performance of our control rules generation algorithm is better and the fuzzy controller, whose control rules are obtained automatically by the proposed algorithm on the real field database of ball mill pulverizing system, has higher control quality. In addition, the proposed fuzzy controller has been put into practice and the field data verify the effectiveness of the fuzzy controller.*

Keywords: Ball mill pulverizing system, Fuzzy controller, Data mining, Association analysis, Control rules generation

1. Introduction. Ball mill pulverizing system supplies the dry pulverized coal to the boiler and is one of the major assistant equipments in a thermal power plant. Moreover, the ball mill pulverizing system has been widely adapted to various kinds of coal and has been used in more than sixty percent thermal power plants in China [1]. However, one of its shortcomings is that the ball mill pulverizing system consumes a lot of power, which is 15-25% of the whole consumption in power plant [2]. Therefore, to control the ball mill pulverizing system work stably and safely could ensure the output capability being in the higher level all along and the energy consumption would be reduced.

The ball mill pulverizing system is a multi-variable and strong coupling system with nonlinearity [3], and the auto disturbance rejection controller, the reversed frame normalizing method and the H-infinite method are used in [4]. Neural network learns from scratch by adjusting the interconnections between neurons without relying on the model of controlled plant and some applications of neural network for the ball mill pulverizing system are presented in [5-9]. Fuzzy control, which is a model free design method and more insensitive to plant parameter variations [10,11], has been successfully used to solve many complex industrial problems [12,13]. Since fuzzy control is beneficial to handling the complex nonlinear plant and could be implemented conveniently in the field, the fuzzy controllers for ball mill pulverizing system are proposed in [14-20]. However, the control rules of a fuzzy controller, which are usually obtained from the knowledge of experts, would be subjective and inaccurate [21]. Moreover, if the input variables or the linguistic