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Online Coal Anomaly Detection Method Based on Improved Random Forest Algorithm and Its Application in Thermal Power Plants

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Introduction

In order to improve the utilization rate of coal generation and reduce the carbon emission of coal-fired boilers, the operation parameters of power plant boilers should be matched with the actual burning coal. Due to the complicated coal-mixing combustion process, once the coal is mixed, the difference between the combustion coal and the preset coal is large, resulting in the mismatch of boiler operation parameters will not only reduce the power generation efficiency, but also affect the normal operation of auxiliary equipment, and even cause serious accidents. At present, the coal information of pulverizing system belongs to the category of abnormal detection of coal, which is of great significance to the safe and economic operation of power plant equipment. To the best of our knowledge, there is no mature solution to deal with this problem at present. In this paper, we propose a data-driven method to realize online coal identification.

Methodologies

Firstly, a variable set was constructed based on the operational parameters related to coal type information, and the characteristic variables with strong correlation to coal type identification were extracted based on the importance of variables. Then the random forest model of coal classification is constructed. During online operation, principal component analysis (PCA) monitoring model was constructed to evaluate the applicability of random forest model, so as to guide the updating of coal identification model and facilitate the long cycle iterative operation of the identification model. The method proposed in this paper does not need to rely on additional hardware detection equipment and is easy to implement and apply in the field.

Conclusion

The actual industrial data verification results show that the data-based coal identification method has high identification accuracy, can quickly identify coal online, and has good applicability. The popularization and application of this method is conducive to improving the safety of power plant boiler operation.

Figures

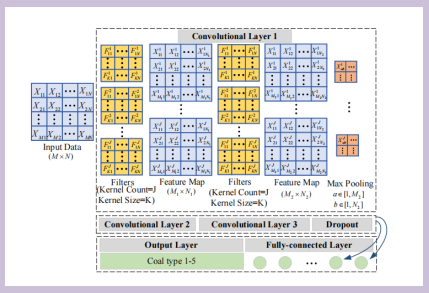

Figure 1. Structure diagram of the one-dimensional convolution network

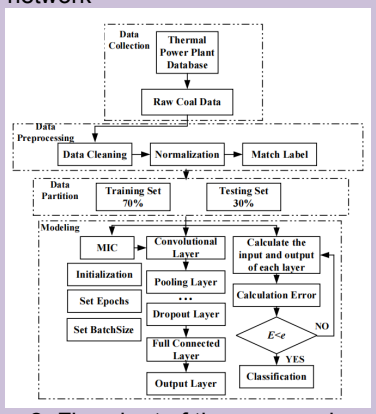

Figure 2. Flowchart of the proposed method

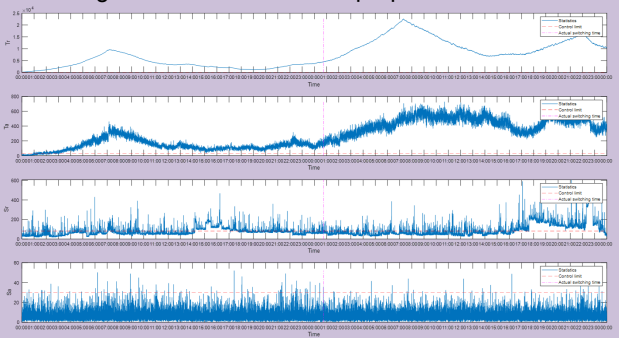

Figure 3. Proposed method

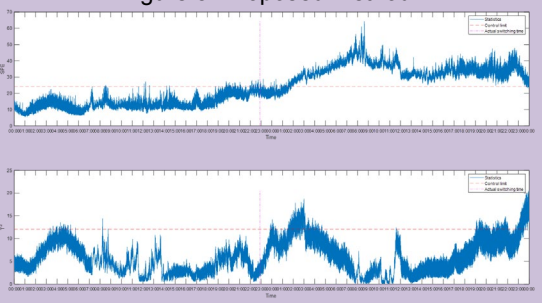

Figure 4. PCA