Conceptual Analysis of Different Clustering Techniques for Static Security Investigation

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Abstract

Power system contingency studies play a pivotal role in maintaining the security and integrity of modern power system operation. However, the number of possible contingencies is enormous and mostly vague. Therefore, in this paper, two well-known clustering techniques namely K-Means (KM) and Fuzzy C-Means (FCM) are used for contingency screening and ranking. The performance of both algorithms is comparatively investigated using IEEE 118-bus test system. Considering various loading conditions and multiple outages, the IEEE 118-bus contingencies have been generated using fast-decoupled power flow (FDPF). Silhouette analysis and fuzzy partition coefficient techniques have been profitably exploited to offer an insight view of the number of centroids. Moreover, the principal component analysis (PCA) has been used to extract the dominant features and ensure the consistency of passed data with artificial intelligence algorithmsô requirements. Although analysis of comparison results showed excellent compatibility between the two clustering algorithms, the FCM model was found more suitable for power system static security investigation.

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