A Fast *k*-means Clustering Implementation for Multispectral Image Classification

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**ABSTRACT** A *k*-means clustering technique has been widely used for data clustering in many applications such as pattern recognition, data mining, and multispectral/hyperspectral image classifications. A typical implementation of image data clustering is to group image pixels based on their spectral signatures into several classes. *k*-means clustering is sensitive to two initial conditions; the number of classes and initial cluster centers. In the first condition, if a wrong number of classes is assigned, the classification accuracy will be poor. In the second condition, the solution depends on a choice of initial cluster centers, i.e., different initial cluster centers may generally produce different cluster centers and convergence rates. In a traditional way, initial cluster centers are randomly selected from all the pixels. This scheme may be expensive if all the initial cluster centers are quite similar. In this paper, we focus on the second condition, probably a crucial issue. Thus, the paper aims to fasten the *k*-means clustering implementation for multispectral image classification while maintain its accuracy. We modify the initialization process of *k*-means clustering by initiate the initial cluster centers instead of randomly selection. In our approach, endmembers extracted by endmember extraction techniques are chosen for the initial cluster centers. Two experiments are conducted and compared. These experiments are to examine the number of iterations of two cases; when initial cluster centers are randomly selected and when they are initiated by endmembers. The result demonstrates that the number of iterations of the second case is less than that from the first one. Also, the classification accuracies of both cases are comparable. Thus, the proposed approach reduces the computational time of *k*-mean clustering for multispectral data classification and at the same time a classification quality is preserved.

**KEY WORDS** *k*-means clustering, multispectral classification, endmember extraction

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