Abstract

In mineralogy, analysing the chemical components of crystals existing in igneous rocks can make contribution to forecast the volcanic eruption. In the laboratory, it's possible to use scanning electron microscope(SEM) to scan a thin section of igneous rocks in order to acquire images of crystals. However, due to the working mechanism of SEM, it cannot get the whole image of the thin section at one time, but acquire an patch image every time showing the part of thin section. This paper proposes a feature-based image stitching algorithm to stitch a series of patch images scanned by SEM into a large mosaic image by applying a geometrical and radiometric alignment. First, after obtaining a series of patch images, the dimension of a mosaic image will be calculated and a reference image will be obtained and fixed on the mosaic image. Then an algorithm for feature extraction is used to extract image features for each patch image, and rough match the feature points according to the image feature descriptors. RANSAC will then be used to refine the matched feature points. These refined feature point pairs will be used to estimate the parameters for geometrical transformation. A global adjustment method is mentioned in this paper to estimate the parameters. A geometrical alignment is implemented after obtaining the estimated parameters. In the next stage, the model for radiometric alignment is selected and the parameters is estimated again with the global adjustment method. Due to the reason that the true adjustment parameters are unknown, it's unable to know whether the algorithm correctly predicted the transformation parameters. Therefore, a synthetic dataset is generated by predefined basic transformation parameters. The designed algorithm is used to stitch the synthetic images to the mosaic image and calculate the transformation parameters afterwards. By comparing the predefined transformation parameters and the parameters calculated by algorithm, the quality of image stitching algorithm is discussed.