Abstract—Metallographic images of metal crystal structures which have disconnected boundaries and heterogeneous intensity need to be segmented and analyzed to estimate the materials' performance. Comparing to other image segmentation methods, the watershed segmentation algorithm (WSA) has so far dominated in the segmentation of metallographic image based on seeds growing. However, an object in metallographic image with poor quality has more than one seed, so objects in the image will be over-segmented into several parts so that it becomes even hard to identify the segmentation result. Hence the traditional iterative watershed segmentation algorithm (TIWSA), a revised watershed algorithm, has been designed to mitigate the over-segmentation dilemma by classifying and merging pseudo-blobs to surrounding blobs. However, during the process of pseudo-blobs combination in TIWSA, a pseudo-blob may falsely be merged into a surrounding real-blob due to noises and textures in the image, so the TIWSA has to reduce combinations of pseudo-blobs in order to assure the accuracy of merging process so that the over-segmentation dilemma cannot be eradicated. Hence the TIWSA needs to be revised to protect the real-blobs and prevent them from merging other pseudo-blobs. This paper, aiming at this problem, firstly represents a new principle called *real-blob classification rule* to classify the real-blobs based on the iterative prior probability of real-blob. Once a new blob is formed, it will be examined whether it is a real-blob and all real-blobs will be recorded. Secondly, the pseudo-blob merge rule is revised that the recorded real-blobs canno longer merge other pseudo-blobs during the process of pseudo-blobs combination. The result shows that this improved TIWSA not only avoids wrong merging, but also maximizes the number of the pseudo-blobs elimination which mitigates the over-segmentation dilemma in TIWSA.

Keywords--segmentation of metallographic image, iterative watershed algorithm, ridge detection, real-blob classification.