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Real-time multi-beam SEM image stitching (Conference Presentation)

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Paper Abstract

In biomedical research, acquiring an image of large areas or a whole section is highly desirable, while retaining microscopic resolution. Scanning Electron Microscopy (SEM) typically provides resolution of 2 nm to 10 nm, but SEM is limited in terms of throughput, which leads to a small Field Of View (FOV) of typically 5x5µm. The Multi-Beam Scanning Electron Microscope (MBSEM) is developed to keep resolution while increasing the throughput, by using 196 parallel beams. All individual beams create one tile in a big composite image. We need to stitch the individual tiles. Usually, this is done based on information in the images itself, but that takes a lot of computation time. We developed a real-time MBSEM image stitching algorithm for our experimental setup, based on prior information about the position and contrast of the tiles. First, a calibration that is performed before starting the scan provides an estimation of the corner positions of the tiles with respect to the sample. In order to map tiles to the desired output frame, we apply the affine transformation which uses the coordinate information from the calibration step. Finally, blending is applied in the overlap regions generating a seamless composite image. Our fully automated, high-speed algorithm demonstrates that our method is very robust for illumination, rotation and zoom of the images.

Paper Details

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