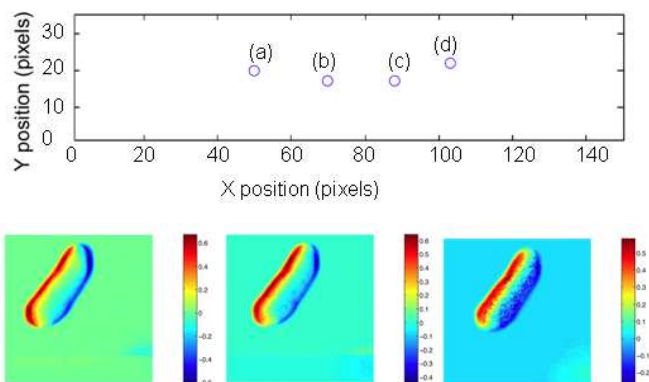


BlueBEAR provides a substantial computing resource that properly supports the research work of research staff and students at Birmingham. It provides a cost effective facility that optimises the effectiveness of research and ensures the University continues to be a world-class academic learning and research environment.

Cross-Correlation Nanoparticle Tracking for 2D Spatial Drift Correction in Post-acquisition Analysis

Challenges

Scanning Transmission Electron Microscopy (STEM) with aberration corrector is a powerful tool for nanostructures. However, like many other microscopy techniques, lateral spatial drift due to the relative movement of the probe and the sample often hinder quantitative analysis of images taken as varying experimental conditions. Fig. 1 shows the relative position of Au nanorod in the images and Fig. 2 is the normalized uncorrected image subtraction, of which blue and red part comes from nonalignment of sample. Due to the large dataset involved, manual alignment of the images is not feasible.

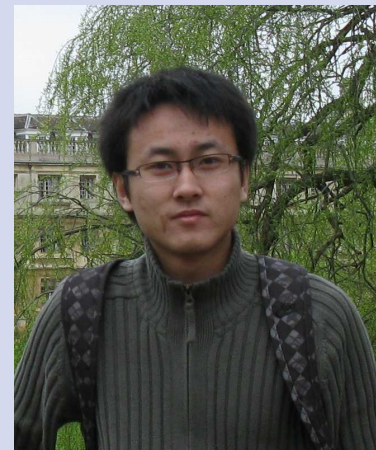
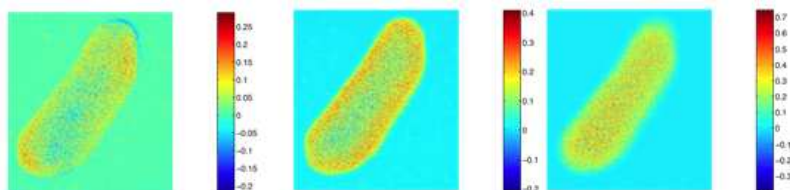


Background

In this study, we have developed a semi-automatic routine based on the cross-correlation algorithm for post-acquisition image analysis to improve the efficiency of alignment. Correlation coefficient was employed as criterion, taking advantage of its linear invariability. Maximum of correlation coefficient indicates the relative drift distance. These images can then be re-aligned through matrix manipulation.

Results

We applied this method to the images of Au nanorod structure. With comparison of the centroids of successive images (512x512pixels), the standard deviation is within 2 pixels and subtracted images are much more uniform (Fig. 3). This demonstrates the validity of this approach and improves greatly the efficiency of post quantitative information extraction.



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