

### **Three-dimensional Data merging of Randomly Oriented Continuous Diffraction Patterns**

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We have developed methods for the assembly of three-dimensional diffraction data from noisy and randomly oriented continuous diffraction images. Before a structural reconstruction is possible, the patterns must be oriented with respect to each other and the signal to noise ratio must be increased by averaging of redundant data. While certain aspects of this problem are similar to problems in single-particle electron tomography, there are also significant differences. In single-particle electron tomography, similar images are located based on their correlation and the mutual orientation of the averaged images is determined from the common lines of intersection of their Fourier transforms. We present an extension of this scheme to the case of diffraction images, which intersect in spherical sections in Fourier space rather than in planar sections and which have statistical properties different from those of tomograms. We study how our scheme works on both real and simulated sets of three-dimensional data.

**Keywords:** 3D image, imaging, fourier transform