Geometric models of subcellular components of a cell

We want to construct simplified geometric models of subcellular components of a cell, like the nucleus or mitochondria. The input will be high resolution Focused Ion Beam Scanning Electron Microscope (FIB-SEM) images of plane sections through the cell, which are assembled into a 3D voxelized volume. These voxel volumes have already been segmented to identify the voxels belonging to the subcellular objects of interest. The output will be a simplified geometric approximation to the voxel volumes in these objects, bounded by pieces of planes, spheres, and cones which fit together to form a smooth surface. Such a simplified description can serve as a compressed summary of the volume, taking much less data to specify, and can also be used to compute things like the surface area of the object. The goal is to adapt methods of creating these simplified models that are described in the following two papers.

- Li P, Wang B, Sun F, Guo X, Zhang C, Wang W (2015) Q-Mat: Computing medial axis transform by quadratic error minimization, ACM Trans. Graph 35 (1): Article 8.
- Thierry J-M, Guy E, Boubekeur T (2013) Sphere-Meshes: shape approximation using spherical quadric error metrics, ACM Trans. Graph 32 (6): Article 178