ASSEMBLING LARGE MOSAICS OF ELECTRON MICROSCOPY IMAGES USING GPU

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MOTIVATION

The Neural Circuit Reconstruction (NCR) Toolkit is used to register and warp thousands of images of Transmission Electron Microscope into volumes [1,2]. In the current toolset exporting the aligned mosaic images from the original images is a bottleneck in the process when terrabytes of images need to be mapped. We accelerated this process using GPU.

METHOD

(Input 1) Grid transform file
   • Warped Tile image parameters
   • Non-uniform transform parameters

(Input 2) EM Tiles
   • Heating by the electron beam causes distortion of the tile

Interpolation
Tiles are loaded into texture memory. Random access to texture memory is optimized by the texture caching process. Random access is required because the tile is non-linearly distorted.

GPU data copy cost minimization
Copying data from CPU to GPU is costly. A queuing process replaces the earliest used texture with required texture minimizing texture copies.

RESULTS

The Neural Circuit Reconstruction (NCR) Toolkit is used to register and warp thousands of images of Transmission Electron Microscope into volumes [1,2]. In the current toolset exporting the aligned mosaic images from the original images is a bottleneck in the process when terrabytes of images need to be mapped. We accelerated this process using GPU.

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OPTIMIZATIONS

References:

Acknowledgements:
The authors would like to thank the members of the Collaborative Research in Computational Neuroscience (CRCNS) group at the Scientific Computing and Imaging Institute and the Marc Lab for the useful comments on the project. We also like to thank NIH R01 EB005832 (PI: Tasdizen) grant, DOE, NAECS CLAST Grant, ASC R-U510464, NSF, CNS Grant 06-51321, and NSF CCF-0701873 for enabling us to do this work. We would like to thank NVIDIA for their generous donation of GPU cards.