Fast segmentation from blurred data in 3D fluorescence microscopy

ABSTRACT

- A fast algorithm for segmenting 3D images from linear measurements based on the Potts model (or piecewise constant Mumford-Shah model).
- To that end, we first derive suitable space discretizations of the 3D Potts model which are capable of dealing with 3D images defined on non-cubic grids.
- Our discretization allows us to utilize a specific splitting approach which results in decoupled subproblems of moderate size.
- The crucial point in the 3D setup is that the number of independent subproblems is so large that we can reasonably exploit the parallel processing capabilities of the graphics processing units (GPU).

EXISTING SYSTEM

- Segmentation is an important component of many image processing pipelines. For instance, a segmentation of the image can be used to extract objects of interest nuclei of cells in microscopic images.
- Furthermore, it can serve for dimensionality reduction by aggregating related pixels into larger regions (“superpixels”).
- In many imaging modalities however, the image of interest cannot be recorded directly, but it is reconstructed from indirect linear measurements given by the device
- The relation between the imaged object and the data is given by some imaging operator

PROPOSED SYSTEM

- The crucial point in the 3D setup is that the number of independent subproblems is so large that we can reasonably exploit the parallel processing capabilities of the graphics processing units (GPU).
- Our GPU implementation is up to 18 times faster than the sequential CPU version. This allows to process even large volumes in acceptable runtimes.
- As a further contribution, we extend the algorithm in order to deal with non-negativity constraints. demonstrate the effciency of our method for combined image deconvolution and segmentation on simulated data and on real 3D widefield fluorescence microscopy data.

HARDWARE REQUIRMENT

- Processor - Pentium-IV
- Speed - 1.1 Ghz
- RAM - 256 MB(min)
- Hard Disk - 20 GB
- Key Board - Standard Windows Keyboard
- Mouse - Two or Three Button Mouse
- Monitor - SVGA

SOFTWARE REQUIRMENT

- Tool - MATLAB R2012
- Operating system - Windows Xp, 7

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