Cell Segmentation and Tracking

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Motivation

• Biological Process

• Disease Progress
Problem Statement
Dataset

- *C. elegans* developing embryo
  Waterston Lab, University of Washington

- Voxel size: 0.09 x 0.09 x 1.0 μm

- Time step (min): 1 (1.5)
Segmentation: Algorithm

Level 1: Initial segmentation (proposed by MPI-GE (benchmark))
Segmentation: Algorithm

Level 2: Superpixel segmentation

Input image → Noise filtering → SLIC → Superpixel segmentation → Segmented image 2
Segmentation: Algorithm

Level 3: Boundary Correction

Segmented image 1 + Segmented image 2 → Output image

Majority voting on boundary of segmented nuclei
Segmentation: Comparison

Input Data

Benchmark Segmentation
Segmentation: Comparison

Our Algorithm

Input Data
Segmentation: Comparison
Segmentation: Results

Validation

Dataset 01

Benchmark: 67.47%

Proposed algorithm: 69.73%

Dataset 02

Benchmark: 59.65%

Proposed algorithm: 64.77%
Take-home message

Addition of the proposed boundary correction pipeline improves the segmentation accuracy.
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CELL TRACKING CHALLENGE TEAM

Martin Maška
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Tracking: Algorithm

Two consecutive segmented images → Graph construction → Undirected graphs → Node matching → Final labels
Tracking: Results (to do..)

Validation

Dataset 01
- Proposed algorithm: 67.47%
- Benchmark: 69.73%

Dataset 02
- Benchmark: 59.65%
- Benchmark: 69.73%