Electronic Supplementary Material (ESI) for Molecular BioSystems

The cell monolayer trajectory from the system state point of view

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Supplementary video:

Description of video files:

Monitored object is HeLa cells (Human Negroid cervix epitheloid carcinoma) were obtained from ECACC - European collection of cell cultures. The cells were grown at low optical density overnight in a 37 ºC temperature in a synthetic dropout media with 30% raffinose as the sole carbon source. The nutrient solution for HeLa cells consists of: 86% EMEM, 10% newborn-calf serum, 1% antibiotics and antimycotics, 1% L-glutamine, 1% non essential amino acids, 1% NaHCO3 (all components from the PAA company).
The video file were creted from series of images from original phase-contrast images or entropy images of growing cells taken at 1-min intervals. The Olympus IX 51 with an automated state, integrated incubator, and photographic Camedia C7070 camera were used for taking of images. The objective with magnification of 20X was used.

Supplementary video 1 Example of HeLa (phase contrast) cell oscillations in shape and color.

Supplementary video 2 Example of HeLa (entropy transformation with $\alpha = 1.0$) cell oscillations in shape and color.

Supplementary video 3 Example of HeLa (entropy transformation with $\alpha = 1.0$) cell oscillations in shape and color.

Supplementary video 4 Demonstration of cell dynamics that represent the changes from one cell state to another (entropy transformation with $\alpha = 1.0$).

Supplementary video 5 Demonstration of cell interior dynamics that represent the changes from one cell state to another (entropy transformation with $\alpha = 1.0$).

Supplementary video 6 Demonstration of cell resting in one particular state (entropy transformation with $\alpha = 1.0$).

Supplementary video 7 Demonstration of cell resting in one particular state (phase contrast).

Supplementary video 8 Demonstration of cell interior of cell resting in one particular state (phase contrast)

Supplementary video 9 Demonstration of cell interior of cell resting in one particular state (entropy transformation with $\alpha = 1.0$).

Supplementary video 10 Interaction between cells (phase contrast)

Supplementary video 11 Interaction between cells (entropy transformation with $\alpha = 1.0$)

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Supplementary figures:

Supplementary Figure 1 Segmentation of cells and background.

Supplementary Figure 2 Demonstration of time lapse microscopy image.

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Supplementary Figure 1

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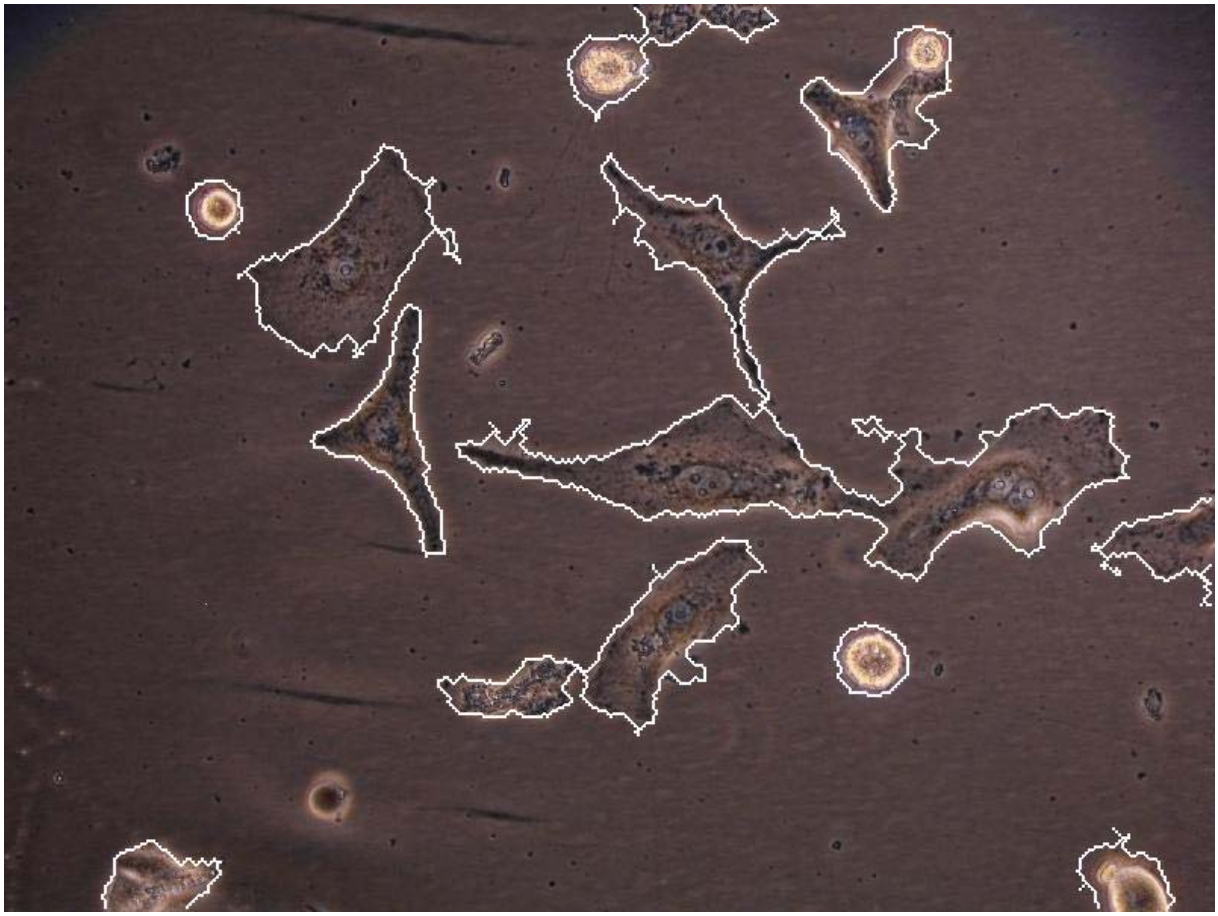

Segmentation of cells and background: Example of cell-background segmentation of HeLa cells based on the cell dynamics. The algorithm of cell segmentation is based on the assumption that the dynamics of live cell interior is significantly higher than the dynamics of background (noise). The image is divided into patches and the variation of intensity is measured for each patch for N consecutive images. The segmentation is realized as thresholding of the intensity variation. Patches with high variation corresponds to the live cell interior and the patches with low variation corresponds to the background.

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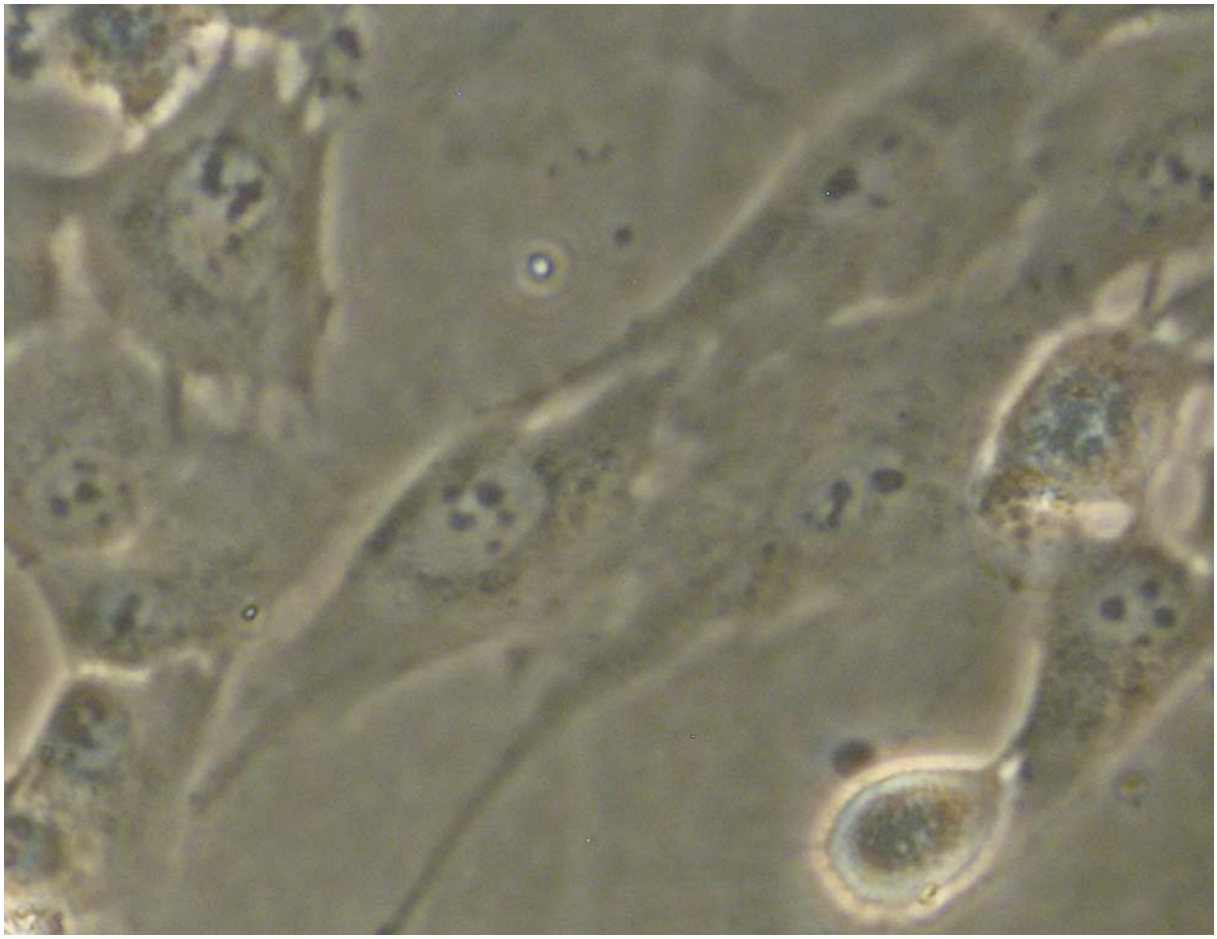
Supplementary Figure 2



Demonstration of time lapse microscopy image: Typical image of the mammalian cell from phase-contract time lapse microscopy. The image has low contrast between background and cells and between cells. Intensity of the background is the same as the intensity of some parts of cells. The borders of cells are smooth and the shape of the cell has very high flexibility.