

Supplementary Data 1

Verbatim print of the configuration file used for creating the synthetic competition videos, the lines starting with semicolon ';' are comment lines (not used):

```
;----- characteristics of one 'universal' cell -----
[cell]
; Should be 23 for humans.
chromosome count = 23

; Lengths of phases of cell cycle
; (in percent)
; times correspond to literature
duration of G1 phase = 45.0
duration of S phase = 30.0
duration of G2 phase = 15.0
duration of prophase = 1.25
duration of metaphase = 2.85
duration of anaphase = 0.25
duration of telophase = 0.325
duration of cytokinesis = 0.325

; amount of fluorophore molecules filling the nucleus interior
; (in percent)
coverage = 300.0

; The average diameter of standard cell (in microns)
cell diameter = 7.0

; A diameter of nucleolus (in microns)
nucleolus diameter = 1.4

; How far a cell can normally move between frames (in microns)
;
; When setting this value, take into account how many
; frames are used to sample cell cycle, which correlates
; with time delay between acquisition of frames in real
; situation
;
; Default value is based on our observation that a cell
; moves 1.5-2.0um/frame if time-sampling is 9.5min/frame,
; and about 1um/frame if time-sampling is 5min/frame. Thus,
; both cases yield "average" velocities of 0.184um/min and 0.2um/min.
;
; short sequence:
; We use 0.14um/min and 23.75hrs/cycle.
cell magnitude of movement per frame = 0.4

; How far a cell can move between frames (in microns) if the cell is cometing.
; Refer to the type StateOfComet for details about cometing.
comet cell magnitude of movement per frame = 0.5

; maximum magnitude of vectors used for usual and occurring-most-of-the-time
; non-rigid deformation of cells (in microns)
;
; short sequence:
cell nonrigid deformation = 0.15

; maximum magnitude of vectors used for "strong" non-rigid
; deformation of cells (in microns); this deformation typically
; happens just occasionally and, unlike the deformations driven
; with the cellNonRigidDeformation constant, one usually notices it
;
; short sequence:
cell nonrigid strong deformation = 0.7

; Should or shouldn't non-rigid deformations (if available) be done
; in every frame. It is good to disable them when noFramesPerCellCycle
; is more than 60.
;
; short sequences:
cell sparse nonrigid deformations = false

; How far a cell can "see" when it is trying to move
; to region with lower density of cells (in microns).
;
; The higher the value is, the greater outlook a cell has
; and the higher chance it flows into less dense region (
; and the higher time demand for the simulation :-).
;
; This value must not be less than cellMagnitudeOfMovementPerFrame.
```

```

;
; short sequences:
cell look distance = 0.6

; Default (average) number of frames per cell cycle
number of frames per cell cycle = 50

;----- characteristics of scheduler -----
[scheduler]

; Number of initial cells put into the process
number of initial cells = 15

; A constant that defines which slice from fully _ISotropic_ 3D image
; should be used for spatiotemporal image. The spatiotemporal images
; are created from the ISotropic images before these are anisotropically
; resampled.
slice of interest = 60

;----- optical system -----
[objective]
name = Zeiss 63x/1.40 Oil DIC (new)
magnification = 63

[microscope]
name = Zeiss S100
magnification = 0.859

[microscope adapter]
magnification = 1

[confocal unit]
name = Atto CARV
magnification = 1

[confocal unit adapter]
magnification = 1

[psf]
;experimentally measured point spread function
;corresponding to the selected components
location = /mnt/gryf/COMMON/DATA/PSF/2013-01-30_1_1_9_0_2_0_0_1_0_0_0_0_11_14.ics

[light source]
;experimentally measured quadratic surface of uneven illumination
;corresponding to the selected components
b1 = 0.8507717563
b2 = 0.0003232258
b3 = 0.0002796816
b4 = -0.0000000193
b5 = -0.0000003282
b6 = -0.0000002623

[fluorophore]
photobleaching rate = 0.003

[camera]
name = Micromax 1300-YHS
pixel size = 6.7
dynamic range = 12
grid = (1300,1030)
baseline = 550
ADC gain = 6
ADC offset = 0
read out noise = 25
dark current = 0.1
full well depth = 18000

[acquisition]
time = 5000
dynamic range usage = 85

[table]
z step = 0.2

[voi]
; size and shift in microns
size = (110,110,12)
shift = (0,0)

[subpixel precision]
level = 1

```