

Short user guide for SIMCEP simulation tool

1 Introduction

SIMCEP is a simulation tool providing the functionality presented in the manuscript *Computational framework for simulating fluorescence microscopy images with cell populations*. The tool is implemented with MATLAB and all source codes are freely available under terms of GNU General Public License. The motivation behind the tool is to allow a hands-on experience on the simulation methodology presented in the manuscript. Moreover, it provides a modular tool for future research.

SIMCEP is available at <http://www.cs.tut.fi/sgn/csb/simcep/> as a zip-archive. The tool requires MATLAB environment in order to work. The SIMCEP is developed with MATLAB version 7.1 and downwards compatibility is not guaranteed.

2 Getting started

After downloading and extracting the archive, run file `make_simcep` on MATLAB command line. It compiles necessary C-function into mex-file using your operating system specific compiler. Thereafter, SIMCEP is ready for use. You can now run the simulation with command:

```
[image,binary,features] = simcep;
```

The command will simulate an example image with default parameters. The output variables are the simulated RGB image (`image`), binary version of the simulated image (`binary`), and a struct containing selected information from the simulated objects (`features`). After simulation has finished, you can visualize the simulated image with

```
imshow(image, [])
```

3 Structure of the tool

The SIMCEP tool consists of several functions implemented as separate files. The main function for simulation is available in the file `simcep.m`. Description of each function is available by typing `help functionName` in the MATLAB command line, where *functionName* is the name of the function.

The parameters controlling the simulation functions are modified using the file `simcep_options.m`. More detailed descriptions of the parameters are also available in the file. The main function sets the parameters using the file, and therefore all new parameters can be added to the file.

SIMCEP is implemented using object oriented programming. The main class of the tool is *cellobj* from which classes *nuclei*, *cytoplasm*, and *sub-cell* are inherited from. The use of classes allows a modular way to define properties for different simulation objects.

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