

# Analysis of simulation from CompuCell3D

## New differentiation model

**Previous work** Here is a short reminder of the previous simulation campaign:

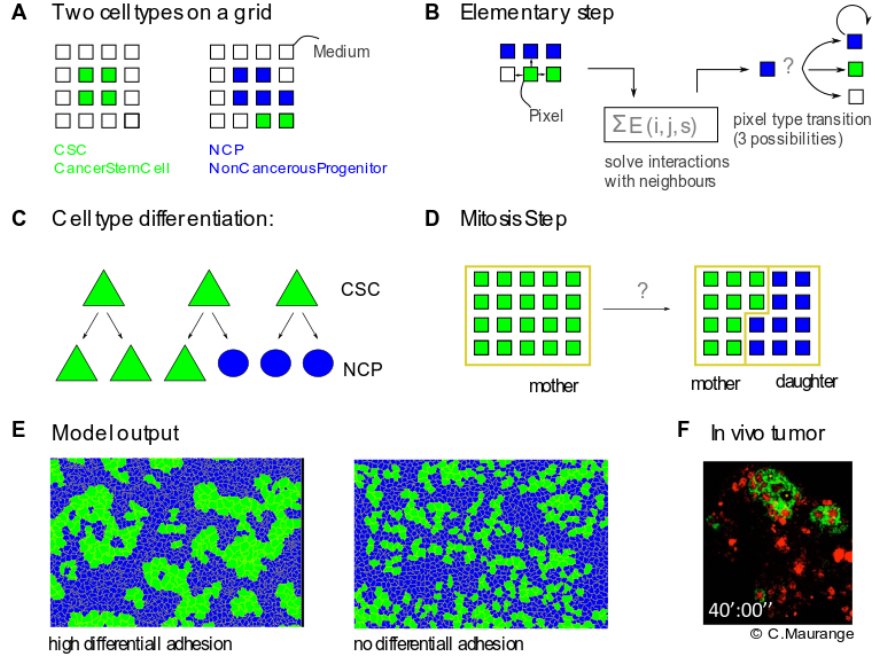


Figure 1: 'Figure 1'

In Figure 1 C, mitosis and differentiation are described as a single step process. As a consequence, three probabilities need to be set:

- symetric renewal  $P_{sr}$
- asymetric renewal  $P_{ar}$
- symetric differentiation  $P_{sd}$

To lower the number of parameters, we instead considered differentiation and mitosis as two separate processes, both daughter cells being independently tested for differentiation (Figure 2A bellow).

We define the self-renewing probability  $P_s$  and the differentiating probability  $P_d$ . The previous probabilities can be expressed as a function of the new ones, as detailed on the figure bellow for each daughter cell.

**New model** We consider 3 scenarios:

- Differentiation is independant from the cells neighborhood
- Differentiation depends on the **mother cell** neighborhood **before** division
- Differentiation depends on the **daughter cells** neighborhoods **after** division

This neighborhood depedence is quantified by stating that the **clustering coefficient** of the cell, as depicted on figure 2B bellow.

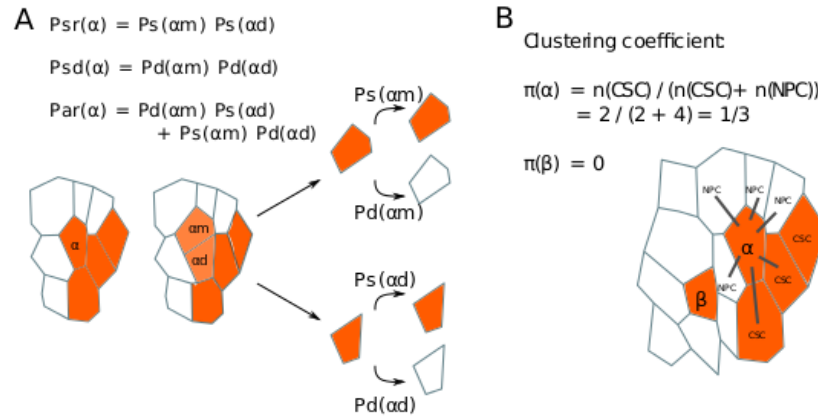


Figure 2: 'Figure 2'

**Results** The code necessary to reproduce those figures is available in the CancerStemCells\_GGH package. Notebook detailing the usage is there:

CancerStemCells\_GGH/Notebooks/Analysis of the simulation results.ipynb

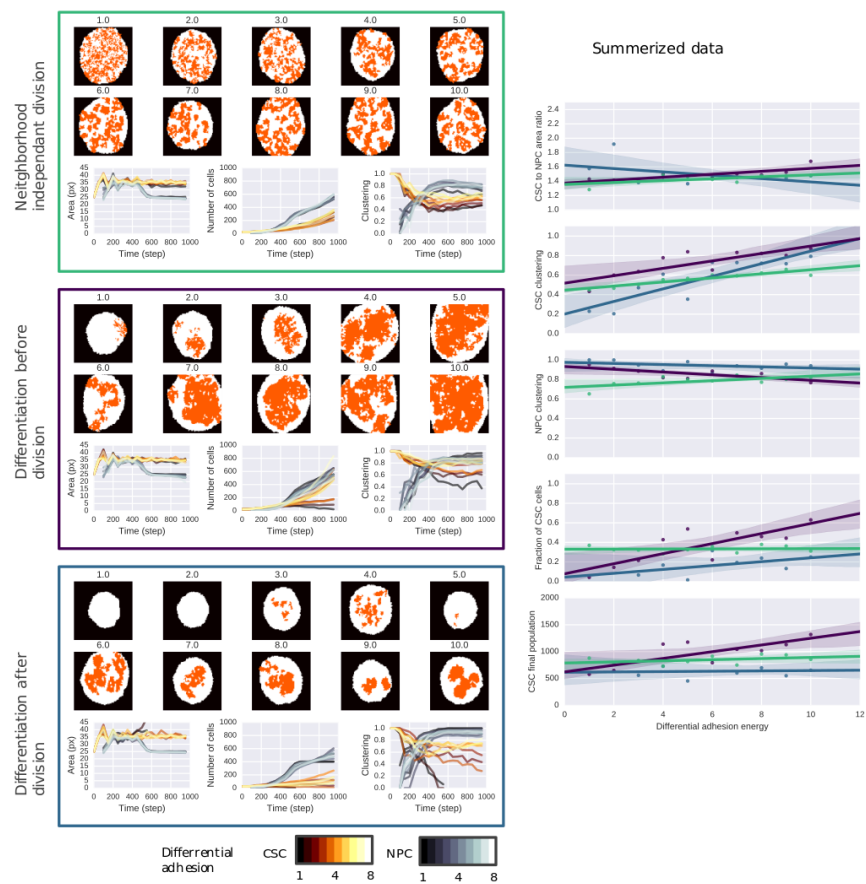


Figure 3: Big Figure