Clonal Inferno

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The research story

Clonal inferno resulted from the attempt to visualize tumor growth and nutrient consumption of the growing tumors. We used a three-dimensional hybrid cellular automata model (see HAL, halloworld.org), where cancer cells are represented as round cells, while the nutrient concentration was simulated as the brown-yellow field underneath. Single tumor cells were seeded throughout the domain and grew in response to an underlying diffusible nutrient that drove cell proliferation. During division, mutations of a cells genome yielded slight differences in fitness giving rise to different shades of orange, yellows, and reds seen for the cells in the tumors. The diffusible nutrient is presented as the underlying brown-yellow rugged surface. The yellow regions underneath each tumor are areas where the nutrition has been depleted, leading to holes in the brown landscape and steep nutrition gradients. The main purpose was to investigate good representations of tumor and nutrient at the same time.

The image

The image shown was a first test, which does not quite show biological reality. We managed to find a more biological relevant representation for this problem, which produces, unfortunately, less exciting images. Hence here we show a quite interesting, but scientifically not accurate, image. The image looks a bit like growing mushrooms on a distant planet, or violent explosions. The rugged surface with long spikes underneath make for an aggressive imagery, quite fitting for cancer.

F. Matthäus et al. (eds.), *The Art of Theoretical Biology*, https://doi.org/10.1007/978-3-030-33471-0_58