

# A model of proportionate growth

Tridib Sadhu

It is a common observation that as a baby animal grows, different parts of the body grow, to the first approximation, at the same rate. This property is called proportionate growth. How this is achieved is an interesting problem in Biology, and is not well understood.

I will discuss a simple toy model where this feature comes out quite naturally from local rules without fine tuning any parameter. In the model, one starts with a simple periodic background on a lattice, and adds particles at one site. There is a relaxation rule that distributes particles to neighboring sites if there are too many particles at any site. Depending on the initial state, and the choice of the rules one gets different beautiful but intricate patterns. An example is shown in the figure. The patterns produced are composed of large distinguishable structures with sharp boundaries, all of which grow at the same rate, keeping their overall shapes unchanged.

I will indicate how, in some special cases, the limiting pattern can be characterized exactly in terms of discrete holomorphic functions. I will also present an interesting connection to Apollonian circle packing problem.

