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Simple PDE model of spot replication in any dimension

We propose a simple PDE model which exhibits self-replication of spot solutions in any dimension. This model is analysed in one and higher dimensions. In one dimension, we rigorously demonstrate that the conditions proposed by Nishiura and Ueyama for self-replication are satisfied. In dimension three, two different types of replication mechanisms are analysed. The first type is due to radially symmetric instability, whereby a spot bifurcates into a ring. The second type is non-radial instability, which causes a spot to deform into a peanut-like shape, and eventually split into two spots. Both types of replication are observed in our model, depending on parameter choice. Numerical simulations are shown confirming our analytical results.

This is a joint work with Chiun-Chuan Chen.