

# Emerging patterns in the Abelian Sandpile Model

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## Abstract

The Abelian Sandpile Model is a simple cellular automaton describing the dynamics of a pile of sand under particle's addition. It presents Self Organized Criticality and seems to display allometry. Here I will show the emergence of 2-dimensional periodic patterns (patches) and 1-dimensional periodic defects (strings). These objects play a key role in the comprehension of a number of configuration naturally emerging in the dynamics. I will present the classification of these objects and the relation between the densities and their periodicity vector, called momentum, a reminiscent of a dispersion relation. Strings interact, they can merge and split, their interaction graphs will be showed and explained. In the understanding of the whole structure  $SL(2, \mathbb{Z})$  plays a key role.