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# A Sandpile to Model the Brain

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## Abstract

In neuroscience there has emerged an interest in the hypothesis that the brain functions at a critical point, where it is balanced between a phase of too much disorder and a phase of too much order. The model that is the focus of this thesis - the Abelian sandpile model - is a model that was developed due to an interest in constructing a model exhibiting self-organized critical behaviour; where the critical behaviour arises over time in an open, dissipative system as opposed to through the tuning of a parameter in an equilibrium system as is the case in classical models of criticality. In this thesis we present the Abelian sandpile model before we explain the concept of criticality and why it is of interest to some neuroscientists. We also present our own two variations of the model where we alter the dissipative structure of the system. We subsequently perform some simulations on the models, comparing the behaviour of the classical model to the behaviour of the altered ones. We find that our alterations to the model changes the behaviour of the system to a degree that we do not expect it to exhibit critical behaviour.

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