

## **Readings in Neuroinformatics**

Slaven Cvijetic, 14.12.2018

Dynamics of Pattern Formation in Lateral-Inhibition Type Neural Fields, Shun-ichi Amari, Biol. Cybernetics 27, 77-87 (1977).

### **Abstract**

The behaviour of brain structures has previously been described with a mathematical approach. In the current paper, we made use of the fact that a nerve normally consists of many randomly connected neurons allowing a statistical approach and the development of field equations. So far, there has been no advances in the treatment of multi-stable dynamical situations in cortical structures. We propose a new mathematical framework called dynamic neural fields to reliably study the behaviour of the cortex. We derived five types of stable dynamics for a single layer. Two are monostable fields with simple local or global excitation patterns. Two are bi-stable fields where one is described by an explosion-like excitation patterns and another that approaches the input stimulus maximum. The last type keeps periodic excitation. Additionally, we show on a two-layer system (one excitatory the other inhibitory) the process of neural oscillations and active transients. This is achieved by reducing the field boundaries to those of the excitatory region. There, we also show that occurrence of travelling waves. We lay down the theoretical fundament for further exploration of the interaction of cortical areas.