The abstract for this article is from the **Special Issue on Neurodynamic Correlates of Higher Cognition and Consciousness: Theoretical and Experimental Approaches - in Honor of Walter J Freeman's 80th Birthday Part I: Theoretical and Experimental Aspects of Higher Cognitive Functions** was provided by World Scientific.

Access to World Scientific is possible through the publisher’s website: [http://www.worldscientific.com/worldscinet/nmnc](http://www.worldscientific.com/worldscinet/nmnc)

The Table of Contents for the online version of this journal is available at the publisher’s website: [http://www.worldscientific.com/toc/nmnc/05/01](http://www.worldscientific.com/toc/nmnc/05/01)

**MODELING GOAL-ORIENTED DECISION MAKING THROUGH COGNITIVE PHASE TRANSITIONS**  
*ROBERT KOZMA, MARKO PULJIC, LEONID PERLOVSKY*  
DOI: 10.1142/S1793005709001246
MODELING GOAL-ORIENTED DECISION MAKING THROUGH COGNITIVE PHASE TRANSITIONS

ROBERT KOZMA
Computational NeuroDynamics Laboratory, FedEx Institute of Technology, 373 Dunn Hall, University of Memphis, Memphis, TN 38152, USA

MARKO PULJIC
Computational NeuroDynamics Laboratory, FedEx Institute of Technology, 373 Dunn Hall, University of Memphis, Memphis, TN 38152, USA

LEONID PERLOVSKY
US Air Force Research Laboratory, Sensors Directorate, 80 Scott Drive, Hanscom AFB, MA 01731, USA

Cognitive experiments indicate the presence of discontinuities in brain dynamics during high-level cognitive processing. Non-linear dynamic theory of brains pioneered by Freeman explains the experimental findings through the theory of metastability and edge-of-criticality in cognitive systems, which are key properties associated with robust operation and fast and reliable decision making. Recently, neuropercolation has been proposed to model such critical behavior. Neuropercolation is a family of probabilistic models based on the mathematical theory of bootstrap percolations on lattices and random graphs and motivated by structural and dynamical properties of neural populations in the cortex. Neuropercolation exhibits phase transitions and it provides a novel mathematical tool for studying spatio-temporal dynamics of multi-stable systems. The present work reviews the theory of cognitive phase transitions based on neuropercolation models and outlines the implications to decision making in brains and in artificial designs.

**Keywords**: Neurodynamics; phase transition; neuropercolation; metastability; decision theory

**Cited by**: