

Accepted Manuscript

The Brain Dynamics Toolbox for Matlab

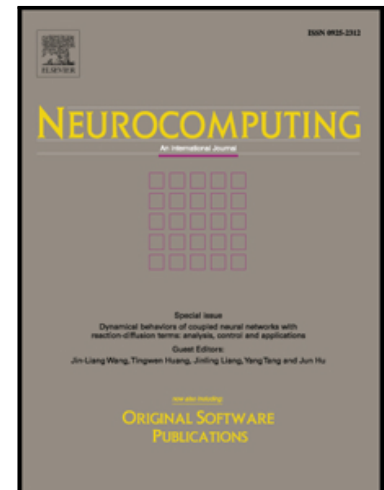
Stewart Heitmann, Matthew J Aburn, Michael Breakspear

PII: S0925-2312(18)30762-8
DOI: [10.1016/j.neucom.2018.06.026](https://doi.org/10.1016/j.neucom.2018.06.026)
Reference: NEUCOM 19704

To appear in: *Neurocomputing*

Received date: 18 December 2017
Revised date: 16 April 2018
Accepted date: 12 June 2018

Please cite this article as: Stewart Heitmann, Matthew J Aburn, Michael Breakspear, The Brain Dynamics Toolbox for Matlab, *Neurocomputing* (2018), doi: [10.1016/j.neucom.2018.06.026](https://doi.org/10.1016/j.neucom.2018.06.026)



This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

The Brain Dynamics Toolbox for Matlab

Stewart Heitmann, Matthew J Aburn, Michael Breakspear

*QIMR Berghofer Medical Research Institute
300 Herston Road, Herston QLD 4006, Australia*

Abstract

Nonlinear dynamical systems are increasingly informing both theoretical and empirical branches of neuroscience. The Brain Dynamics Toolbox provides an interactive simulation platform for exploring such systems in MATLAB. It supports the major classes of differential equations that arise in computational neuroscience: Ordinary Differential Equations, Delay Differential Equations and Stochastic Differential Equations. The design of the graphical interface fosters intuitive exploration of the dynamics while still supporting scripted parameter explorations and large-scale simulations. Although the toolbox is intended for dynamical models in computational neuroscience, it can be applied to dynamical systems from any domain.

Keywords: initial-value problems, differential equations, numerical integration, visualization, brain dynamics

1. Introduction

Computational neuroscience relies heavily on numerical methods for simulating non-linear models of brain dynamics. Software toolkits are the manifestation of those endeavors. Each one represents an attempt to balance mathematical flexibility with computational convenience. Toolkits such as GENESIS [1], NEURON [2] and BRIAN[3] provide convenient methods to simulate conductance-based models of single neurons and networks thereof. The Virtual Brain [4] scales up that approach to the macroscopic dynamics of the whole brain by combining neural field models [5] with anatomical connectivity datasets [6]. Mathematical toolkits such as AUTO [7], XPPAUT [8], MATCONT [9], PyDSTool [10] and CoCo [11] are useful for analyzing non-linear dynamics but assume advanced mathematical theory.

Download English Version:

<https://daneshyari.com/en/article/10151147>

Download Persian Version:

<https://daneshyari.com/article/10151147>

[Daneshyari.com](https://daneshyari.com)