# NEURAL TISSUE RESPONSE TO IMPACT – NUMERICAL STUDY OF WAVE PROPAGATION AT LEVEL OF NEURAL CELLS

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**Abstract:** In this article, we deal with a numerical solution of the issue concerning one-dimensional longitudinal mechanical wave propagation in linear elastic neural weakly heterogeneous media. The crucial idea is based on the discretization of the wave equation with the aid of a combination of the discontinuous Galerkin method for the space semi-discretization and the Crank-Nicolson scheme for the time discretization. The linearity of the second-order hyperbolic problem leads to a solution of a sequence of linear algebraic systems at each time level. The numerical experiments performed for the single traveling wave and Gauss initial impact demonstrate the high-resolution properties of the presented numerical scheme. Moreover, a well-known linear stress-strain relationship enables us to analyze a high-frequency regime for the initial excitation impact with respect to strain-frequency dependency.

Key words: *Wave propagation in neural medium; discontinuous Galerkin method, Crank-Nicolson scheme, high-resolution semi-implicit scheme, traveling wave, energy invariant, Gauss pulse, critical frequency*

*Received: December 23, 2013* **DOI:** 10.14311/NNW.2014.24.010
*Revised and accepted: April 10, 2014*

## 1. Introduction

During its life the human organism is influenced by many different types of forces. Apart from gravitation there is a considerable amount of various forces, which have an effect on the interaction of a human body with the surrounding environment.

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