

BIOGRAPHICAL SKETCH

Born in Meriden, Connecticut

B.S. 2002, The Pennsylvania State University,
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QUALIFYING EXAMINATION & PUBLICATIONS

Time in Preparation: 2006—2011

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Publication:

Morales, G.J., Zhuang, H., Pavlovic, M., “An N-Node
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COLLEGE OF ENGINEERING
& COMPUTER SCIENCE
Florida Atlantic University

THE FLORIDA ATLANTIC UNIVERSITY

COLLEGE OF ENGINEERING & COMPUTER SCIENCE

announces the

Ph.D. Dissertation Defense

of

George J. Morales

for the degree of

DOCTOR OF PHILOSOPHY (PH.D.)

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Boca Raton, FL

**A Study on Neural Conduction as in Myelinated
Structure under Pathological Conditions**

A method for modeling and simulating neural action potential (AP) propagation along the length of an axon containing a number of Ranvier nodes is proposed in this dissertation. A system identification approach is adopted to represent node of Ranvier (NR) response to current pulse stimulus in the form of transfer function representations for NR excitability. Segments of myelinated internodal (IN) and NR regions are cascaded, representing the remaining downstream axon after a site-of-stimulus introduction of an external current pulse. This cascading network is used to simulate “cable” properties and signal propagation along the length of the axon. This work proposes possible solutions to attenuation losses inherited in the classical myelinated cable models and accounts for neuronal AP velocity as well as introducing signal attenuation and transient delays associated with internodal demyelination.

This model could aid as a predictive tool for the diagnosis and analysis of axonal signal integrity associated with demyelination pathology. Possible applications could include functional stimulation control methodologies for axon bundles that may exhibit signal fidelity issues associated with demyelination. It is further proposed that this model may serve as an instructive tool for further development and incorporation of other axon dynamic behaviors such as: relative refractory periods of AP generation, NR AP recovery mechanisms and responses to varied current stimulus input.

DEPARTMENT: Computer and Electrical Engineering and
Computer Science

DISSERTATION TITLE: “A Study on Neural Conduction in
Myelinated Structure Under Pathological Conditions”

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