

Master Thesis

Activation of nerve cells in the human brain

Project description:

The purpose of this project is to study different parameters responsible for the activation¹ of nerve cell processes (axons) in the stimulation region of human brain in the context of deep brain stimulation (DBS). It is expected that the student does an exclusive literature survey on DBS effectiveness in the case of Parkinson's disease and pursue the project to hypothesize the possible scenarios leading to the problems in stimulation.

The aim of this work is to

- Three dimensional simulation of human brain with DBS electrode embedded into it
- Electric field simulation at the region of interest (ROI)
- Parametric analysis for the activation of axons in ROI
- Hypothesize the possible solutions for non-activation of axons

Students who are interested in working on this project should have

- interest in bio-electromagnetics
- good experience with Matlab or Python, COMSOL Multiphysics®
- Interest in differential equation systems
- ability to solve problems in an autonomous manner

References:

1. Appali, Revathi , Sriperumbudur, Kiran and van Rienen, Ursula. (2019). Extracellular Stimulation of Neural Tissues: Activating Function and Sub-threshold Potential Perspective. 10.1109/EMBC.2019.8857113