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Title : *Effects of defects and exposure to electromagnetic field on the generation and propagation of action potential in nerve fibres.*

Abstract:

This thesis deals with the effects of defects and EMF on the generation and propagation of action potential in nerve fibre. After a good physical and mathematical modelling of nerve fibre defects and exposure to EMF, appropriate mathematical and numerical methods are used to investigate the action of each phenomenon on the generation and propagation of front waves. It is found that

- defect in myelin sheath and imperfections of ionic channels strongly modify the velocity of propagation and can even lead to propagation failure,
- the domain of initial values of the amplitude and width of the signal or excitation leading to front waves generation are delineated for each type of perturbation. This domain increases or decreases due to perturbations,
- numerical simulations in an electric cable with linear and nonlinear portions show that front wave introduced in the nonlinear portion is deformed in the linear portion and its propagation velocity changes as the result of the modification of electronic components. This result can be used for the manufacture of low cost electrical transmission lines and artificial neurons.

Keywords: Nerve fibre, nerve front wave, defects in ionic channels and myelin sheath, electromagnetic field, propagation failure, transmission lines with linear and nonlinear portions.