MATHEMATICAL PHYSICS
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STIMULI AND PROPAGATION OF ACTION POTENTIAL IN NERVOUS TISSUES.

Kreety Khatri (2K19/EP/045) , Pulkit Pandey (2K19/EP/076)
DELHI TECHNOLOGICAL UNIVERSITY, New Delhi, 10042,India

ABSTRACT—- In this era of advancement ,we very well acknowledge the use of applied mathematics in almost every domain- be it Composite Materials, Artificial Intelligence or Epidemic Analysis.This Document presents an overview of Mathematical Models in the Stimuli and Propagation of action potential in Cortical Nervous Tissues using Fundamental Laws of Physics. As we are already aware that action potential is an explosion of Electrical activity that is created by depolarizing currents resulting in rapid potential changes throughout the neuron(from dendrite to synapse),various mathematical tools such as Differential Equations,Vector Calculus and Numerical Analysis can be employed in order understand the propagation.

Keywords— Action Potential, Transmission of Information, Mathematical Models, Membrane Potential, Dendritic and Axon Structure.

I MOTIVATION

The primary motivation is to integrate the subjects of Mathematics and NeuroPhysics(Neuroscience+Physics) in order to give a viable explanation of a fundamental phenomenon of our brain.

*Literature Review:*We analyzed the following resources aligning with our topic of study to gain a holistic understanding:

- ☐ Conduction of Current through the surface membrane of Nerve Fibre [1].
- ☐ Modeling Strategies, Scales and Propagation of Action Potential in a Single cell Neuron [2].
- ☐ Simplification of Non-Linear Characteristic Neuronal Tissue Equations responsible for neuronal Activation.[3]
- ☐ Comparison of using different numerical methods for solving Hodgkin Huxely Model.[4]
- ☐ Mathematical Techniques that can incorporate realistic forms of axo -dendritic interactions and the slow intrinsic currents causing bursting behavior in single neurons.[5]

II PLAN OF ACTION

Identifying valuable Resources and Data: Figuring out relevant resources with aligning experimental data i.e.parameters causing action potential and transmission of information.

Analyzing Mathematical Models : Considering different Mathematical Models like Compartmental Modeling of Action Potential for Critical Analysis.

Summarizing Final Results : Stating viable Application of Mathematics in the field of Neurophysics.

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We hope we have provided a satisfactory proposal.

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