REAL-TIME NEURAL SIGNAL FILTERING VIA HODGKIN-HUXLEY SIMULATION MODELS

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ABSTRACT

This project addresses the challenge of automated colourization for 256×256 grayscale images using a dataset of 12,600 image pairs, balanced across human subjects, animals, and natural scenery. We frame colourization as a supervised learning problem in the CIELAB colour space, where a model predicts chrominance channels (a^*, b^*) from the luminance channel (L^*). A shallow convolutional neural network (CNN) provides the baseline performance, while our primary solution employs a deeper convolutional encoder-decoder architecture. This design captures high-level semantic features and spatial context, addressing limitations of shallow networks in perceptual realism. —-Total Pages: 1

1 INTRODUCTION

2 SCOPE & FEASIBILITY

Begin by solving Hudgkin-Huxley equations using Euler's and Improved Euler's Method (since these are the methods we have learned thus far from ESC103) then expand and solve using Runge-Kutta methods once they are covered in CHE260. At a high-level, these solvers will generate synthetic neural data through the Hodgkin-Huxley equations which are a set of non-linear ordinary differential equations that describe how ion channels create action potential.

Following this we will design and implement a digital filter to isolate the spike band, and create a spike detection algorithm based upon an adaptive threshold derived from the signal's noise floor.

3 TECHNICAL BACKGROUND

4 CONCLUSION