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

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ABSTRACT

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1 INTRODUCTION

2 BOHR'S HYDROGEN ATOM THEORY

Bohr's theory of the hydrogen an atom was an early model to include quantum concepts, namely: quantized energy levels. More importantly, his model enabled him to derive a numerical formula for the Rydberg constant based on the three key postulates. Firslty, within this model, electrons revolve in specific orbits around the nucleus as defined by their energy level. Secondly, the angular momentum L of an electron is also quantized and is given by the formula:

$$L = M_e v r_n = n\frac{h}{2pi}$$

where m_e is the electron's mass, r_n is the radius of the nth orbit, and h is Planck's constant. Lastly, electrons move between quantized energy levels whereby they produce a signle photon of light. Using these postulates, Bohr derived the formula for the Rydberg constant using the nth level energy of an electron:

$$E_n = -\frac{2\pi^2 m_e e^4}{(4\pi\epsilon_0)^2 h^2}\frac{1}{n^2} = -\frac{hcR_H}{n^2}$$

The energy emitted by a photon during transition from n_i to n_f is then:

$$E_{\text{photon}} = hcR_H\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right)$$

We can thus derive the famous Rydberg formula given below:

$$\frac{1}{\lambda} = R_H\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right)$$

Although Bohr made great strides in understanding the atomic model, there are several key limitations in his theory's application. The greatest of which is that Bohr's model fails for anything other than a single-electron atom. Further, his theory cannot explain the intensity of emission spectra nor why some spectral lines are split into two.

3 EQUIPMENT & PROCEDURE

To observe these phenomena, key equipment including a spectrometer and a sodium lamp were used. Additionally, the Hartmann Relation method was used to tune and calibrate the experiment apparatus. The subsequent outline the equipments' function, calibration and experimental procedures in further detail.

3.1 STATION APPARATUS & INSTRUMENTS

The Rydberg experiment station's primary apparatus is a triprism spectrometer capable of resolving to 0.1 nm.