ITSP PROJECT ABSTRACT

To Develop an Electronic Model of a Neuron

Our main aim is to develop a basic electronic model of a neuron that can mimic the functions of an actual neuron. Further, we wish to create a neural network using this model as our basis.

Through this project we wish to understand the structure and functioning of neurons, modelling this structure and functioning and searching for possible applications of these models.

We have already studied the mechanism of conduction of signals through the axon in BB101 involving potential gated channels and membrane potentials through a network of RC circuits. We believe that we can implement this through basic logic gates and RC circuits.

Further we need to model the inter-neural connections and need to learn what exactly happens before the signal reaches the axon, which would require a more detailed study of the neuron.

PLAN OF ACTION

- May 1- May 14 For the first 2 weeks, we plan to make a detailed study of the structure of the neuron and electronic neural models that have already been created. Also, we plan to complete the axon's model and some part of the dendrites at least in theory, if not in practice.
- May 15- May 30 In this period we plan to complete our model of the neuron and model the inter-neural connections so that we can create a network of such models.
- May 31-June 14 We plan to understand how to implement a memory and basic logic(like line following/colour identification, etc.) using a neural network and also debug the entire system. We also want to find some further applications of our project in fields like image processing.

We can create the model of the neuron using 2 approaches, either create a network of logic gates and RC circuits or though an Arduino board. The first method although time consuming and difficult, allows us to connect multiple neurons while we are not sure if we can do the same with an Arduino.

Tentative list of components required and their approximate cost: -

1. logic gates ,ICs, and other electronic items- approx. Rs.700/-
2. possibly 1 Arduino board- Rs. 1200/-
3. Miscellanious Costs- approx Rs. 1000/-

Hence, the total approximate cost of the project should be around Rs. 3000/-

Note: the strength of computing via neural networks lies in their ability of rapid parallel processing which has applications in fields like image processing and to develop primitive and simple brains,etc.