CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
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Project Number
22661

Project Title
Chaos in the Brain: A Simulation of Coupled Differential Equations

Abstract

Objectives/Goals
The goal of this project was to effectively and numerically solve coupled differential equations thax display chaotic behavior in a computer program. The differential equations modeled the system dynamics of neural firings inside of a human brain.

Methods/Materials
In order to complete this project, the researcher had to first acquire the programming skill that would be needed in order to write the computer project. The program was written in a language known p #Scheme.# Scheme is a function based language meaning that functions can be passed as parameters. Also the researcher had to learn ways of finding the derivative (slope of a function), integration (area under a function), and numerical methods to solve the differential equations.

Results
The written computer program returned a graph of the functions. It showed phase trajectories movingx towards either of two points.

Conclusions/Discussion
It is concluded that it is indeed possible to write a computer program to numerically solve coupled differential equations that display chaotic behavior. Two points of attraction, or places where there is stability, were found on the graph. However, a limit cycle was wanted in return rather than the points of attraction. The parameters used must have not been correct in order to form the limit cycle. Anothx program will be written to explore the possibilities for all of the parameters.

Summary Statement
This project is a computer program that models the chaotic behavior in a neural population by solving coupled differential equations.

Help Received
Biology Teacher helped proofread report; Computer Teacher taught advanced math and programming skills; Mother and Father proofread report and helped with backboard.