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Computational Physics Project Abstract

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Abstract:

Our team will be exploring the area of Cellular Automata. Cellular automata simulations will be conducted on Arduino with attached hardware, mainly LED matrices and also on a larger scale using a Java/Fortran/Processing simulator that we will create. Our aim is to create and analyze different rules of automata both on software and hardware and to study the effects of how rules, initial conditions and number of iterations lead to chaos. The focus on practical applicability of the project will be decided later among (but not limited to) the following topics:

- Conway's game of life: Simulate various scenarios and create special automata.
- Characteristics of random number generation based on different types of CA
- Self-repeating machines/computers using CA
- Using the automata to achieve some particular behavior like for example visiting all the squares in a grid.
- Using the automata to do mathematical equations
- Simulations like traffic jams using CA
- Computer music composition
- Simulating the Georgia Tech human spiral wave(s).
- And of course, beautiful graphs like fractals.

One special highlight of this project would be a 3D simulation of cellular automata using a led cube and Arduino.