Go game as metaphor of cancer metastasis

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Abstract

This work aims for modeling and simulating the metastasis of cancer, via the analogy between the cancer process and the board game Go. In the game of Go, black stones that play first could correspond to a metaphor of the birth, growth, and metastasis of cancer. Moreover, playing white stones on the second turn could correspond the inhibition of cancer invasion. Mathematical modeling and algorithmic simulation of Go may, therefore, benefit the efforts to deploy therapies to surpass cancer illness by providing insight into the cellular growth and expansion over a tissue area. We use the Ising Hamiltonian, that models the energy exchange in interacting particles, for modeling the cancer dynamics. Parameters in the energy function refer the biochemical elements that induce cancer birth, growth, and metastasis; as well as the biochemical immune system process of defense.

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Guidelines

Run GoIsingCancer with the SGF (smart game files) input, one per Go/cancer-IS (immune system) game. This is the Go gaming as a metaphor of cancer versus the immune system reaction.

The output gives the options for:

1) Display the board and play, step by step, the SGF sequence of Go/cancer-IS game.

2) Display the CFG from the Go-cancer game step by step.

3) Display the graph that illustrates, step by step, the Ising energy for each set of Go/cancer-IS stones-cells during a game.

In addition, you may see:

1) The given graphical files showing the evolution of the Ising energy from simulations made with SGF files that correspond to Go-cancer and the of the immune system reaction games.

2) The videos that show the evolution from the SGF of Go/cancer-IS.

Before start

From http://delta.cs.cinvestav.mx/~matias/CancerModelingSimulation/principal.html, take the executable GoIsingCancer. Use the Java platform of NetBeans for run the application.

Protocol