Evolving Quantum Gomoku Engines

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This design investigation in its present form was to engineer a quantum gomoku game in C# that could successfully simulate the concepts of quantum mechanics with an Artificial Intelligence program being implemented to play against a person and to measure its effectiveness in doing so. The initial procedure was to program the quantum gomoku game in C# along with the AI/genetic algorithm. Before it was programmed, the game was planned out first. After the game was programmed, the game was retested and redesigned for improvement. Finally, specific insights of the game were examined and overall data illustrates the testing of the prototype (classical gomoku) by displaying the effects of number of trials on AI winning time under different approaches, including the testing of the redesigned quantum gomoku engine. When testing the prototype, under the “randomized” approach, it took an average of 11.03±0.76s in 40 trials for the AI to win. Under the “Nash equilibrium” approach, it took an average of 13.28±1.41s. When the AI was tested for overall winning percentage in 40 trials, it was 7.50%. After, the prototype was redesigned into a quantum gomoku engine without an AI, where in 40 trials it took an average of 11.98±0.73s for the quantum gomoku engine to win. The contributions of this project are twofold. First, the constructed quantum gomoku game serves as an excellent tool in simulating the behavior of atoms at the quantum level. Secondly, the game also helps one understand more about the “weirdness” of quantum mechanics.

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