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Fixed-point quantum search as implemented in an Ising spin system

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The fixed-point quantum search provides a solution to the oscillation problem in a quantum search algorithm through the variation of oracle and inversion phases at each iteration. We simulate the fixed-point algorithm in an Ising spin system with first- and second-nearest neighbor interactions. Since the oracle and the inversion operator acts on O(2), then the oracle qubit is required to be in a superposition of states at the start of the simulation. This provides a way to implement the rotation required in the variation of phases at each iteration. Results show that the probability of success calculated from the algorithm and obtained from the simulation gives a similar behavior which effectively damps the oscillation. We also investigate the effect of tolerance on the fidelity as we increase the number of iterations.