Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Physically-motivated dynamical algorithms for the graph isomorphism problem SHIUEYUAN SHIAU, ROBERT JOYNT, S.N. COPPERSMITH, Physics Dept., Univ. of Wisconsin-Madison — The graph isomorphism problem (GI) plays a central role in the theory of computational complexity and has importance in physics and chemistry as well. No polynomial-time algorithm for solving GI is known. We investigate quantum physics-based polynomial- time algorithms for solving the graph isomorphism problem in which the graph structure is reflected in the behavior of a dynamical system. The method is to construct graph invariants based on the two-particle Green's function on the graph. The algorithm has been tested on strongly regular graphs - graphs that are known to be very difficult to distinguish by conventional means - up N=35, where N is the number of vertices. The GF for non-interacting fermions successfully distinguishes all pairs of non-isomorphic graphs for $N < 35$ while that for hard-core bosons works for all graphs tested.

Shiueyuan Shiau
Physics Dept, Univ. of Wisconsin-Madison

Date submitted: 22 Dec 2004 Electronic form version 1.4