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Chris Godsil and **Simone Severini*** (simoseve@gmail.com), Department of Physics & Astronomy, University College London, London, WC1E 6BT, England. *Control by quantum dynamics on graphs.*

We address the study of controllability of a closed quantum system whose dynamical Lie algebra is generated by adjacency matrices of graphs. We characterize a large family of graphs that renders a system controllable. The key property is a novel graph-theoretic feature consisting of a particularly disordered cycle structure. Disregarding efficiency of control functions, but choosing subfamilies of sparse graphs, the results translate into continuous-time quantum walks for universal computation. (Received September 21, 2011)