Experimentally optimized implementation of the Fredkin gate with atoms in cavity QED.

Summary: A scheme of fast synthesizing the Fredkin gate is proposed in cavity QED via quantum Zeno dynamics. Three atoms are trapped in three different but directly coupled cavities in this scheme. The strictly numerical simulations are given, and the influences of cavity decay and spontaneous emission on the gate operation are analyzed with master equation. The result shows that our scheme is robust against atomic spontaneous emission because of the large detuning. Since the atoms are separated in different cavities, it is easier to manipulate atoms experimentally.

*Keywords:* Fredkin gate; coupled cavity; quantum Zeno dynamics; rotating wave approximation