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Quantum stochastic walks: A generalization of classical random walks and quantum walks ALAN ASPURU-GUZIK, Department of Chemistry and Chemical Biology, Harvard University — We introduce the quantum stochastic walk (QSW), which determines the evolution of generalized quantum mechanical walk on a graph that obeys a quantum stochastic equation of motion. Using an axiomatic approach, we specify the rules for all possible quantum, classical and quantum-stochastic transitions from a vertex as defined by its connectivity. We show how the family of possible QSWs encompasses both the classical random walk (CRW) and the quantum walk (QW) as special cases, but also includes more general probability distributions. As an example, we study the QSW on a line, the QW to CRW transition and transitions to genearlized QSWs that go beyond the CRW and QW. QSWs provide a new framework to the study of quantum algorithms as well as of quantum walks with environmental effects.

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