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QUANTUM TECHNIQUES FOR CLASSICAL SYSTEMS

Zach Virgilio

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Masao Doi noticed that certain techniques from quantum field theory had broader applications in the late 1970s. Specifically, the creation and annihilation operators of quantum field theory could be used to construct operators for classical systems. Systems composed of identical classical particles lend themselves especially well to such a description. Recently, John Baez and others have added to Doi's early results, specifically in the analysis of stochastic reaction networks, systems which are used in chemistry. This paper covers some of those fundamental results, most notably the construction of the 'master equation' in terms of creation and annihilation operators. Along the way, Baez's presentation of the material is improved and many similarities between classical stochastic systems and quantum systems are highlighted. We then consider a system constructed from many identical reaction networks that allows diffusion and show that these techniques extend to this new system. Lastly, we introduce some questions indicated by these results.