Classical simulation of open quantum systems

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One of the central questions of (adiabatic) quantum computation is, when do quantum computations outperform classical ones? In order to answer it we have to understand computation power of both quantum and classical systems. This talk will deal with computational power of classical simulations. For a physicists an especially important class of problems is understanding physics of a particular system. I will briefly mention systems that we do know how to efficiently solve, and those that seem hard. Then I will focus on systems that are coupled to the environment, in particular a situation described by the Lindblad master equation. It turns out that classical simulations of such systems can be efficient eventhough the Hamiltonian version is difficult. Therefore, opening a system to the outside world – a situation that is arguably a relevant one – can sometimes render the problem easier.