Simulation of quantum many-body systems for measurements with restricted precision

The accurate simulation of quantum many body systems is one of the great challenges of many body physics. It is one of the central problems in various fields such as high energy physics, condensed matter physics, quantum chemistry and nuclear physics. To simulate perfectly quantum measurements on an arbitrary state of one needs in general to know correlations between any subset of the many body system. The number of these correlations grows exponentially with the number of particles - a fact that renders the simulation of generic quantum many-body system intractable. However, perfect simulations are in principle not necessary if one wants to simulate the results of real experiments, as any real experiment will always have some imperfections. In our project we aim - for any given finite measurement accuracy - to find the minimal amount of entanglement that one needs to invoke to simulate the measurements efficiently.

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