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# Computing local dynamics of many-body systems

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Efficient simulation of large quantum systems is one of the ultimate goals of computational quantum physics. Here we will focus on the problem of time evolution of a small subsystem which is embedded in a larger system. To that end, we encapsulate the "influence" a quantum environment can have to any possible subsystem in a new object, Feynman and Vernon's celebrated influence functional [1]. Remarkably, in many relevant cases, like strongly thermalizing or integrable systems, the influence functional can be well approximated by a matrix product state in time with relatively low bond dimension[2][3][4]. We propose an algorithm to obtain this matrix product state representation in one dimensional geometries by iteratively contracting a tensor network[5]. We then apply this approach to study transport properties of the non-integrable ising chain and majorana edgemodes in the presence of dissipation. Quantum environments which consists of free fermions allow for another avenue of obtaining their influence functional: By computing the fermionic correlation function analytically and then converting it to a matrix product state using Fishman and White's algorithm. This opens the door to study the problem of interacting impurities embedded in a non-interacting bath.

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