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Computation of the Time-Translation Operator Using Time-Spectral-Elements[1] CHARLES WEATHERFORD, Florida A&M University — The time-translation operator [U(t)] is usually applied directly to an initial quantum mechanical state in order to translate the state in time. Many traditional techniques are available for this computation, all of which are essentially sequential and do not parallelize well for modern high performance computing platforms. The need for a more scalable method, especially in coming era of many-core computers, is great. I propose to use an algorithm which employs spectral elements in time and spectral or spectral elements in space to compute, not the time-translated initial state, but rather the time-translation operator itself. The operator U(t) is first expanded in shifted Chebyshev polynomials with an argument given by the scaled time-independent part [H0(t)] of the generally time-dependent Hamilton H(t). The coefficients of the expansion are the same shifted Chebyshev polynomials with time argument. These operators are then projected onto a manifold of initial states which are all propagated at once by forming a set of simultaneous equations with the initial condition of U(t=0)=1. The width of the time elements is determined by h-p optimation. The algorithm is used to solve several model problems.

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