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A new fast numerical method for the generalized Rosen-Zener model

Friday, 5 April 2024 11:00 (30 minutes)

In quantum mechanics, the Rosen-Zener model represents a two-level quantum system. Its generalization to multiple degenerate sets of states leads to larger non-autonomous linear systems of ordinary differential equations (ODEs). We propose a new method for computing the solution operator of this system of ODEs. This new method is based on a recently introduced expression of the solution in terms of an infinite matrix equation, which can be efficiently approximated by combining truncation, fixed point iterations, and low-rank approximation. This expression is possible thanks to the so-called $*$-product approach for linear ODEs. In the numerical experiments, the new method's computing time scales linearly with the model's size. We provide a first partial explanation of this linear behavior. Joint work with Christian Bonhomme and Niel Van Buggenhout.

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