Runge-Kutta methods and FEM-BEM coupling for the Schrödinger equation

Alexander Rieder

June 18th, 2014

The Schrödinger equation is a time dependent problem posed on the full space $\mathbb{R}^d$. Runge-Kutta methods are the standard for higher order time-stepping schemes and result in a sequence of stationary problems on $\mathbb{R}^d$. Using a discrete variant of the Laplace transform we can transform the timestepping sequence to a helmholtz problem. The coupling of finite element (FEM) and boundary element methods(BEM) allows to discretize such problems by restricting to a bounded domain Ω and transforming the exterior problem to a boundary integral equation. In this talk I show how to use this method to discretize the Schrödinger equation in 2D and 3D and present some stability and convergence results.