Space-time Boundary Element Spaces and Operator Preconditioning for the Two-dimensional Heat Equation

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The standard approach in space-time boundary element methods for discretizing variational formulations of boundary integral equations is using space-time tensor product spaces originating from a separate decomposition of the boundary Γ and the time interval $(0,T)$. However, this approach does not allow adaptive refinement in space and time simultaneously. This motivates the use of an arbitrary decomposition of the whole space-time boundary $\Sigma = \Gamma \times (0,T)$ into boundary elements. In this talk we consider the two-dimensional heat equation as a model problem and compare these two discretization methods.

Moreover, when using space-time tensor product spaces we can construct a preconditioner for the first boundary integral equation by using the discretization of the hypersingular operator with respect to an appropriate dual mesh. The theoretical results are confirmed by numerical tests.

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