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Experimental Study of the HUM Control Operator for Linear Waves

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We consider the problem of the numerical approximation of the linear controllability of waves. All our experiments will be done in a bounded domain Ω of the plane, with Dirichlet boundary conditions and with internal control. Previous work on this subject (Glowinski et al.) used the following approach: first discretization of the wave equation, and then computation of the control operator of the discrete model. However, this method is known to produce high frequency spurious oscillations. Our work is based on another approach: a Galerkin approximation of the optimal control operator of the continuous model based on the spectral theory of the Laplace operator in Ω . This allows us to obtain surprisingly good illustrations of the main theoretical results available on the controllability of linear waves, and to formulate some questions for the future analysis of optimal control theory of waves.