

## Hyperbolic differential-operator equations with the time differentiation in boundary conditions

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We give an abstract interpretation in Hilbert spaces of such initial boundary value problems for hyperbolic equations that a part of boundary conditions may contain the differentiation on the time of the same (second) order as the equation. The well-posedness of these abstract problems in appropriate abstract functional spaces is proved. Moreover, we expand the unique solution to the series of eigenvectors of the corresponding spectral problem. Then, we show an application of the abstract results to second order partial (hyperbolic) differential equations. The latter, in fact, is a generalization of the classical Fourier method of separation of variables to the case when the boundary conditions may contain the (second order) differentiation on the time.