Abstracts of MMA2015, May 26–29, 2015, Sigulda, Latvia

SPECTRUM ANALYSIS OF THE WEIGHTED FINITE DIFFERENCE SCHEME FOR THE WAVE EQUATION WITH INTEGRAL BOUNDARY CONDITIONS*

JURIJ NOVICKIJ[1,2] and ARTŪRAS ŠTIKONAS[1,2]

[1] *Institute of Mathematics and Informatics, Vilnius University*
Akademijos str. 4, LT-08663 Vilnius, Lithuania
[2] *Faculty of Mathematics and Informatics, Vilnius University*
Naugarduko str. 24, LT-03225 Vilnius, Lithuania
E-mail: jurij.novickij@mif.vu.lt

Consider the hyperbolic equation

$$\frac{\partial^2 u}{\partial t^2} - c^2 \frac{\partial^2 u}{\partial x^2} = f(x,t), \qquad (x,t) \in (0,L) \times (0,T],$$

with the classical initial conditions

$$u|_{t=0} = \phi(x), \quad \left.\frac{\partial u}{\partial t}\right|_{t=0} = \psi(x), \qquad x \in \overline{\Omega} := [0,L],$$

and the additional nonlocal integral boundary conditions

$$u(0,t) = \gamma_0 \int_0^L \beta^0(x) u(x,t)\, dx + v_l(t), \quad t \in [0,T],$$

$$u(1,t) = \gamma_1 \int_0^L \beta^1(x) u(x,t)\, dx + v_r(t), \quad t \in [0,T],$$

where $f(x,t)$, $\phi(x)$, $\psi(x)$, $v_l(t)$, $v_r(t)$ are given functions, γ_0, γ_1 are given parameters, β^0 and β^1 are weight functions.

We study the spectrum of the weighted difference operator for the formulated problem using the methods described in [1]. We investigate the characteristic function [2], and obtain stability conditions subject to boundary variables γ_1, γ_2 and weight functions.

REFERENCES

[1] J. Novickij, A. Štikonas. On the stability of a weighted finite difference scheme for wave equation with nonlocal boundary conditions. *Nonlinear Anal. Model. Control*, **19** (3):460–475, 2014.

[2] A. Skučaitė, A. Štikonas. Investigation of the spectrum of the Sturm-Liouville problem with a nonlocal integral condition. *Liet. matem. rink., Proc. LMS, Ser. A*, **54** (3):67–72, 2013.

*The research was partially supported by the Research Council of Lithuania (grant No. MIP-047/2014).