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ON THE APPROXIMATE SOLUTION OF THE KIRCHHOFF–BERNSTEIN NONLINEAR WAVE EQUATION

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Let us consider the nonlinear equation

$$w_{tt}(x,t) = \varphi\Big(\int_0^\pi w_x^2(x,t)\,dx\Big)w_{xx}(x,t), 0 < x < \pi, \quad 0 < t < T, \qquad (1)$$

with the initial boundary conditions

$$w(x,0) = w^0(x), \quad w_t(x,0) = w^1(x), \qquad (2)$$

$$w(0,t) = w(\pi,t) = 0, 0 \le x \le \pi, \quad 0 \le t \le T. \qquad (3)$$

Here $\varphi(z)$, $w^i(x)$ are given functions, $i = 0, 1$, and T is a given constant, $\varphi(z) \ge \alpha > 0$.

A numerical algorithm is proposed for the solution of (1),(2). It includes Galerkin's method and an implicit difference scheme for approximating with respect to variables x and t and also an iteration process for solving a discrete system. The theorem on the algorithm error is proved.