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TO RESOLVABILITY OF PHYSICALLY NONLINEAR PROBLEM OF THE THEORY OF SLANTING SHELLS UNDER FINITE DISPLACEMENTS

I.G. Teregulov and S.N. Timergaliyev

The present article is devoted to investigation of resolvability of a problem of both geometrically and physically nonlinear theory of slanting shells. The problem is to determine the stressed-deformed state of free shells which do not obey any geometrical boundary conditions. The necessity of studying such shells was pointed out by I.I. Vorovich in [1]. In the present article we shall suggest a method based on solving the problem in deformations (see [2]).

1°. In this Section we shall derive formulas for displacement vector via the components of deformation. These formulas represent the foundation of the method suggested. To this end we shall use relations for components of a finite deformation, obtained by the Kirchhoff–Love hypotheses

$$\begin{aligned}
\varepsilon^0_{jj} &= w_{j\alpha^j} - B_{jj}w - G^k_{jj}w_k + \frac{1}{2}w^2_{\alpha^j}, \quad j=1,2,\\
\varepsilon^0_{12} &= \frac{1}{2}(w_{1\alpha^2} + w_{2\alpha^1}) - B_{12}w - G^k_{12}w_k + \frac{1}{2}w_{\alpha^1}w_{\alpha^2},\\
\varepsilon^1_{ij} &= -w_{\alpha^i\alpha^j} + G^k_{ij}w_{\alpha^k}, \quad i \le j, \ \ i,j=1,2,
\end{aligned} \tag{1}$$

where ε^0_{ij}, ε^1_{ij} are components of the tangential and bending deformation of the muddle surface S_0, respectively; w_i, w are, respectively, the tangential and normal displacements of points of S_0; B_{ij} are the components of the tensor of curvature of S_0; G^k_{ij} are the Christoffel symbols of second genus; α^1, α^2 are the Cartesian coordinates on a plane, which change in a certain flat bounded domain Ω.

Relations (1) will be considered as a system of differential equations with respect to w_i, w with known right sides ε^0_{ij}, ε^1_{ij}. To find w_i, w we pass from (1) to the following system

$$w_{1\alpha^1} - w_{2\alpha^2} + (B_{22} - B_{11})w + (G^k_{22} - G^k_{11})w_k + \frac{1}{2}(w^2_{\alpha^1} - w^2_{\alpha^2}) = \varepsilon^0_{11} - \varepsilon^0_{22},$$

$$w_{1\alpha^1} + w_{2\alpha^1} - 2B_{12}w - 2G^k_{12}w_k + w_{\alpha^1}w_{\alpha^2} = 2\varepsilon^0_{12}, \tag{2}$$

$$-w_{\alpha^1\alpha^1} - w_{\alpha^2\alpha^2} + (G^k_{11} + G^k_{22})w_{\alpha^k} = \varepsilon^1_{11} + \varepsilon^2_{22}. \tag{3}$$

Equation (3) contains only w and thus represents a linear second order partial differential equation. Therefore, the solution of system (2)–(3) is to be started with solving (3). We introduce notation:

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