

In my note “Uniqueness of the symmetric solution of the problem of large deflections of a symmetrically loaded circular plate,” published in **DAN**, vol. 123, no. 3, 1958, a proof was proposed for the uniqueness of the symmetric solution. The proof was based on the Hildebrandt–Graves theorem, which ensures only the absence of

“nearby” solutions.
However, if one carries out
the following calculations,
the general result remains
valid (we retain the
notation of the article
mentioned).

Applying to the system of equations (1)

1960

SovietRxiv

View the original and related papers at <https://sovietrxiv.org/items/ru-196001.55617>

Source: Math-Net.Ru and CyberLeninka. Machine translation. Verify with the original.

Abstract

Full Text

Letter to the Editor

In my note “Uniqueness of the symmetric solution of the problem of large deflections of a symmetrically loaded circular plate,” published in *DAN*, vol. 123, no. 3, 1958, a proof was proposed for the uniqueness of the symmetric solution. The proof was based on the Hildebrandt–Graves theorem, which ensures only the absence of “nearby” solutions. However, if one carries out the following calculations, the general result remains valid (we retain the notation of the article mentioned).

Let, in addition to the “principal” solution $u_1; v_1$, continuous in λ (the existence of such a solution for all λ was shown in my note), for some λ^* there exist a second solution $u_2; v_2$.

Applying to the system of equations (1)

$$Av - \frac{u^2}{2} = 0, \quad \frac{1}{r}Au + uv + \lambda \int_0^r \varphi \rho d\rho = 0 \quad (1)$$

at the point $u_2(\lambda^*), v_2(\lambda^*)$ the theorem of L. V. Kantorovich on Newton’s method (*UMN*, 3, issue 6, 1948), it is possible to continue continuously the solution $u_2(\lambda^*), v_2(\lambda^*)$ by the amount

$$\Delta\lambda = \frac{1}{2c\|q\|_{L_2}}.$$

The constants C and $\|q\|_{L_2}$ depend neither on the solution nor on λ . Consequently, moving in “steps” of $\Delta\lambda$, one can continuously continue the second branch of the solution up to $\lambda = 0$.

Now two alternatives are possible.

1. Either, under continuous continuation, the second branch gives at $\lambda = 0$ a solution different from 0. This is impossible, since there exist a priori estimates of the solutions

$$\|u\|_{L_2} < c_1\lambda\|q\|_{L_2}, \quad \|v\|_{L_2} < c_2\lambda\|q\|_{L_2}.$$

2. Or there exists some $\lambda_0 \in [0, \lambda^*]$ which is a branching point of the solutions. This too is impossible, since, by the Hildebrandt–Graves theorem, “nearby” solutions are absent.

The contradiction obtained proves the assertion.

N. Morozov

Note: Figure translations are in progress. See original paper for figures.

Source: Math-Net.Ru and CyberLeninka. Machine translation. Verify with the original.