BILINEAR FORMS IN BOUNDED DOMAINS OF R^N

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The talk is based on the results obtained in cooperation with Wojciech Kozłowski in [1]. We Investigate the bundle of bilinear forms in a bounded domain in R^N with a nonempty boundary. We construct the Laplace type operator L in the whole bundle of such forms and prove its ellipticity. We investigate the boundary value problem for the system of natural boundary conditions constructed for L. We prove that all the conditions are elliptic. We also prove the existence of an orthogonal basis in L^2 consisted of eigenvectors of the operator. Such a basis enables an investigating of the boundary value problems by the methods of harmonic analysis. The class of bilinear forms, i.e., tensors of degree two, occupies a unique place in the class of all tensors. Its importance stems primarily from its wide-ranging applications in geometry, physics, and engineering. Especially in domains with a non-empty boundary, where various boundary conditions naturally imposed by external forces must be satisfied.

References

[1] Kozlowski W, Pierzchalski A. *Elliptic boundary conditions for the Laplacian on bilinear forms*, *J. Appl. Math. Comput. Mech.* **25** (2026), no. 2, 54 -66.