

ULAM-HYERS STABILITY OF ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS IN SOBOLEV SPACES

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ABSTRACT. In the present paper we study the Ulam-Hyers stability of some elliptic partial differential equations on bounded domains with Lipschitz boundary. We use direct techniques and also some abstract methods of Picard operators.

The novelty of our approach consists in the fact that we are working in Sobolev spaces and we do not need to know the explicit solutions of the problems or the Green functions of the elliptic operators. We show that in some cases the Ulam-Hyers stability of linear elliptic problems mainly follows from standard estimations for elliptic PDEs, Cauchy-Schwartz and Poincaré type inequalities or Lax-Milgram type theorems.

We obtain powerful results in the sense that working in Sobolev spaces, we can control also the derivatives of the solutions, instead of the known pointwise estimations. Moreover our results for the nonlinear problems generalize in some sense some recent results from the literature (see for example *V. L. Lazăr, Ulam-Hyers stability of partial differential equations, Creative Mathematics and Informatics, 21 (2012), No. 1, 73-78*).

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