



NUMERICAL VERIFICATION OF SOLUTIONS FOR ELLIPTIC PROBLEMS WITH VERY HIGH ACCURACY BY USING A SPECTRAL METHOD

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In this talk, we consider a numerical verification method of solutions for nonlinear elliptic boundary value problems with very high accuracy. We show a constructive error estimates for the H_0^1 -projection into polynomial spaces by using the property of the Legendre polynomials. Also, we show that the polynomial approximation yields a very accurate approximate solution for elliptic problems with Dirichlet boundary conditions. Combining these results with known verification procedure in [1], we will give some highly accurate verification examples for Emden's equation, which confirms us the actual effectiveness of the present method. Particularly, our method enables us to prove the local uniqueness property with rather large domain around a very small neighborhood containing the exact solution, which implies that the non-existence result for solutions could be verified in the wide range.

References

- [1] Nakao, M.T., Hashimoto, K. & Watanabe, Y., "A numerical method to verify the invertibility of linear elliptic operators with applications to nonlinear problems", Computing 75, 2005, pp. 1-14.