Extended convergence of Gauss-Newton's method and uniqueness of the solution

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ABSTRACT.

The aim of this paper is to extend the applicability of the Gauss-Newton's method for solving nonlinear least squares problems using our new idea of restricted convergence domains. The new technique uses tighter Lipschitz functions than in earlier papers leading to a tighter ball convergence analysis.

REFERENCES

[1] Amat, S., Hernández, M. A. and Romero, N., *Semilocal convergence of a sixth order iterative method for quadratic equations*, Applied Numerical Mathematics, **62** (2012), 833–841

[2] Argyros, I. K., Cho, Y. J. and Hilout, S.,*Numerical methods for equations and its applications*, CRC Press, Taylor and Francis, New York, 2012

[3] Argyros, I. K., Cho, Y. J. and George, S., *Local convergence for some third-order iterative methods under weak conditions*, J. Korean Math. Soc., **53** (2016), No. 4, 781–793

[4] Argyros, I. K. and Magreñán, A. A., *Iterative Algorithms I, Nova Science Publishers Inc.*, New York, 2016

[5] Argyros, I. K. and Magreñán, A. A., *Iterative methods and their dynamics with applications*, CRC Press, New York, 2017

[6] Argyros, I. K. and Magreñán, A. A., *Iterative Algorithms II*, Nova Science Publishers Inc., New York, 2017

[7] Chen, J. and Li, W., *Convergence of Gauss-Newton's method and uniqueness of the solution*, Appl. Math. Comput., **170** (2005), 687–705

[8] Haubler, W. M., *A Kantorovich convergence analysis for the Gauss-Newton method*, Numer. Math., **48** (1986), 119–125

[9] Magreñán, A. A., *Different anomalies in a Jarratt family of iterative root finding methods*, Appl. Math. Comput., **233** (2014), 29–38

[10] Magreñán, A. A., *A new tool to study real dynamics: The convergence plane*, Appl. Math. Comput., **248** (2014), 29–38

[11] Ortega, M. and Rheinboldt, W. C., *Iterative solution of nonlinear equations in several variables*, Academic Press, New York, 1970

[12] Stewart, G. W., *On the continuity of the generalized inverse*, SIAM J. Math., **17** (1960), 33–45

[13] Smale, S., *Newton's method estimates from data at one point* in: R Ewing, K. Gross, C. Martin (Eds). The merging of disciplines: New directions in Pure Applied and Computational Mathematics, Springer, New York, 1886, 185–196

[14] Traub, J. F. and Wozniakowski, H., *Convergence and complexity of Newton iteration*, J. Assoc. Comput. Math., **29** (1979), 250–258

[15] Wang, X., *Convergence of Newton's method and uniqueness of the solution of equations in Banach space*, IMA J. Numer. Anal., **20** (2000), 123–134

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