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SELF-ADAPTIVE PROJECTION ALGORITHMS FOR SOLVING THE SPLIT EQUALITY PROBLEMS

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Abstract. In this paper, we first introduce a self-adaptive projection algorithm by adopting Armijolike searches to solve the spit equality problem (SEP), then we propose a relaxed self-adaptive projection algorithm by using projections onto half-spaces instead of those onto the original convex sets, which is much more practical. Weak convergence results for both algorithms are analyzed. Key Words and Phrases: Split equality problem, self-adaptive projection algorithm, relaxed self-adaptive projection algorithm, Armijo-like searches.

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References

- [1] A. Aleyner, S. Reich, Block-iterative algorithms for solving convex feasibility problems in Hilbert and in Banach, J. Math. Anal. Appl., **343**(2008), no. 1, 427-435.
- [2] H. Attouch, A. Cabot, F. Frankel, J. Peypouquet, Alternating proximal algorithms for constrained variational inequalities: Application to domain decomposition for PDE's, Nonlinear Anal., 74(2011), no. 18, 7455-7473.
- [3] H. Attouch, J. Bolte, P. Redont, A. Soubeyran, Alternating proximal algorithms for weakly coupled minimization problems. Applications to dynamical games and PDEs, J. Convex Anal., 15(2008), 485-506.
- [4] H. Attouch, Alternating minimization and projection algorithms. From convexity to nonconvexity, Communication in Instituto Nazionale di Alta Matematica Citta Universitaria - Roma, Italy, June 8-12, 2009.
- [5] H.H. Bauschke, J.M. Borwein, On projection algorithms for solving convex feasibility problems, SIAM Rev., **38**(1996), 367-426.
- [6] C. Byrne, A Unified Treatment of Some Iterative Algorithms in Signal Processing and Image Reconstruction, Marcel Dekker, New York, 1984.
- [7] C. Byrne, A. Moudafi, Extensions of the CQ algorithm for the split feasibility and split equality problems, J. Nonlinear and Convex A, to appear.

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- [8] Y. Censor, T. Bortfeld, B. Martin, A. Trofimov, A unified approach for inversion problems in intensity-modulated radiation therapy, Phys. Med. Biol., 51(2006), 2353-2365.
- Y. Censor, T. Elfving, A multiprojection algorithm using Bregman projections in a product space, Numer. Algorithms, 8(1994), 221-239.
- [10] R. Chen, J. Li, Y. Ren, Regularization method for the approximate split equality problem in infinite-dimensional Hilbert spaces, Abstr. Appl. Anal., Volume 2013, Article ID 813635, 5 pages.
- [11] Q.L. Dong, S. He, Solving the split equality problem without prior knowledge of operator norms, Optimization, 65(12) (2016), 2217-2226.
- [12] M. Fukushima, A relaxed projection method for variational inequalities, Math. Program., 35(1986), 58-70.
- [13] E.M. Gafni, D.P. Bertsekas, Two-metric projection methods for constrained optimization, SIAM J. Control Optim., 22(1984), 936-964.
- [14] G. López, V. Martín-Márquez, F. Wang, H.K. Xu, Solving the split feasibility problem without prior knowledge of matrix norms, Inverse Probl., 27(2012), 085004.
- [15] A. Moudafi, Alternating CQ-algorithm for convex feasibility and split fixed-point problems, J. Nonlinear Convex Anal. 15(4) (2014), 809-818.
- [16] A. Moudafi, A relaxed alternating CQ-algorithm for convex feasibility problems, Nonlinear Anal., 79(2013), 117-121.
- [17] B. Qu, N. Xiu, A note on the CQ algorithm for the split feasibility problem, Inverse Probl., 21(2005), 1655-1665.
- [18] Ph.L. Toint, Global convergence of a class of trust region methods for nonconvex minimization in Hilbert space, IMA J. Numer. Anal., 8(1988), 231-252.
- [19] Q. Yang, The relaxed CQ algorithm for solving the split feasibility problem, Inverse Probl., 20(2004), 1261-1266.
- [20] J. Zhao, J. Zhang Q. Yang, A simple projection method for solving the multiple-sets split feasibility problem, Inverse Probl. Sci. Eng., 21(2013), no. 3, 537-546.

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