Dedicated to Professor Yeol Je Cho on the occasion of his retirement

Iterative algorithms for split common fixed points of demicontractive operators without priori knowledge of operator norms

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Abstract.

The split common fixed points problem for demicontractive operators has been studied in Hilbert spaces. An iterative algorithm is considered and the weak convergence result is given under some mild assumptions.

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REFERENCES

- Ansari, Q. H., Rehan, A. and Wen C. F., Implicit and explicit algorithms for split common fixed point problems, J. Nonlinear Convex Anal., 17 (2016), 1381–1397
- Bauschke, H. H. and Borwein, J. M., On projection algorithms for solving convex feasibility problems, SIAM Review., 38 (1996), 367–426
- [3] Boikanyo, O. A., A strongly convergent algorithm for the split common fixed point problem, Appl. Math. Comput., 265 (2015), 844–853
- [4] Byrne, C., A unified treatment of some iterative algorithms in signal processing and image reconstruction, Inverse Probl., 20 (2004), 103–120
- [5] Cegielski, A., General method for solving the split common fixed point problem, J. Optim. Theory Appl., 165 (2015), 385–404
- [6] Ceng, L. C., Ansari Q. H. and Yao, J. C., An extragradient method for split feasibility and fixed point problems, Comput. Math. Appl., 64 (2012), 633–642
- [7] Censor, Y. and Segal, A., The split common fixed point problem for directed operators, J. Convex Anal., 16 (2009), 587–600
- [8] Kraikaew P. and Saejung, S., On split common fixed point problems, J. Math. Anal. Appl., 415 (2014), 513-524
- [9] Măruşter, S. and Rus, I. A., Kannan contractions and strongly demicontractive mappings, Creat. Math. Inform., 24 (2015), No. 2, 171–180
- [10] Mărușter, S., A note on the convergence of Mann iteration, Creat. Math. Inform., 26 (2017), No. 1, 85-88
- [11] Maingé, P.-E. and Măruşter, S., Convergence in norm of modified Krasnoselski-Mann iterations for fixed points of demicontractive mappings, Appl. Math. Comput., 217 (2011), No. 24, 9864–9874
- [12] Moudafi, A., The split common fixed-point problem for demicontractive mappings, Inverse Probl., 26 (2010), Art. ID 055007
- [13] Takahashi, W., The split common fixed point problem and strong convegence theorems by hybrid methods in two Banach spaces, J. Nonlinear Convex Anal., 17 (2016), 1051–1067

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- [14] Takahashi, S. and Takahashi, W., The split common null point problem and the shrinking projection method in two Banach spaces, Linear Nonlinear Anal., 1 (2015), 297–304
- [15] Tan, K. K. and Xu, H. K., Approximating fixed points of nonexpansive mappings by the Ishikawa iteration process, J. Math. Anal. Appl., 178 (1993), 301–308
- [16] Wang, F., A new method for split common fixed-point problem without priori knowledge of operator norms, J. Fixed Point Theory Appl., DOI 10.1007/s11784-017-0434-0
- [17] Wang, F. and Xu, H. K., Cyclic algorithms for split feasibility problems in Hilbert spaces, Nonlinear Anal., 74 (2011), 4105–4111
- [18] Xu, H. K., Iterative methods for the split feasibility problem in infinite-dimensional Hilbert spaces, Inverse Probl. 26 (2010), Art. ID 105018
- [19] Yao, Y. H., Leng, L. M., Postolache, M. and Zheng, X. X., A unified framework for the two-sets split common fixed point problem in Hilbert spaces, J. Nonlinear Sci. Appl., 9 (2016), 6113–6125
- [20] Yao, Y. H., Liou, Y. C. and Yao, J. C., Split common fixed point problem for two quasi-pseudo-contractive operators and its algorithm construction, Fixed Point Theory Appl., 2015 (2015), Art. ID 127
- [21] Yao, Y. H., Liou, Y. C. and Yao, J. C., Iterative algorithms for the split variational inequality and fixed point problems under nonlinear transformations, J. Nonlinear Sci. Appl., 10 (2017), 843–854
- [22] Zheng, X. X., Yao, Y. H., Liou, Y. C. and Leng, L. M., Fixed point algorithms for the split problem of demicontractive operators, J. Nonlinear Sc. Appl., 10 (2017), 1263–1269

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