

A MODIFIED INERTIAL SUBGRADIENT EXTRAGRADIENT METHOD FOR SOLVING PSEUDOMONOTONE VARIATIONAL INEQUALITIES AND COMMON FIXED POINT PROBLEMS

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Abstract. In this paper, we introduce a modified inertial subgradient extragradient method for solving a variational inequality problem with Lipschitz pseudomonotone mapping and a common fixed-point problem of a family of nonexpansive mappings. Under mild conditions, we obtain strong convergence theorems in a real Hilbert space. An application is also provided.

Key Words and Phrases: Inertial subgradient extragradient method, variational inequality, pseudomonotone mapping, nonexpansive mapping, fixed point.

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REFERENCES

- [1] Q.H. Ansari, A. Rehan, C.F. Wen, *Split hierarchical variational inequality problems and fixed point problems for nonexpansive mappings*, Fixed Point Theory Appl. 2015 (2015), Art. ID 274.
- [2] L.C. Ceng, A. Petruşel, J.C. Yao, Y. Yao, *Systems of variational inequalities with hierarchical variational inequality constraints for Lipschitzian pseudocontractions*, Fixed Point Theory, **20**(2019), 113-133.
- [3] L.C. Ceng, C.F. Wen, *Systems of variational inequalities with hierarchical variational inequality constraints for asymptotically nonexpansive and pseudocontractive mappings*, Revista Real Academia de Ciencias Exactas, Físicas y Naturales. Serie A. Matem., **113**(2019), 2431-2447.
- [4] Y. Censor, A. Gibali, S. Reich, *The subgradient extragradient method for solving variational inequalities in Hilbert space*, J. Optim. Theory Appl., **148**(2011), 318-335.

- [5] S.Y. Cho, S.M. Kang, *Approximation of common solutions of variational inequalities via strict pseudo-contractions*, Acta Math. Sci. 32 (2012), 1607-1618.
- [6] S.Y. Cho, *Generalized mixed equilibrium and fixed point problems in a Banach space*, J. Nonlinear Sci. Appl., **9**(2016), 1083-1092.
- [7] S.Y. Cho, *Strong convergence analysis of a hybrid algorithm for nonlinear operators in a Banach space*, J. Appl. Anal. Comput., **8**(2018), 19-31.
- [8] S.Y. Cho, S.M. Kang, *Approximation of fixed points of pseudo-contraction semigroups based on a viscosity iterative process*, Appl. Math. Lett., **24**(2011), 224-228.
- [9] S.V. Denisov, V.V. Semenov, L.M. Chabak, *Convergence of the modified extragradient method for variational inequalities with non-Lipschitz operators*, Cybern. Syst. Anal., **51**(2015), 757-765.
- [10] K. Goebel, S. Reich, *Uniform Convexity, Hyperbolic Geometry, and Nonexpansive Mappings*, Marcel Dekker, New York, 1984.
- [11] P.T. Harker, J.S. Pang, *A damped-Newton method for the linear complementarity problem*, Lect. Appl. Math., **26**(1990), 265-284.
- [12] S. Karamardian, S. Schaible, *Seven kinds of monotone maps*, J. Optim. Theory Appl., **66**(1990), 37-46.
- [13] G.M. Korpelevich, *The extragradient method for finding saddle points and other problems*, Ekonomika Matematicheskie Metody, **12**(1976), 747-756.
- [14] R. Kraikaew, S. Saejung, *Strong convergence of the Halpern subgradient extragradient method for solving variational inequalities in Hilbert spaces*, J. Optim. Theory Appl., **163**(2014), 399-412.
- [15] Y. Shehu, Q.L. Dong, D. Jiang, *Single projection method for pseudo-monotone variational inequality in Hilbert spaces*, Optimization, **68**(2019), 385-409.
- [16] M.V. Solodov, B.F. Svaiter, *A new projection method for variational inequality problems*, SIAM J. Control Optim., **37**(1999), 765-776.
- [17] W. Takahashi, C.F. Wen, J.C. Yao, *The shrinking projection method for a finite family of demimetric mappings with variational inequality problems in a Hilbert space*, Fixed Point Theory, **19**(2018), 407-419.
- [18] W. Takahashi, C.F. Wen, J.C. Yao, *Iterative methods for the split common fixed point problem with families of demimetric mappings in Banach spaces*, J. Nonlinear Convex Anal., **1**(2018), 1-18.
- [19] D.V. Thong, D.V. Hieu, *Modified subgradient extragradient method for variational inequality problems*, Numer. Algorithms, **79**(2018), 597-610.
- [20] D.V. Thong, N.A. Triet, X.H. Li, Q.L. Dong, *An improved algorithm based on inertial subgradient extragradient method for solving pseudo-monotone variational inequalities*, Optimization, to appear.
- [21] Z. Xue, H. Zhou, Y.J. Cho, *Iterative solutions of nonlinear equations for m-accretive operators in Banach spaces*, J. Nonlinear Convex Anal., **1**(2000), 313-320.
- [22] Y. Yamada, *The hybrid steepest-descent method for variational inequalities problems over the intersection of the fixed point sets of nonexpansive mappings*, In: Butnariu, D., Censor, Y., Reich, S. (eds.) *Inherently Parallel Algorithms in Feasibility and Optimization and Their Applications*, North-Holland, Amsterdam, 2001, 473-504.
- [23] L. Zhang, H. Zhao, Y. Lv, *A modified inertial projection and contraction algorithms for quasi-variational inequalities*, Appl. Set-Valued Anal. Optim., **1**(2019), 63-76.
- [24] X. Zhao, K.F. Ng, C. Li, J.C. Yao, *Linear regularity and linear convergence of projection-based methods for solving convex feasibility problems*, Appl. Math. Optim., **78**(2018), 613-641.

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