## AN ITERATIVE METHOD FOR GENERALIZED VARIATIONAL INEQUALITIES WITH APPLICATIONS

## CHANGQUN WU\* AND SUN YOUNG CHO\*\*

\*School of Business and Administration, Henan University, Kaifeng 475001, China. E-mail: kyls2003@yahoo.com.cn

\*\*Department of Mathematics, Gyeongsang National University, Jinju 660-701, Korea. E-mail: ooly61@yahoo.co.kr

**Abstract.** In this paper, we introduce a composite iterative process for an inverse-strongly accretive mapping and a nonexpansive mapping. We study the convergence analysis of the iterative algorithm. Strong convergence theorems are established in a real Banach space.

**Key Words and Phrases**: Sunny nonexpansive retraction, fixed point, nonexpansive mapping, variational inequality.

2010 Mathematics Subject Classification: 47H05, 47H09, 47H10, 47J25.

**Acknowledgement.** The authors are extremely grateful to the referee for useful suggestions that improved the contents of the paper.

## References

- [1] K. Aoyama, H. Iiduka, W. Takahashi, Weak convergence of an iterative sequence for accretive operators in Banach spaces, Fixed Point Theory Appl. 2006(2006), 13 pages.
- [2] F.E. Browder, Fixed point theorems for noncompact mappings in Hilbert spaces, Proc. Natl. Acad. Sci. USA 53(1965), 1272-1276.
- [3] F.E. Browder, Nonlinear operators and nonlinear equations of evolution in Banach spaces, Proc. Symp. Pure. Math. 18(1976), 78-81.
- [4] R.E. Bruck, Properties of fixed point sets of nonexpansive mappings in Banach spaces, Tras. Amer. Math. Soc. 179(1973), 251-262.
- [5] F.E. Browder, W.V. Petryshyn, Construction of fixed points of nonlinear mappings in Hilbert space, J. Math. Anal. Appl. 20(1967), 197-228.
- [6] Y.J. Cho, Y. Yao, H. Zhou, Strong convergence of an iterative algorithm for accretive operators in Banach spaces, J. Comput. Appl. Anal. 10(2008), 113-125.
- [7] Y.J. Cho, X. Qin, Systems of generalized nonlinear variational inequalities and its projection methods, Nonlinear Anal. 69(2008), 4443-4451.
- [8] Y.J. Cho, S.M. Kang, X. Qin, On systems of generalized nonlinear variational inequalities in Banach spaces, Appl. Math. Comput. 206(2008), 214-220.
- [9] L.C. Ceng, J.C. Yao, An extragradient-like approximation method for variational inequality problems and fixed point problems, Appl. Math. Comput. 190(2007), 205-215.
- [10] H. Iiduka, W. Takahashi, Strong convergence theorems for nonexpansive mappings and inversestrongly monotone mappings, Nonlinear Anal. 61(2005), 341-350.
- [11] H. Iiduka, W. Takahashi, M. Toyoda, Approximation of solutions of variational inequalities for monotone mappings, PanAmer. Math. J. 14(2004), 49-61.

- [12] S. Kitahara, W. Takahashi, Image recovery by convex combinations of sunny nonexpansive retractions, Topol. Meth. Nonlinear Anal. 2(1993), 333-342
- [13] X. Qin, M. Shang, H. Zhou, Strong convergence of a general iterative method for variational inequality problems and fixed point problems in Hilbert spaces, Appl. Math. Comput. 200(2008), 242-253.
- [14] X. Qin, Y.J. Cho, S.M. Kang, Some results on non-expansive mappings and relaxed cocoercive mappings in Hilbert spaces, Appl. Anal. 80(2009), 1-13.
- [15] X. Qin, M. Shang, Y. Su, Strong convergence of a general iterative algorithm for equilibrium problems and variational inequality problems, Math. Comput. Model. 48(2008), 1033-1046.
- [16] X. Qin, Y.J. Cho, S.M. Kang, Convergence theorems of common elements for equilibrium problems and fixed point problems in Banach spaces, J. Comput. Appl. Math. 225(2009), 20-30.
- [17] S. Reich, Asymptotic behavior of contractions in Banach spaces, J. Math. Anal. Appl. 44(1973), 57-70.
- [18] S. Reich, Strong convergence theorems for resolvents of accretive operators in Banach spaces, J. Math. Anal. Appl. 75(1980), 287-292.
- [19] T. Suzuki, Strong convergence of Krasnoselskii and Mann's type sequences for one-parameter nonexpansive semigroups without Bochne integrals, J. Math. Anal. Appl. 305(2005), 227-239.
- [20] W. Takahashi, M. Toyoda, Weak convergence theorems for nonexpansive mappings and monotone mappings, J. Optim. Theory Appl. 118(2003), 417-428.
- [21] H.K. Xu, Inequalities in Banach spaces with applications, Nonlinear Anal. 16(1991), 1127–1138.
- [22] H.K. Xu, Iterative algorithms for nonlinear operators, J. London Math. Soc. 66(2002), 240-256.

Received: August 31, 2009; Accepted: April 27, 2010.