

## CONVERGENCE THEOREM FOR EQUILIBRIUM PROBLEMS AND FIXED POINT PROBLEMS

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**Abstract.** In this paper, we introduce an iterative scheme for finding a common element of the set of solutions of an equilibrium problem and the set of common fixed points of finitely many nonexpansive mappings in a Hilbert space. We prove a strong convergence theorem under mild assumptions on parameters.

**Key Words and Phrases:** Nonexpansive mapping, equilibrium problem, fixed point problem, Hilbert spaces.

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## REFERENCES

- [1] E. Blum, W. Oettli, *From optimization and variational inequalities to equilibrium problems*, Math. Student, **63**(1994), 123-145.
- [2] P.L. Combettes, S.A. Hirstoaga, *Equilibrium programming in Hilbert spaces*, J. Nonlinear Convex Anal., **6**(2005), 117-136.
- [3] S.D. Flam, A.S. Antipin, *Equilibrium programming using proximal-like algorithms*, Math. Program., **78**(1997), 29-41.
- [4] S. Takahashi, W. Takahashi, *Viscosity approximation methods for equilibrium problems and fixed point problems in Hilbert spaces*, J. Math. Anal. Appl., **331**(2007), 506-515.
- [5] T. Suzuki, *Strong convergence of Krasnoselskii and Mann's type sequences for one-parameter nonexpansive semigroups without Bochner integrals*, J. Math. Anal. Appl., **305**(2005), 227-239.
- [6] H.K. Xu, *Viscosity Approximation Methods for Nonexpansive Mappings*, J. Math. Anal. Appl., **298**(2004), 279-291.
- [7] W. Takahashi, K. Shimoji, *Convergence theorems for nonexpansive mappings and feasibility problems*, Math. Comput. Modelling, **32**(2000), 1463-1471.
- [8] A. Moudafi, *Viscosity approximation methods for fixed-point problems*, J. Math. Anal. Appl., **241**(2000), 46-55.
- [9] R. Wittmann, *Approximation of fixed points of nonexpansive mappings*, Arch. Math., **58**(1992), 486-491.
- [10] A. Tada, W. Takahashi, *Strong convergence theorem for an equilibrium problem and a nonexpansive mapping*, in Nonlinear Analysis and Convex Analysis, W. Takahashi and T. Tanaka (Eds.), pp. 609-617, Yokohama, Japan, 2007.

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