PROXIMAL DYNAMICAL MODELS FOR SOLVING STRONGLY PSEUDO-MONOTONE MIXED EQUILIBRIUM PROBLEMS

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ABSTRACT

In this paper, we develop proximal dynamical systems (PDSs) for solving mixed equilibrium problems (MEPs) in Hilbert spaces. Under the assumptions of strong pseudo-monotonicity and Lipschitz-type continuity, we establish the existence and uniqueness of an equilibrium solution and prove its global exponential stability. Moreover, a discrete-time realization of the system is developed, leading to a proximal algorithm that achieves linear convergence to the unique solution under suitable parameter conditions for the fixed-point type PDS. Along with this, we established a second predefined time-convergence PDS to address MEPs. By using proximal operators, Lyapunov functions, and comparisons with existing results, improved predefined-time convergence criteria are obtained. A key feature of the second proposed PDS method is that the convergence time is independent of the initial conditions and the step size. Finally, numerical experiments are reported to confirm the theoretical results.

***K*eywords** Mixed Equilibrium Problem · Proximal Dynamic Methods · Strong pseudo-monotonicity · Stability Analysis.

References

[1] Hung PG and Muu LD. The Tikhonov regularization extended to equilibrium problems involving pseudomonotone bifunctions. Nonlinear Anal. Theory Methods Appl. 2011, 74, 6121–6129.

[2] ElFarouk N. Pseudomonotone variational inequalities: convergence of the auxiliary problem method. J. Optim. Theory Appl. 2001, 111, 305–326.

[3] Moudafi A. Proximal point methods extended to equilibrium problems. J. Nat. Geom. 1999, 15, 91–100. Bot RI, Csetnek ER, and Vuong PT. The forward backward-forward method from discrete and continuous perspective for pseudo-monotone variational inequalities in hilbert spaces. Eur. J. Oper. Res. 2020, 287, 49-60.

[4] Song Y and Zhang Q. Proximal algorithms for a class of mixed equilibrium problems. Fixed Point Theory and Applications, 2012, (1), 166.

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