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RELATIVELY RELAXED PROXIMAL POINT ALGORITHMS AND THEIR ROLES TO APPROXIMATION SOLVABILITY OF NONLINEAR VARIATIONAL INCLUSION PROBLEMS BASED ON GENERALIZED YOSIDA APPROXIMATIONS

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Abstract. In this communication, the approximation solvability of a general class of nonlinear variational inclusion problems using the relatively relaxed proximal point algorithms based on the generalized Yosida approximation - a generalization to the classical Yosida approximation - is explored, while the weak convergence is achieved. The notion of relative maximal monotonicity introduced by Verma (2008, 2009) generalizes the classical maximal monotonicity. Furthermore, the relatively relaxed proximal point algorithm in essence generalizes the classical relaxed proximal point algorithms considered by Eckstein and Bertsekas (1992) based on the work of Rockafellar (1976).

Keywords: Variational inclusions, Maximal monotone mapping, Generalized resolvent operator.

AMS Mathematics Subject Classifications: 49J40, 65B05

1. Introduction

Let X be a real Hilbert space with the norm $\|\cdot\|$ and the inner product $\langle\cdot,\cdot\rangle$. We consider approximation solvability of a general class of nonlinear inclusion problems of the form to the context of relatively maximal monotone mappings: find a solution to

$$0 \in M(x), \tag{1}$$

where $M : X \to 2^X$ is a set-valued mapping on X.

It seems that greatly motivated by the work of Rockafellar [12] on the classical proximal point algorithm, Eckstein and Bertsekas [4], relaxed the classical proximal point algorithm and then proved that the sequence converges weakly to a solution of (1). As a result, on one hand, they further generalized the alternating direction method of multipliers for convex programming,