

On the convergence of a new iterative algorithm of three infinite families of generalized nonexpansive multi-valued mappings

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Abstract. In this paper, we establish some weak and strong convergence theorems for a new iterative algorithm under some suitable conditions to approximate the common fixed point of three infinite families of multi-valued generalized nonexpansive mappings in a uniformly convex Banach spaces. Our results generalize and improve several previously known results of the existing literature.

Keywords. Common fixed point; generalized nonexpansive map; three step iterative scheme; weak and strong convergence; condition (A') .

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1. Introduction

In recent years, approximation of fixed point of multi-valued nonexpansive mappings and multi-valued generalized nonexpansive mappings by iteration has been studied by many authors (see [2, 3, 20, 22, 24, 26, 28, 31, 32]). The fixed point theory of multi-valued mappings is much more complicated and difficult than the corresponding theory of single-valued mappings and has many fruitful applications in various fields, for example, game theory and mathematical economics. Thus, it is natural to extend the known fixed point results for single-valued mappings to the setting of multi-valued mappings. However, some classical fixed point theorems for single-valued nonexpansive mappings have already been extended to multi-valued mappings. The first set of results in this direction were established by Markin [17] in Hilbert spaces and by Browder [4] for spaces having weakly continuous duality mapping. Dozo [10] generalized these results in a Banach space satisfying Opial's condition.

In 1969, Nadler [18] proved a fixed point theorem for multi-valued contraction mappings and convergence of a sequence and also extended theorems on the stability of fixed points of single-valued mappings. Markin [17] first used the Hausdorff metric to study the fixed points for multi-valued contractions and nonexpansive mappings. Later in 1997, Hu *et al.* [13] obtained common fixed point of two nonexpansive multi-valued mappings satisfying certain contractive conditions.