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Common fixed point results for weakly commuting maps by altering distances

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Abstract: The present paper deals with common fixed point results for four mappings and also for a sequence of mappings on a metric space under the control function namely the altering distances between points. The results obtained generalize the earlier results of Khan, Swaleh and Sessa (1984) and Sastry and Babu (1999, 2001) and others in turn.
Keywords: Weakly commuting map, altering distance, fixed point.
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1. Introduction

The theory of common fixed point for self mappings in metric space satisfying certain conditions has a vast literature. However the existence of fixed points for self maps on a metric space by altering distances between the points with the use of certain control function is an interesting aspect. In this direction Khan, Swaleh and Sessa [2] established the existence and uniqueness of a fixed point for a single altering distance map. Recently Sastry and Babu [7,8], Naidu [5,6] proved a fixed point theorem by altering distances between the points for a pair of self maps, which address a new type of contractive fixed point problems. Pant [3] established a unique common fixed point theorem for four self maps by using the conditions of the type commutativity, contractive and continuity. The main purpose of this paper is to obtain conditions for the existence of a unique common fixed point for four self maps on a complete metric space by altering distances between the points. Before going to our results, we give here some definitions.

Definition 1.1 [2] An altering distance is a mapping $\varphi : [0, \infty) \to [0, \infty)$ which satisfies

1. φ is increasing and continuous,
2. $\varphi(t) = 0$ if and only if $t = 0$.

Definition 1.2 Let A and S be self mappings of a metric space (X, d), then A and