Dynamics of Continuous, Discrete and Impulsive Systems
Series **A:** *Mathematical Analysis* **27 (2020)** 195-207
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CONVERGENCE OF AK-ITERATION, VATAN TWO STEP ITERATION, PICARD-S ITERATION AND CR-ITERATION, STABILITY OF AK-ITERATION AND COMPARISON OF RATE OF CONVERGENCE

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Abstract. Let $(X, ||.||)$ be a normed linear space, K be a nonempty closed convex subset of X and $T : K \to K$ be a map that satisfies the condition, i.e., there exist $\delta \in [0, 1)$ and $L \geq 0$ such that $||Tx - Ty|| \leq \delta||x - y|| + L||x - Tx||$ for all x, y in K. We assume that $F(T) \neq \emptyset$ where $F(T)$ denotes the set of all fixed points of T. In this paper, we prove that AK, Vatan two step, Picard-S and CR-iteration procedures converges strongly to a fixed point of T. Also, we discuss T-stability and data dependence of these iteration procedures. Further, we prove that the $AK-$iteration procedure converges faster than the remaining iteration procedures. We apply these results to solve a nonlinear equation.

Keywords. Fixed point, $AK-$iteration procedure, Vatan two step iteration procedure, Picard-S iteration procedure, CR-iteration procedure, $T-$stability, data dependence, rate of convergence.

AMS (MOS) subject classification: 47H10, 54H25.

1 Introduction

Let K be a nonempty closed convex subset of a normed linear space $(X, ||.||)$ and $T : K \to K$ be a selfmap of K. A point $x \in K$ is called a fixed point of T if $Tx = x$ and we denote the set of all fixed points of T by $F(T)$.

A map $T : K \to K$ is called a contraction map if it satisfies the condition i.e., there exists $\delta \in (0, 1)$ such that for all $x, y \in K$

$$||Tx - Ty|| \leq \delta||x - y||. \tag{1.1}$$

Harder and Hicks [5] defined the stability of a fixed point iteration procedure and made a systematical study. Due to Harder, the stability of a general fixed point iteration procedure with respect to T is as follows.