Nonlinear Analysis 74 (2011) 4105–4111

Contents lists available at ScienceDirect

Nonlinear Analysis

journal homepage: www.elsevier.com/locate/na

Cyclic algorithms for split feasibility problems in Hilbert spaces

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ARTICLE INFO

Article history:
Received 26 October 2010
Accepted 24 March 2011
Communicated by Ravi Agarwal

MSC:
47J25
47N10
65J15
90C25

Keywords:
Convex feasibility
Split feasibility
Split common fixed point
Nonexpansive mapping
Class-$\mathfrak{T}$ operator
Iterative algorithm

ABSTRACT

The split common fixed point problem (SCFPP) is equivalently converted to a common fixed point problem of a finite family of class-$\mathfrak{T}$ operators. This enables us to introduce new cyclic algorithms to solve the SCFPP and the multiple-set split feasibility problem.

1. Introduction

Let $\mathcal{H}$ and $\mathcal{K}$ be real Hilbert spaces and let $A : \mathcal{H} \to \mathcal{K}$ be a bounded linear operator. Given integers $p, r \geq 1$ and given also nonempty closed convex subsets $\{C_i\}_{i=1}^{p}$ and $\{Q_j\}_{j=1}^{r}$ in $\mathcal{H}$ and $\mathcal{K}$, respectively.

The convex feasibility problem (CFP) is formulated as finding a point x^* satisfying the property:

$$x^* \in \bigcap_{i=1}^{p} C_i. \tag{1.1}$$

Note that the CFP has received a lot of attention due to its extensive applications in many applied disciplines as diverse as approximation theory, image recovery and signal processing, control theory, biomedical engineering, communications, and geophysics (see [1–3] and the references therein).

The multiple-set split feasibility problem (MSSFP) was recently introduced [4] and is formulated as finding a point x^* with the property:

$$x^* \in \bigcap_{i=1}^{p} C_i \quad \text{and} \quad Ax^* \in \bigcap_{j=1}^{r} Q_j. \tag{1.2}$$

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0362-546X/$ – see front matter
doi:10.1016/j.na.2011.03.044