

👉 Inertial methods for finding minimum-norm solutions of the split variational inequality problem beyond monotonicity

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- Let \mathcal{X} be a Hilbert or Banach space, \mathcal{C} a nonempty closed subset of \mathcal{X} and $T : \mathcal{C} \rightarrow \mathcal{C}$ a nonlinear operator. We denote by $F(T)$ the set of fixed points of T , i.e.
$$F(T) = \{x \in \mathcal{C} : Tx = x\}.$$

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- The VIP is defined as finding a point $x^* \in \mathcal{C}$ such that

$$\langle Ax^*, y - x^* \rangle \geq 0, \quad \forall y \in \mathcal{H}, \quad (1.3)$$

$A : \mathcal{H} \rightarrow \mathcal{H}$ is a nonlinear operator, \mathcal{H} is a Hilbert space and $\mathcal{C} \subset \mathcal{H}$ is nonempty, closed, convex.

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- It is known that VIP (1.3) is equivalent to the FPP, for all $\gamma > 0$,

$$x^* = P_{\mathcal{C}}(I - \gamma A)x^*. \quad (1.4)$$

Thus Fixed point methods can be applied to solve VIP.

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- The VIP (1.3) was later generalized to the following SVIP by Censor *et al.*: Find $x \in \mathcal{C}$ such that

$$\langle Ax, y - x \rangle \geq 0, \quad \forall y \in \mathcal{C}, \quad (1.5)$$

and $z = Tx \in \mathcal{Q}$ solves

$$\langle Fz, u - z \rangle \geq 0, \quad \forall u \in \mathcal{Q}, \quad (1.6)$$

where \mathcal{C} and \mathcal{Q} are nonempty, closed and convex subsets of real Hilbert spaces \mathcal{H}_1 and \mathcal{H}_2 respectively,

$A : \mathcal{H}_1 \rightarrow \mathcal{H}_1$, $F : \mathcal{H}_2 \rightarrow \mathcal{H}_2$ are two operators and $T : \mathcal{H}_1 \rightarrow \mathcal{H}_2$ is a bounded linear operator.

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- The first known attempt to solve the SVIP when A and F are monotone and Lipschitz continuous was made by Censor *et al.* [C]. First, they transformed the SVIP into an equivalent constrained VIP in the product space $\mathcal{H}_1 \times \mathcal{H}_2$ (see [Section 4][C]). Then, they employed the well-known subgradient extragradient method to solve the problem.

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Our interest

- Our interest in this work is to solve the SVIP when A and F are pseudomonotone and Lipschitz continuous, without any product space reformulation of the original problem, and with minimal number of projections per iteration.

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Co-coercive mappings

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 - *L-co-coercive* (or *L-inverse strongly monotone*), if there exists $L > 0$ such that

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Let $\mathcal{H} = l_2(\mathbb{R})$. Then, the operator $A : \mathcal{H} \rightarrow \mathcal{H}$ defined by

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Our assumptions

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Let $\{x_n\}$ be a sequence generated by Algorithm 3.5 under Assumption 3.1. Then, $\{x_n\}$ converges strongly to $p \in \Gamma$, where $\|p\| = \min\{\|z\| : z \in \Gamma\}$.

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The stepsize η_n given in Step 3 of Algorithms 3.2 and 3.5 is well-defined.

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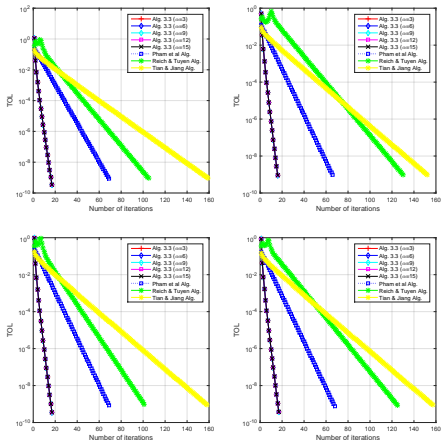


Figure: Top Left: **Case 1**; Top Right: **Case 2**; Bottom Left: **Case 3**; Bottom Right: **Case 4**.

Example 2

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$M(x)(t) := \int_0^t x(s)ds, \quad \forall x \in L_2([0, 1]), \quad t \in [0, 1]$. Then g is $\frac{16}{25}$ -Lipschitz continuous and $\frac{1}{5} \leq g(x) \leq 1, \quad \forall x \in \mathcal{C}$.

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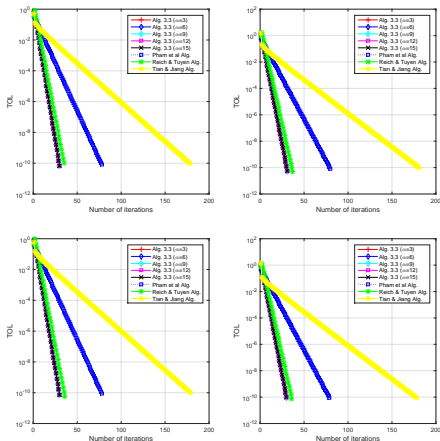


Figure: Top Left: **Case 1**; Top Right: **Case 2**; Bottom Left: **Case 3**; Bottom Right: **Case 4**.

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THANKS FOR LISTEN

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Thank You!