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ERRATUM

Erratum to: Higher-order optimality conditions for weakly efficient solutions in nonconvex set-valued optimization

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Unfortunately, the incorrect version of [1, Theorem 4.3] was published. The correct version of [1, Theorem 4.3] is given in this paper.

By employing the generalized higher-order contingent derivatives of set-valued maps, Wang et al. [1] established a sufficient optimality condition of weakly efficient solutions for (SVP):

$$(SVP)\begin{cases} min & F(x), \\ s.t. & G(x)\bigcap(-D) \neq \emptyset, x \in E. \end{cases}$$

Theorem 1 (see [1, Theorem 4.3]) *Assume that the following conditions are satisfied:*

(i) $(u_i, v_i, w_i) \in \{0_X\} \times C \times D, i = 1, 2, \ldots, m-1$;
(ii) *There exists* $(\Gamma, L) \subset (C^+ \times D^+) \setminus (0_{Y^*}, 0_{Z^*})$ *such that*

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$C := \{x \in Y | f(x) \geq 0, \, for \; any \; f \in \Gamma\}, D := \{x \in Z | g(x) \geq 0, \, for \; any \; g \in L\}$,

$$\sup_{(f,g)\in(\Gamma,L)} \left\{ \frac{f(0_Y) + g(-z_0)}{f(e) + g(k)} \right\} = 0, \tag{1}$$

and

$$\sup_{(f,g)\in(\Gamma,L))} \left\{ \frac{f(y) + g(z)}{f(e) + g(k)} \right\} > 0 \tag{2}$$

for any $(y, z) \in G\text{-}D^{(m)}(F_+, G_+)(x_0, y_0, z_0, u_1, v_1, w_1, \dots, u_{m-1}, v_{m-1}, w_{m-1})(x)$, $x \in dom[G\text{-}D^{(m)}(F_+, G_+)(x_0, y_0, z_0, u_1, v_1, w_1, \dots, u_{m-1}, v_{m-1}, w_{m-1})]$.
Then (x_0, y_0) *is a weakly efficient solution of* (SVP).

We would like to explain the mistake in [1, Theorem 4.3] and correct it.

On the one hand, it follows from [1, Proposition 3.2] that $0_X \in dom[G\text{-}D^{(m)}(F_+, G_+) (x_0, y_0, z_0, u_1, v_1, w_1, \dots, u_{m-1}, v_{m-1}, w_{m-1})]$ and $(0_Y, 0_Z) \in G\text{-}D^{(m)}(F_+, G_+)(x_0, y_0, z_0, u_1, v_1, w_1, \dots, u_{m-1}, v_{m-1}, w_{m-1})(0_X)$. Therefore, for any $\Gamma \subset C^+$ and $L \subset D^+$ with $\Gamma \times L \neq \{0_{Y^*}\} \times \{0_{Z^*}\}$, the condition (2) in Theorem 1 never holds.

On the other hand, the condition (1) can be simply written as

$$z_0 = 0_Z. \tag{3}$$

Indeed, (3) $\Rightarrow$ (1) is obvious. In what concerns the implication (1) $\Rightarrow$ (3), it follows from $z_0 \in -D$ that $g(-z_0) \geq 0$, for all $g \in L \subset D^+$. Thus, if (1) holds, then for all $(f, g) \in \Gamma \times L$, we have

$$0 \leq \frac{f(0_Y) + g(-z_0)}{f(e) + g(k)} \leq \sup_{(f',g')\in\Gamma\times L} \left\{ \frac{f'(y) + g'(z)}{f'(e) + g'(k)} \right\} = 0,$$

which implies $g(-z_0) = 0$, for all $g \in L$. This means that $-z_0, z_0 \in \{x \in Z | g(x) \geq 0, \forall g \in L\} = D$. Since D is pointed, we conclude that $z_0 = 0_Z$.

Thus the corrections of [1, Theorem 4.3] are as follows.

Theorem 2 *Assume that the following conditions are satisfied:*

(i) $(u_i, v_i, w_i) \in \{0_X\} \times C \times D, i = 1, 2, \dots, m-1$*;*
(ii) $z_0 = 0_Z$ *and there exist* $\Gamma \subset C^+$ *and* $L \subset D^+$ *with* $\Gamma \times L \neq \{0_{Y^*}\} \times \{0_{Z^*}\}$ *such that*

$$C := \{x \in Y | f(x) \geq 0, \; for \; any \; f \in \Gamma\}, \quad D := \{x \in Z | g(x) \geq 0, \; for \; any \; g \in L\}$$

and

$$\sup_{(f,g)\in\Gamma\times L} \left\{ \frac{f(y) + g(z)}{f(e) + g(k)} \right\} > 0$$

for any $(y, z) \in G\text{-}D^{(m)}(F_+, G_+)(x_0, y_0, z_0, u_1, v_1, w_1, \ldots, u_{m-1}, v_{m-1}, w_{m-1})(x)$ *with* $(y, z) \neq (0_Y, 0_Z)$, $x \in dom[G\text{-}D^{(m)}(F_+, G_+)(x_0, y_0, z_0, u_1, v_1, w_1, \ldots, u_{m-1}, v_{m-1}, w_{m-1})]$.

Then (x_0, y_0) *is a weakly efficient solution of* (SVP).

Proof The proof follows on the lines of [1, Theorem 4.3].

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Reference

1. Wang, Q.L., Li, S.J., Teo, K.L.: Higher-order optimality conditions for weakly efficient solutions in nonconvex set-valued optimization. Optim. Lett. **4**, 425–437 (2010)