January 14, 2017

Errata and Supplements to "Nonsmooth Mechanics and Convex Optimization" (CRC Press, 2011)

- Page 8, (1.3):
  $\forall x \in \mathcal{K} \qquad \rightarrow \qquad x \in \mathcal{K}$

- Page 17, proof of Fact 1.3.15:
  $A \bullet B = A^{1/2} B A^{1/2} \qquad \rightarrow \qquad A \bullet B = \mathrm{tr}(A^{1/2} B A^{1/2})$

- Page 23, proof of Fact 1.4.6:

  From (1.18) and the equality in (1.20), we obtain

  $$x_0 = \|\boldsymbol{x}_1\|, \quad s_0 = \|\boldsymbol{s}_1\|. \qquad (1.21)$$

  The equality in (1.19) holds if and only if either

  $$\begin{cases} \boldsymbol{x}_1 = \boldsymbol{0}; \\ \boldsymbol{s}_1 = \boldsymbol{0}; \\ \boldsymbol{x}_1 \neq \boldsymbol{0},\ \boldsymbol{s}_1 \neq \boldsymbol{0}, \text{ and } \boldsymbol{x}_1 = -\alpha \boldsymbol{s}_1\ (\alpha > 0) \end{cases} \qquad (1.22)$$

  is satisfied.[16] Thus we see that (a) holds if and only if (1.21) and (1.22) are satisfied. but the latter condition is equivalent to (c).

  ↓

  The equality in (1.19) holds if and only if either

  $$\begin{cases} \boldsymbol{x}_1 = \boldsymbol{0}; \\ \boldsymbol{s}_1 = \boldsymbol{0}; \\ \boldsymbol{x}_1 \neq \boldsymbol{0},\ \boldsymbol{s}_1 \neq \boldsymbol{0}, \text{ and } \boldsymbol{x}_1 = -\alpha \boldsymbol{s}_1\ (\alpha > 0) \end{cases} \qquad (1.21)$$

  is satisfied.[16] With reference to (1.18) and the equality in (1.20), we obtain $x_0 = 0$ if $\boldsymbol{x}_1 = \boldsymbol{0}$ and $s_0 = 0$ if $\boldsymbol{s}_1 = \boldsymbol{0}$. Furthermore, in the final case of (1.21) we obtain

  $$x_0 = \|\boldsymbol{x}_1\|, \quad s_0 = \|\boldsymbol{s}_1\|. \qquad (1.21)$$

  From this observation we conclude that (a) is equivalent to (c).

- Page 54, the 1st line of section 2.2.4:
  "We here establish the optimality conditions for (P) and (P*). We assume that $\varPhi$ is a closed proper convex function."

- Page 59, Definition 2.2.13:
  $L : \mathbb{V} \times \mathbb{Y}^* \to \mathbb{R} \cup \{+\infty\} \qquad \to \qquad L : \mathbb{V} \times \mathbb{Y}^* \to \mathbb{R} \cup \{-\infty\}$

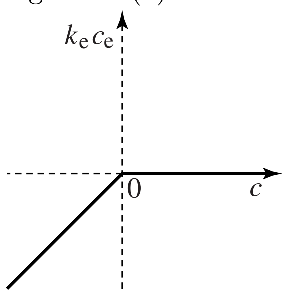
- Page 62, eq. (2.44):

$$\varPhi(\boldsymbol{x}; \boldsymbol{\lambda}, \boldsymbol{\nu}) = \begin{cases} f_0(x) & \text{if } f_j(x) + z_j \leq 0 \quad (j = 1, \dots, m), \\ & \quad h_l(x) + \nu_l = 0 \quad (l = 1, \dots, k), \\ +\infty & \text{otherwise}, \end{cases}$$

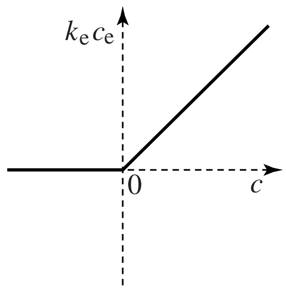
$$\downarrow$$

$$\varPhi(\boldsymbol{x}; \boldsymbol{\lambda}, \boldsymbol{\nu}) = \begin{cases} f_0(x) & \text{if } f_j(x) + \lambda_j \leq 0 \quad (j = 1, \dots, m), \\ & \quad h_l(x) + \nu_l = 0 \quad (l = 1, \dots, k), \\ +\infty & \text{otherwise}, \end{cases}$$

- Page 107, Figure 4.4(a):



$\to$



- Page 257, (9.6):

$$\omega_1(\boldsymbol{\varepsilon}_{\mathrm{w}}) > 0, \quad \omega_2(\boldsymbol{\varepsilon}_{\mathrm{w}}) > 0, \tag{9.6a}$$
$$\omega_1(\boldsymbol{\varepsilon}_{\mathrm{w}}) > 0, \quad \omega_2(\boldsymbol{\varepsilon}_{\mathrm{w}}) = 0, \tag{9.6b}$$
$$\omega_1(\boldsymbol{\varepsilon}_{\mathrm{w}}) = 0, \quad \omega_2(\boldsymbol{\varepsilon}_{\mathrm{w}}) = 0 \tag{9.6c}$$

$$\downarrow$$

$$\lambda_1(\boldsymbol{\sigma}) > 0, \quad \lambda_2(\boldsymbol{\sigma}) > 0, \tag{9.6a}$$
$$\lambda_1(\boldsymbol{\sigma}) > 0, \quad \lambda_2(\boldsymbol{\sigma}) = 0, \tag{9.6b}$$
$$\lambda_1(\boldsymbol{\sigma}) = 0, \quad \lambda_2(\boldsymbol{\sigma}) = 0 \tag{9.6c}$$

- Page 277, (9.72):
  $\langle z^*, \varLambda \rangle \qquad \to \qquad \langle z^*, \varLambda x \rangle$

- Page 313, 2 lines below (10.3b):
  $\boldsymbol{r}(r_\mathrm{n}, \boldsymbol{r}_\mathrm{t}) \qquad \to \qquad \boldsymbol{r} = (\boldsymbol{r}_\mathrm{t}, r_\mathrm{n})$

- Page 327, (10.35):

$$\begin{cases} \Delta u_\mathrm{t} > 0 & \Rightarrow \quad r_\mathrm{t} \leq 0, \\ \Delta u_\mathrm{t} < 0 & \Rightarrow \quad r_\mathrm{n} \geq 0. \end{cases}$$

$$\downarrow$$

$$\begin{cases} \Delta u_\mathrm{t} > 0 & \Rightarrow \quad r_\mathrm{t} \leq 0, \\ \Delta u_\mathrm{t} < 0 & \Rightarrow \quad r_\mathrm{t} \geq 0. \end{cases}$$

- Page 340, 6 lines below (10.81):

$$0 \leq \alpha \langle \boldsymbol{x} - \bar{\boldsymbol{y}}, \boldsymbol{y} - \bar{\boldsymbol{y}} \rangle + \alpha^2 \|\boldsymbol{y} - \bar{\boldsymbol{y}}\|^2.$$

$$\downarrow$$

$$0 \leq 2\alpha \langle \boldsymbol{x} - \bar{\boldsymbol{y}}, \boldsymbol{y} - \bar{\boldsymbol{y}} \rangle + \alpha^2 \|\boldsymbol{y} - \bar{\boldsymbol{y}}\|^2.$$

- Page 358, footnote 5:

$$f(\boldsymbol{\sigma}) = \|\operatorname{dev}(\boldsymbol{\sigma})\| = \left[\left(\boldsymbol{\sigma} - \tfrac{1}{3}\operatorname{tr}(\boldsymbol{\sigma})\right) : \left(\boldsymbol{\sigma} - \tfrac{1}{3}\operatorname{tr}(\boldsymbol{\sigma})\right)\right]^{1/2} = \left[\boldsymbol{\sigma} : \boldsymbol{\sigma} - \tfrac{1}{3}(\boldsymbol{I} : \boldsymbol{\sigma})^2\right]^{1/2},$$

$$\downarrow$$

$$f(\boldsymbol{\sigma}) = \|\operatorname{dev}(\boldsymbol{\sigma})\| = \left[\left(\boldsymbol{\sigma} - \tfrac{1}{3}\operatorname{tr}(\boldsymbol{\sigma}\boldsymbol{I})\right) : \left(\boldsymbol{\sigma} - \tfrac{1}{3}\operatorname{tr}(\boldsymbol{\sigma}\boldsymbol{I})\right)\right]^{1/2} = \left[\boldsymbol{\sigma} : \boldsymbol{\sigma} - \tfrac{1}{3}(\boldsymbol{I} : \boldsymbol{\sigma})^2\right]^{1/2},$$