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Corrigendum

Corrigendum to: "The explicit linear quadratic regulator for constrained systems" [Automatica 38(1) (2002) 3–20]☆

Alberto Bemporad[a,*], Manfred Morari[b], Vivek Dua[c], Efstratios N. Pistikopoulos[c]

[a] *Dipartimento di Ingegneria dell'Informazione, Università di Siena, Via Roma 56, 53100 Siena, Italy*
[b] *Institut für Automatik, ETH - Swiss Federal Institute of Technology, CH-8092 Zürich, Switzerland*
[c] *Centre for Process Systems Engineering, Imperial College, London SW7 2BY, UK*

We apologize that Example 7.1 as published in Bemporad, Morari, Dua, and Pistikopoulos (2002) is incorrect due to a miscalculation of the weight matrix P on the terminal state. It is restated below.

7.1. A simple SISO system

The mp-QP problem associated to the MPC feedback law has form (7) with

$$H = \begin{bmatrix} 1.2152 & 0.7848 \\ 0.7848 & 1.2152 \end{bmatrix}, \quad F = \begin{bmatrix} 11.6581 & 10.5542 \\ 11.6925 & 10.5824 \end{bmatrix}.$$

The corresponding partition of the state-space into $N_r = 5$ regions is depicted in Fig. 2(b). The associated MPC law is given in Table 1.

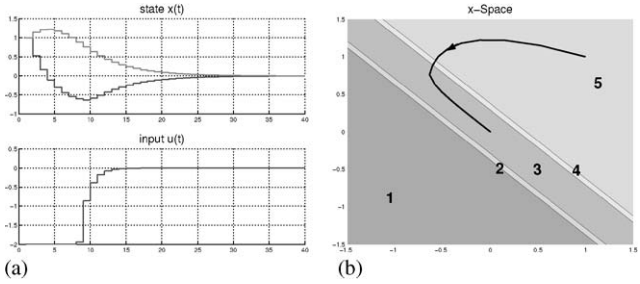

Fig. 2. (a) Closed-loop MPC. (b) State-space partition and closed-loop MPC trajectories.

Table 1
MPC law associated to Fig. 2(b)

Input u	Region
$\begin{bmatrix} -6.8355 \\ -6.8585 \end{bmatrix}' x$	$\begin{bmatrix} 0.7059 & 0.7083 \\ -0.7059 & -0.7083 \end{bmatrix} x \leqslant \begin{bmatrix} 0.2065 \\ 0.2065 \end{bmatrix}$
	(Region #3)
-2	$[-0.7059 \;\; -0.7083]x \leqslant [-0.2065]$
	(Regions #4 & #5)
2	$[0.7059 \;\; 0.7083]x \leqslant [-0.2065]$
	(Regions #1 & #2)

Note that regions (#1,#2) and (#4,#5) have been joined as they have the same feedback law on the first step and their union is convex. If the same example is repeated with the additional state constraint $x_{t+k|t} \geqslant x_{\min}$

$$x_{\min} \triangleq \begin{bmatrix} -0.5 \\ -0.5 \end{bmatrix},$$

$k = 1$, the MPC partition depicted in Fig. 3(b) is obtained. After joining regions with convex unions and the same

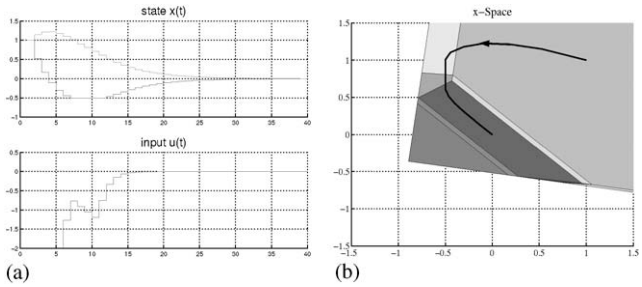

Fig. 3. (a) Closed-loop MPC. (b) State-space partition and closed-loop MPC trajectories.

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* Corresponding author. Automatic Control Laboratory, ETH Zurich Physikstrasse 3, Zurich, Switzerland.
E-mail addresses: bemporad@unisi.it (A. Bemporad), morari@control.ee.ethz.ch (M. Morari), v.dua@ic.ac.uk (V. Dua), e.pistikopoulos@ic.ac.uk (E.N. Pistikopoulos).

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feedback law, the MPC controller consists of $N_{\mathrm{mpc}} = 5$ regions.

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References

Bemporad, A., Morari, M., Dua, V., & Pistikopoulos, E. N. (2002). The explicit linear quadratic regulator for constrained systems. *Automatica*, *38*(1), 3–20.