

P.E. Orukpe

**Department of Electrical/Electronic Engineering,
University of Benin, Nigeria.**

Some equations in this paper were wrongly typesetted in the vol. 21 issue of the Journal of NAMP. The page of the article is therefore reproduced below as it ought to appear in page 45 (Vol. 21).

$$sub. to \left\{ \begin{array}{l} \mu \geq 0 \\ \begin{bmatrix} H & G + \frac{1}{2}A_m^T\mu \\ G^T + \frac{1}{2}\mu^T A_m & \mu_0 - \mu^T b_m \end{bmatrix} \\ \mu_0 \in \mathcal{R} \end{array} \right\}. \quad (3.11)$$

Problems (3.10) and (3.11) are convex. Note that since the original problem in (3.7) is convex, it follows that (3.10) and (3.11) give the exact solution [16].

4.0 Simulation Results

In this section, we present an example that illustrates the implementation of this semidefinite relaxation approach for constrained MPC. The simulations were performed on a PC with Pentium IV processor and we use the software LMI control Toolbox in the MATLAB environment to compute the solution.

Consider the distillation column used in [17], which was modified for our purpose to obtain the following discrete-time parameters at a sampling time of $T = 2min$:

$$A = \begin{bmatrix} 1 - \frac{T}{54} & 0 & 0 & 0 \\ 0 & 1 - \frac{T}{78} & 0 & 0 \\ 0 & 0 & 1 - \frac{T}{114} & 0 \\ 0 & 0 & 0 & 1 - \frac{T}{42} \end{bmatrix}; B = \begin{bmatrix} \frac{34T}{54} \\ \frac{31.6T}{78} \\ 0 \\ 0 \end{bmatrix}; C = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

The input constraint was $|u(k+i|k)| \leq 0.05$, while the state constraint was $|x(k+i|k)| \leq 1$. We specify the design parameters $diag(1,1,1,1)$ and $R = 0.00002$. Given an initial state $x(0) = [0.05 \ 0 \ 0.05 \ 0]^T$, Figures 1 and 2 illustrate the simulation results for the control and output of the system under consideration. Furthermore, in the presence of constraints, no violations occurred. Thus the existence of a feasible solution ensures constraint satisfaction.

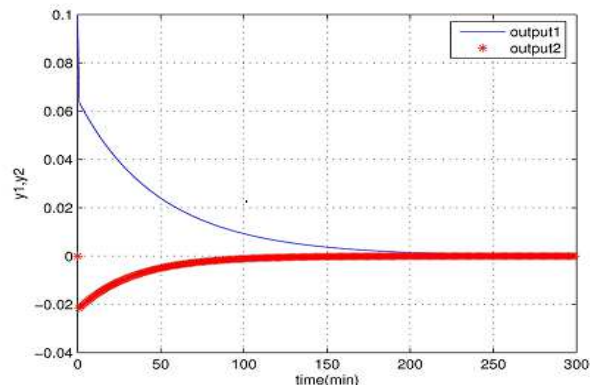
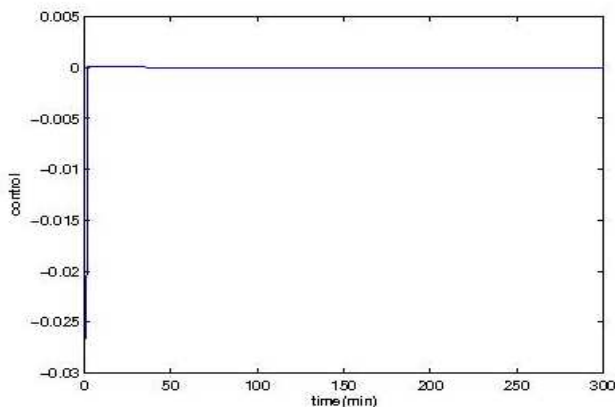


Figure 1: Control for the semidefinite relaxation method Figure 2: Output for the semidefinite relaxation method