International Journal of Innovative Computing, Information and Control
Volume **2**, Number **3**, June **2006**

 ISSN 1349-4198
pp. 491–503

IMPROVEMENT OF TRACKING PERFORMANCE IN SELF-TUNING PID CONTROLLER BASED ON GENERALIZED PREDICTIVE CONTROL

Takao Sato

Division of Mechanical System
Department of Mechanical Engineering
Graduate School of Engineering
University of Hyogo
2167 Shosha, Himeji, Hyogo 671-2201, Japan
tsato@eng.u-hyogo.ac.jp

Akira Inoue

Division of Industrial Innovation Sciences
Graduate School of Natural Science and Technology
Okayama University
3-1-1 Tsushima-naka, Okayama 700-8530, Japan
inoue@suri.sys.okayama-u.ac.jp

Received July 2005; revised November 2005

Abstract. *In this paper a new design method of a self-tuning PID controller is proposed. The PID controller is designed based on generalized predictive control (GPC) including a future reference trajectory. The PID controller given in this paper is based on GPC and, is I-PD type controller. It is shown that the design parameter adjusting the future reference trajectory changes only the integral time of the PID controller. In order to illustrate the effectiveness of the proposed method, numerical examples are shown.*
Keywords: PID control, Generalized predictive control, Self-tuning control, Integral action

1. **Introduction.** Proportional-Integral-Derivative (PID) control [1] is the most widely used control method. The performance of the PID control can be adjusted by tuning PID parameters. However, it is difficult to select the optimal PID parameters. Further, it is necessary to take the fluctuation of plant dynamics into consideration. This paper discusses the problem of designing the PID parameters automatically. In this paper the PID parameters are designed by comparing the PID controller with a generalized predictive control (GPC) law [2, 3]. The PID controller designed by the comparison is called by "PID controller based on GPC". Many PID controllers based on GPC have been proposed. Yamamoto et al. [4] showed that PID control belongs to a special class of GPC and that the PID control is equivalent to GPC under certain conditions. Asano et al. [5] proposed a GPC-Based PID controller not requiring extra compensators. Miller et al. [6] designed a PID controller based on a GPC law using a steady state prediction to reduce computation load in obtaining long period prediction. Moradi et al. [7] proposed