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PREDICTIVE PID CONTROL FOR INDUSTRIAL APPLICATIONS

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Abstract. In this paper a predictive PID (proportional-integral-derivative) controller has been proposed with the freedom of selection of control horizon, which was earlier considered as limitation in order to keep the system causal. Predictive PID tuning parameters are obtained by minimizing the norm difference between control law of discrete PID to the generalized predictive control (GPC). Primitively, two assumptions were considered with reference to selection of control horizon, which have been resolved in this paper. The proposed scheme could be used to get the better optimal PID tuning parameters based on GPC formulation with more freedom in selection of control horizon while keeping the system causal. Simulation studies revealed that a superior performance and higher stability region observed in comparison with the previous method, which was obviously be better than the conventional PID controllers.

Keywords. Proportional integral derivative (PID) controller; Predictive PID; Generalized predictive control (GPC).

1 Introduction

This is an indispensable fact that PID controller ruled over the process industry for last six decade. The main reason of high popularity of PID controllers are its simplicity, robustness, wide range of applicability and suitable performance. First commercial PID controller was introduced by Taylor Instrument Companies and then a great deal of research and development commenced [1]. Cominos and Munro [2] summarized most popular PID parameters tuning methods.

Over the last two decades in the process industry, advancement and competition developed many complex control problem, where simple PI and PID were unable to tackle these problems efficiently. Miller et. al., [3, 4] have illustrated that some of the main complex control problems in the process industries are non-minimum phase, long and varying time delay, multivariable interaction, non-linearities, varying disturbances, soft and hard constraints