

HYBRID PREDICTIVE CONTROL WITH A PRESCRIBED DEGREE OF STABILITY

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Abstract. *In this paper we will consider one class of hybrid controllers. Such a control strategy is a mix of continuous dynamics and discrete events philosophy. Here we consider a finite set of model predictive controllers (MPC) which is the only advanced control technique to have had a significant and widespread impact on industrial process control. There are several advantages for wide acceptance of MPC: guaranteed stability, constraints handling and easy extension to multivariable and nonlinear systems. In this paper we add one more important property: significant increasing of transient performance. Proposed controllers, also, have prescribed degree of stability as a tuning parameter.*

Key words: *Hybrid control, predictive controller, prescribed degree of stability, asymptotic stability*

1. INTRODUCTION

The model predictive control (MPC) is the only advanced control methodology that has made a significant impact in industrial control engineering.

- (i) The extension to multivariable case is easy
- (ii) It handles constraints. The higher performance levels are associated with pushing the limits. That frequently leads to more profitable operation
- (iii) In industrial applications control update rates are relatively low and there is enough time for on-line computation

The authoritative survey papers are presented in [1]–[3]. They noticed that most control laws, for example PID, do not explicitly consider the future implication of current control actions. MPC, on the other hand, explicitly computes the predicted behaviour over some horizon. One can therefore restrict the choice of current proposed input trajectories to those that do not lead to difficulties in the future.

The key problem in MPC is the stability. It had been known from [4] that making the horizon infinite in predictive control leads to guaranteed stability, but if was not known

