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Flatness-based Control of Throttle Valve Using Neural Observer

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Abstract: In this paper, a proposed flatness-based controller is designed for an electronic throttle valve in an internal combustion engine. It is based on the use of the state space variables of the flat nonlinear model, estimated by a neural observer, to track a desired trajectory. The case of the control of an electronic throttle valve study shows the efficiency of the developed control method in terms of tracking in the presence of non linearities.

Keywords: *flat output; flatness-based controller; neural observer; electronic throttle valve.*

Mathematics Subject Classification (2010): 93C10, 93C35.

1 Introduction

Quality improvement of the combustion in automobile engine requires the control of the system of injection as well as the quality of air aspired via the admission collector [3]. This desired air flow is obtained by an electronic throttle valve considered as an electro-valve which presents nonlinear phenomena, depending on the position and the applied control voltage, such as: saturation, hysteresis, dead zone, disturbances and parametric uncertainties of the model.

This paper deals with the use of the differential flatness concept to control this nonlinear system. However, this approach has no systematic methods to detect the flat output for a given system, and presents the difficulty concerning the robustness study of the

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