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ScienceDirect

Journal of the Franklin Institute 351 (2014) 4514–4537

Journal of The Franklin Institute

www.elsevier.com/locate/jfranklin

Fault tolerant tracking control using unmeasurable premise variables for vehicle dynamics subject to time varying faults

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Received 24 December 2012; received in revised form 17 January 2014; accepted 20 May 2014
Available online 18 June 2014

Abstract

This paper deals with fault tolerant tracking controller (FTTC) design for vehicle dynamics system represented by an uncertain continuous time Takagi–Sugeno (T–S) model with unmeasurable premise variables. The goal is to ensure both state and fault estimations and the state trajectory reference tracking even if faults occur. To do this, a Proportional Integer Observer (PIO) with unknown inputs is then designed on the basis of the measure of the roll rate, the steering angle and the lateral offset given by the distance between the road centerline and the vehicle axe at a look-ahead distance. In this study, the faults affecting the system behavior are considered as time varying functions modeled by exponential functions or first order polynomials. Based on descriptor redundancy property solution are proposed in terms of Linear Matrix Inequalities (LMIs). Simulation results illustrate the applicability and the effectiveness of the proposed approaches on the vehicle system.

1. Introduction

Driver assistance and safety are becoming increasingly common in automotive industries applications in order to fight against the problems relative to road security. Indeed, the number of

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http://dx.doi.org/10.1016/j.jfranklin.2014.05.012
0016-0032/