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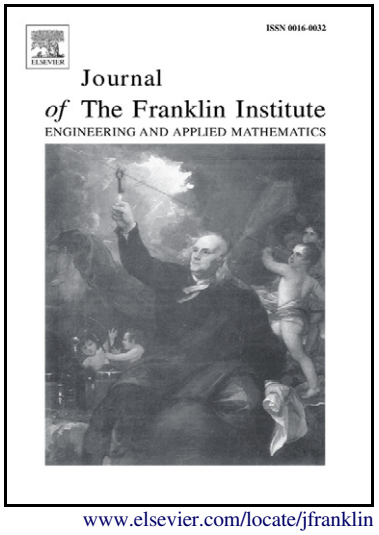

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Application of Active Disturbance Rejection Control in Tank Gun Control System

Yuanqing Xia, Li Dai, Mengyin Fu, Chunming Li and Chunming Wang

Abstract

The problem of position tracking for a tank gun control system with inertia uncertainty and external disturbance is investigated in this paper. The tank gun control system, demanding high tracking precision and stabilization precision, is a nonlinear system. Classical control methods are commonly used in the actual system, which is difficult to ensure high precision and high disturbance rejection capability. An active disturbance rejection control (ADRC) scheme is applied to guarantee the state variables of the closed loop system to converge to the reference state with the help of the extended state observer by estimating the inertia uncertainty and external disturbance. The basic theory of the ADRC is introduced here. According to the mathematical model, the parameters of ADRC are designed. Also, simulation results show that ADRC controller has advantages of high precision and high disturbance rejection ability. A comparison between ADRC and PID is also presented, to show the effectiveness of the ADRC control strategy.

Index Terms

Tank gun, ADRC, SMC, uncertainties, disturbances

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I. INTRODUCTION

Tank gun control system is an important means to improve the efficiency of extensive artillery firepower and improve the surviving ability in the battlefield. An important feature of a military tank is the ability to track the moving targets. The gun controller is a very important part of tank fire control system and it has an important effect on its tactical and technical performance. The control of a tank turret and gun is a formidable problem, because accuracy, stability and speed of response are essential to mission accomplishment and survivability. Furthermore, the tank gun control system should not only have high tracking precision and good dynamic quality, but also strong robustness to overcome the parameters

Yuanqing Xia, Li Dai, Mengyin Fu and Chunming Wang are with the School of Automation, Beijing Institute of Technology, Beijing 100081, China. Email: xia_yuanqing@bit.edu.cn; daili1887@gmail.com; fumy@bit.edu.cn; chunming850313@gmail.com. Chunming Li is with the China North Vehicle Research Institute, P. O. Box; 969 11, Beijing, China. E-mail:chunming@noveri.com.cn

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