A Study on Robust H∞ Control of Visual Servo Systems Design

1999 Fiscal Year Final Research Report Summary

A Study on Robust H∞ Control of Visual Servo Systems Design

Research Project

Project/Area Number

10650427

Research Category

Grant-in-Aid for Scientific Research (C)

Allocation Type

Single-year Grants

Section

一般

Research Field

Control engineering

Research Institution

Kanazawa University

Principal Investigator

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Robust Control / Hイイ D2∞イエD2 Control / Nonlinear Control / Visual Servo / Robot Control

Research Abstract

Motion control of the mechanical systems with visual feedback is a basic ability of human being. Applications that have been proposed widely span manufacturing, car steering and so on. Moreover, the visual feedback control is an important discipline that lies at the intersection between nonlinear control theory and geometric framework of the mechanics and image processing. This research deals with the visual feedback control of robotic manipulators in nonlinear control theoretical aspects.
Firstly, the visual feedback control problem of the planar manipulator is considered as the stabilization problem with respect to the image feature position. The passivity of the manipulators and the rotational matrix property derive the visual feedback controller to guarantee the asymptotic stability in the Lyapunov sense.
Next, the principal contribution of this research is the design and analysis of the robust visual feedback control in the nonlinear Hイイ D2∞イエD2 setting. The Hイイ D2∞イエD2 visual feedback control achieves the internal stability and the Lイイ D22イエD2 gain disturbance attenuation property against the exogenous inputs, e.g., joint torque disturbances and unknown target motions. For the Lイイ D22イエD2 gain performance analysis, the storage function is directly constructed via the properties of the manipulator dynamics and the rotational matrix. Then, the robust visual feedback control against the parametric uncertainties of the manipulator model is proposed. The adaptive Hイイ D2∞イエD2 control technique provides the robust visual feedback control algorithm and the storage function for the Lイイ D22イエD2 gain performance analysis.

Research Products (14 results)

All Other

All Publications

[Publications] A. Kawabata: "Design of H_∞ Filter Based Robust Visual Servoing System"Control Engineering Practice. 6・2. 219-225 (1998)

[Publications] A. Maruyama: "Robust Visual Servo Control of Planar Manipulators under the Eye-in-Hand Configuration"Advanced Robotics. 12・1. 67-80 (1998)

[Publications] 丸山 章: "適応H_∞制御に基づくマニピュレータのロバスト視覚フィードバック制御"システム制御情報学会論文誌. 12・10. 579-585 (1999)

[Publications] A. Maruyama: "L_2 Gain Performance Analysis for Nonlinear Robust Visual Servo Control"Proc. of the 1998 American Control Conference. 2932-2936 (1998)

[Publications] A. Maruyama: "Adaptive H_∞ Control for Robust Visual Feedback Systems"Proc. of the 37th IEEE Conference on Decision and Control. 2283-2288 (1998)

[Publications] A. Maruyama: "Adaptive H_∞ Visual Feedback Control for Robotic Manipulator"Preprints of the 14th IFAC World Congress. E. 171-176 (1999)

[Publications] A. Maruyama: "Visual Feedback Control of Rigid Body Motion based on Dissipation Theoretical Approach"Proc. of the 38th IEEE Conference on Decision and Control. 4161-4166 (1999)

[Publications] A. Kawabata: "Design of Hイイ D2∞イエD2 Filter Based Robust Visual Servoing System"Control Engineering Practice. 6-2. 219-225 (1998)

[Publications] A. Maruyama: "Robust Visual Servo Control of Planar Manipulators under the Eye-in Hand Configuration"Advanced Robotics. 12-1. 67-80 (1998)

[Publications] A. Maruyama: "Robust Visual Feedback Control for Robotic Manipulator Based on Adaptive Hイイ D2∞イエD2 Control (in Japanese)"Trans. of the ISCIE. 12-10. 579-585 (1999)

[Publications] A. Maruyama: "Lイイ D22イエD2 Gain Performance Analysis for Nonlinear Robust Visual Servo Control"Proc. of the 1998 American Control Conference. 2932-2936 (1998)

[Publications] A. Maruyama: "Adaptive Hイイ D2∞イエD2 Control for Robust Visual Feedback Systems"Proc. of the 37th IEEE Conference on Decision and Control. 2283-2288 (1998)

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