

H-infinity Control of an Autonomous Mobile Robot

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ABSTRACT

This thesis proposes a robust trajectory-tracking solution for a two-wheeled mobile robot using H-infinity (minmax) control techniques in the presence of uncertainties that arise from neglecting some of the system dynamics (e.g., motor dynamics, sensor noise, and unmodeled vehicle dynamics). To compensate for the uncertainties in the dynamic model, we illustrate how the kinematics model of the system can be used to design a robust minmax controller and compare it with a P controller and a PI controller. The nonlinear and the linearized models are simulated in MATLAB and the results are presented to demonstrate the performance of the proposed controllers. The difference between the advanced control and the traditional control are explained. The second part of this thesis discusses the construction of the mobile robot system, which is an embedded system. It integrates hardware and software in its design and operation. Hardware includes the physical parts of the system and software includes the programs that determine the robot operation. A Microchip PIC16F877 microcontroller (programmed in assembly language) interfaces and controls the mobile robot devices.