

Abstract

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Lyapunov Stability Study for a Special Actuated Holonomic Wheeled Mobile Robot

This paper represents the Lyapunov stability study for the wheeled mobile robot C3P based on a non-linear and complex mathematical model. The candidate Lyapunov function used in this work is extracted from the robot kinetic energy equation, which includes the robot dynamics and kinematics models. Such function contains uncontrollable and unpredictable variables that yield to very complicated and long analytical analysis. Therefore the analysis is done -partanalytically and numerically in this work, which shows some stability uncertainty within the stable regions. The uncertain stability regions are considered as unstable regions generated by specified operating points. The effect of the control parameters values on overcoming such non-stable regions is presented for different operating points. Forced disturbances are applied on the robot in two different practical experiments. The practical results illustrate the stability study.