Real Time Trajectory Tracking Controller based on Lyapunov Function for Mobile Robot

Abstract

An important issue in robotics research is path tracking control where the robot is required to follow a certain path. The error between the desired path and the actual path is to converge to zero. This problem is more complicated when the robot dynamics is considered. This paper proposes a real time trajectory tracking control for a differential drive wheeled mobile robot (DDWMR) in obstacle-free environment. The robot is guided to follow certain reference path with a pre-calculated velocity profile. The controller design and analysis of the system stability are guaranteed using Lyapunov stability theory. The dynamic model of real DDWMR is derived and used in the LabVIEW simulation environment for testing the validity of designed controller. The obtained simulation results illustrate the success of the proposed controller. Also to Test the effectiveness of proposed controller, a comparison study with a widely used backstepping based controller is performed.


Index Terms

Computer Science  Control Systems

Keywords
Trajectory tracking, nonholonomic robots, dynamic modeling, differential drive, Lyapunov stability, mobile robot