Lyapunov-Based Tracking Control for Nonholonomic Wheeled Mobile Robot

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Abstract : This paper presents a tracking control strategy based on Lyapunov approach for nonholonomic wheeled mobile robot. This control strategy consists of two levels. First, a kinematic controller is developed to adjust the right and left wheel velocities. Using this velocity control law, the stability of the tracking error is guaranteed using Lyapunov approach. This kinematic controller cannot be generated directly by the motors. To overcome this problem, the second level of the controllers, dynamic control, is designed. This dynamic control law is developed based on Lyapunov theory in order to track the desired trajectories of the mobile robot. The stability of the tracking error is proved using Lupunov and Barbalat approaches. Simulation results on a nonholonomic wheeled mobile robot are given to demonstrate the feasibility and effectiveness of the presented approach.