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OBSTACLE AVOIDANCE AND MOTION CONTROL OF A TWO WHEELED MOBILE ROBOT USING SVR TECHNIQUE

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Abstract. *Support vector regression (SVR) based obstacle avoidance and control of a two wheeled mobile robot are considered in this paper. Under the observation information with uncertainties, a method based on the SVR technique is proposed for providing reliable control information in order to control the mobile robot by using a potential function, where the potential function is based on Lyapunov function and the flat plane is constructed to avoid the local minima for compensating the Lyapunov function. As a result, the motion of the mobile robot can be controlled accurately and smoothly. The proposed scheme is evaluated by demonstrating numerical simulation results.*
Keywords: Lyapunov function, Local minima, Support vector regression, Mobile robot, Obstacle

1. **Introduction.** A two wheeled mobile robot has been used extensively in many fields, such as transportation, assembly etc. The two wheeled mobile robot system is an underactuated system, namely, it has two inputs (translational velocity and angular velocity) and three outputs (center positions x, y and heading angle of the mobile robot on two dimensional Cartesian workspace) [1]. In general, motion planning and controller design of the mobile robot are being given much attention in recent literatures. For the mobile robot navigation, the potential field method is popular, because it can unify path planning, trajectory and control into one problem. The basic concept of the potential field method is to fill the robot's workspace with an artificial potential field in which the robot is attracted to its target position and is repulsed away from the obstacles. The approaches of making artificial potential field are presented in [2, 5]. In the presence of obstacles, local minima appear in the potential field. The mobile robot may be trapped in one of the local minima. In order to solve this problem, feedback control of the mobile robot which considers the obstacles by using potential function under the known observation information is proposed in [3, 4]. However, in real application the observation information is with uncertain noises, as a result, the observation information is uncertain one. The above case imposes a severe restriction on the existed methods.

In this paper, a method to drive the mobile robot to the target avoiding the obstacles under the uncertain observation information is proposed based on the potential field method. It can make the mobile robot avoid running into the local minima by constructing the flat plane around the local minima territory. Concerning the effect of the uncertain observation information from the camera, the SVR technique is used to eliminate the uncertainty of the observation information to obtain the accurate positions of the mobile robot, where the linear estimation algorithm is inconvenient for the robot system