MOBILE ROBOTS ADAPTIVE CONTROL USING NEURAL NETWORKS

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Abstract: The paper proposes a feed-forward control strategy for mobile robot control that accounts for a non-linear model of the vehicle with interaction between inputs and outputs. It is possible to include specific model uncertainties in the dynamic model of the mobile robot in order to see how the control problem should be addressed taking into consideration the complete dynamic mobile robot model. By means of a neural network feed-forward controller a real non-linear mathematical model of the vehicle can be taken into consideration. The classical velocity control strategy can be extended using artificial neural networks in order to compensate for the modelling uncertainties. It is possible to develop an intelligent strategy for mobile robot control.

Keywords: intelligent control systems, mobile robots, autonomous navigation, artificial neural networks.

REFERENCES

d'Andrea Novel B., Campion G., Bastin G., (1995), Control of nonholonomic wheeled mobile robots by state feedback linearization, *Int. Journal of Robotics Research*, **14(6)**, pp:543-559

Betourné A., (1995), *Etude de robots mobiles omnidirectionnels: modelisation et simulation*. These de doctorat, Universite Motpellier

Bloch A., Reyhanoglu M., (1992), Control and stabilization of nonholonomic dynamic systems, In *IEEE Trans. on Automatic Control*, **37(11)**, pp. 1746-1757

Campion G., d'Andrea-Novel B., Bastin G., (1991), Modelling and state feedback control of nonholonomic mechanical systems, *Proceedings of the 1991 IEEE Conference on Decision and Control,* December 1991

Campion G., Bastin G., d'Andrea-Novel B., (1996), Structural properties and classification of kinematic and dynamic models of wheeled mobile robots, *IEEE Trans. on Robotics and Automation*, **12(1)**, pp. 47-61

Kanayama Y., Kimura Y., Miyazaki F., (1990), A stable tracking control method for an autonomous mobile robot, *Proc. IEEE Int. Conf. Robot. Automat*., pp: 384-389

Latombe J.-C., (1991), *Robot Motion Planning, Kluwer*, Boston

Mazo M., Rodriguez F.J., et.al, (1995), Electronic Control of a Wheelchair guided by voice commands, *Control Eng. Practice*, **Vol. 3, No. 5**, pp: 665-674

Sarkar N., Yun X., Kumar V., (1994), Control of mechanical systems with rolling constraints: application to dynamic control of mobile robots, *Int. Journal of Robotics Research*, **Vol. 13, No. 1**, pp: 55-69

Tunstel E.W. Jr., Jamshindi M., (1998), *Intelligent Control and Evolution of Mobile Robot Behavior*, NASA Center for Autonomous Control Engineering