

Minimum-Time Control of Mobile Robots: Universal Modeling and Algorithms



In this book, the problem to find suitable control actions to minimize the total traveling time of kinematic models of mobile robots is considered. This subject is a long open problem since the mixed initial-terminal conditions had posed a very hard obstacle to find a closed-form solution for this problem. This book consider a universal equivalent model of the kinematic models of wheeled mobile robots which up to the authors knowledge has never been reported in the literature. Two important aspects appears using these universal kinematic models: an infinite sequence of switching of the bang-bang controls in a finite interval of time (called in this book ISP) and a dual of the Hamilton-Jacobi-Bellman for discrete systems. Up to the authors knowledge, these two contributions has been never reported in the literature. Moreover, the possibility of non bang-bang control using Fourier series in the case of Reeds-Shepp car is also presented. This book should be useful for graduate engineers, physicists and mathematicians as well as researchers exploring new concepts and new possibilities both for modeling and optimal control of mobile robots.

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