Probabilistic Techniques for Mobile Robot Navigation

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In recent years, probabilistic techniques have enabled novel and innovative solutions to some of the most important problems in mobile robotics. Major challenges in the context of probabilistic algorithms for mobile robot navigation lie in the questions of how to deal with highly complex state estimation problems and how to control the robot so that it efficiently carries out its task. In this talk I will discuss both aspects and present an efficient probabilistic approach to solve the simultaneous mapping and localization problem for mobile robots. I will also describe how this approach can be combined with an exploration strategy that simultaneously takes into account the uncertainty in the pose of the robot and in the map. For all algorithms I will present experimental results, which have been obtained with mobile robots in real-world environments as well as in simulation. I will conclude the presentation with a discussion of open issues and potential directions for future research.