Meeting: 1001, Evanston, Illinois, SS 15A, Special Session on Mathematical Problems in Robotics

1001-68-364 **Steven M. LaValle*** (lavalle@uiuc.edu), University of Illinois, Deptartment of Computer Science, 201 N. Goodwin Ave., Urbana, IL 61801, and **Benjamin Tovar**, **Luis Guilamo** and **Rafael Murrieta**. *Optimal Robot Navigation Without Measuring Distances.*

Imagine designing a mobile robot that accomplishes tasks such as finding objects located in its environment, playing games of hide-and-seek with other robots, or simply trying to reach a specified location optimally. Traditional approaches involve using expensive sensors to make precise distance measurements to obstacles in the environment. Using this information, the robot can construct an accurate representation of the environment and also determine its precise position and orientation within the representation. In the approach described in this talk, it is assumed that the robot has simpler sensors. It only knows the ordering of discontinuities in the distance function, and can issue motion commands that move towards any one of these discontinuities. We show that the robot can perform optimal navigation under this sensing model, even though it cannot directly measure distances. We developed a navigation algorithm that maintains Gap Navigation Trees (GNTs), which provide a representation to control the robot. The robot can also accomplish tasks such as hide-and-seek, and optimally locating an object. The model has been validated on a real mobile robot. Algorithms based on the GNTs have been implemented, and several simulation results will be shown. (Received August 31, 2004)