# The Use of Spatial Graphs for Optimal Obstacle Placement: A Study on Impact of the Clutter Spatial Distribution

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Consider a situation where the goal is to place true obstacles in an environment cluttered with false obstacles in order to maximize the total traversal length of a navigating agent (NAVA). Prior to the traversal, NAVA is given location information and probabilistic estimates of each disk-shaped regions being a true obstacle. The NAVA can disambiguate a disk's status only when situated on its boundary. There exists an obstacle placing agent (OPA) that locates obstacles prior to NAVA's traversal. The goal of OPA is to place true obstacles in between the clutter in such a way that NAVA's traversal length is maximized in a game-theoretic sense. We call this the optimal obstacle placement with disambiguations problem. A particular variant we consider is the one where OPA knows the clutter spatial distribution type, but not the exact locations of clutter disks. In this study, we show how such a continuous obstacle field can be fruitfully discretized using spatial graphs. We discuss the impact of different clutter spatial distribution types on the optimal obstacle placement scheme including homogeneous and inhomogeneous Poisson, Matern, Thomas, Strauss and hardcore spatial distributions. Our methodology is based on utilization of repeated measures analysis of variance for analysis of traversal lengths for various obstacle placing schemes for identification of the optimal combination.

Keywords: spatial graph, repeated measures analysis of variance, spatial point process, stochastic optimization