# Obstacle Collision Detection Using Best Ellipsoid Fit

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- Journal paper: obst-coll-det.pdf

- Technical report: dist_comp.pdf

- Conference paper: dist-comp-conf.pdf

This paper describes a method for estimating the distance between a robot and its surrounding environment using best ellipsoid fit. The method consists of the following two stages. First we approximate the detailed geometry of the robot and its environment by minimum-volume enclosing ellipsoids. The computation of these ellipsoids is a convex optimization problem, for which efficient algorithms are known. Then we compute a conservative distance estimate using an important but little known formula for the distance of a point from and n-dimensional ellipse. The computation of the distance estimate (and its gradient vector) is shown to be an eigenvalue problem, whose solution can be rapidly found using standard techniques. We also present an incremental version of the distance computation, which takes place along a continuous trajectory taken by the robot. We have implemented the proposed approach and present some preliminary results.