Robust Task Wrench Resistance

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***Abstract*— Robots should grasp things. How should they do that? Force closure? No. We proposed a robust task-based metric.**

I. Introduction

New grasp quality metric. Works pretty well.

II. Related work

In practice a robot may only need to resist a set of task-specific wrenches on an object, such as gravity for lifting, rather than attempting to resist all possible wrenches, as has been observed for human grasps [**?**], [**?**]. Li and Sastry [**?**] modeled task-specific wrenches with an ellipsoid and proposed a grasp metric based on the largest radius of the task ellipsoid such that the grasp can resist any wrench in the task ellipsoid with unit-magnitude finger forces. However, not all tasks will have wrench distributions well-modeled by an ellipsoid, and furthermore the ratios of expected forces and torques needed to compute a task ellipsoid may be unknown. Thus much past research has modeled the task ellipsoid as a unit ball [**?**], [**?**]. Han et al. [**?**] showed that the question of whether or not a multifinger hand can exert a given force on an object can be reduced to a linear matrix inequality problem. Haschke et al. [**?**] defined a task-specific grasp metric that can be computed by convex optimization when the task wrenches can be described as a cone or a polytope. Kruger and van der Stappen [**?**] described two grasp metrics that measure the sum and maximum of finger forces required to exert a given wrench on an object, and later extended the notion to local force closure grasps [**?**], which can resist wrenches in a neighborhood if a desired target wrench. .... Recent research has focused on data-driven prediction the probability of grasp success for a specific task from features describing the grasp and object, for example using Bayesian Networks [**?**]...

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