מכון ויצמן למדע

THE WEIZMANN INSTITUTE OF SCIENCE

FACULTY OF MATHEMATICS AND COMPUTER SCIENCE

Vision and Robotics Seminar

Room 1 ,Ziskind Building
on Thursday, Jan 25, 2018
at 12:15

Hallel Bunis
Technion

Caging Polygonal Objects Using Minimalistic Three-Finger Hands

Abstract:

Multi-finger caging offers a robust approach to object grasping. To securely grasp an object, the fingers are first placed in caging regions surrounding a desired immobilizing grasp. This prevents the object from escaping the hand, and allows for great position uncertainty of the fingers relative to the object. The hand is then closed until the desired immobilizing grasp is reached.

While efficient computation of two-finger caging grasps for polygonal objects is well developed, the computation of three-finger caging grasps has remained a challenging open problem. We will discuss the caging of polygonal objects using three-finger hands that maintain similar triangle finger formations during the grasping process. While the configuration space of such hands is four dimensional, their contact space which represents all two and three finger contacts along the grasped object's boundary forms a two-dimensional stratified manifold.

We will present a caging graph that can be constructed in the hand's relatively simple contact space. Starting from a desired immobilizing grasp of the object by a specific triangular finger formation, the caging graph is searched for the largest formation scale value that ensures a three-finger cage about the object. This value determines the caging regions, and if the formation scale is kept below this value, any finger placement within the caging regions will guarantee a robust object grasping.