OBJECT MANIPULATION BY A PAIR OF ROBOT FINGERS FROM THE BIO-MIMETIC VIEWPOINT

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This thesis consists of four parts all of which are concerned with realizing stable grasping and orientation control of an object by a pair of multi-DOF robot fingers from the bio-mimetic viewpoint. The first part proposes a guideline for tuning sensory feedback gains used in realizing stable grasping and orientation control of the object by taking into account the well-known force/velocity characteristics of human muscle in muscle physiology. The second part shows that ill-posedness of inverse kinematics can be resolved by using a sensory feedback method and also surplus DOF enhances dexterity of pinching tasks by accelerating considerably the speed of convergence. The third part shows that dexterity is enhanced remarkably by using the proposed method based on mimicking the functional role of each human finger joint. Finally, the fourth part presents the experimental results on the methods proposed in the first and third parts by building and using actual robot fingers.