

Design of intelligent grippers for dexterous manipulation controlled by a simple haptic interface.

Context of the work:

The realization of an artificial hand is a more and more important request on the part of neuroscientists but also from industry. Especially manufacturers in the field of production of goods needed to produce sometimes harsh environmental conditions ((temperature, risk of crushing) to handle delicate parts.

In this project, we need to develop an intelligent gripper (or an artificial hand) capable of dexterous manipulation, handling flexible materials and/or movable objects. This topic is under study for many years in robotics.

Such tasks often require multiple points of contact to facilitate the capture and handling, to improve adhesion and to compensate the deformations of soft objects. It is therefore preferable to use a gripper or a hand with a large number of DOF and manage the kinematic redundancy with the control.

Precedent works in the same area at the LCFC:

Work is currently underway in the laboratory on the design of a prosthetic hand with five fingers which is able to manipulate objects of different shapes. This hand is intended to handle compact objects with weight of about one kilogram. From the analysis of the problem of handling with dexterous hand, a design methodology was developed. Different kinematic solutions and technology to achieve the transmission of the movement were studied. A prototype is being made.

In addition, the implementation of parts of the hand can be performed in the laboratory using a rapid prototyping machine (3D printer).

Description:

It proposes to develop methodological tools to infer the kinematics of a gripper or a hand that provide the greatest possible advantage for dexterous hand manipulation of movable objects or flexible materials. From all the movements and tasks that are relevant from the viewpoint of industrial applications, simulation tools developed will define the relevant kinematics, the number of bodies forming the gripper or the artificial hand and to select the transmission best suited among the actuators and components of the gripper.

A prototype can be quickly achieved with the tools of the laboratory.

The control proposed to help realize the movement is transparent to the user. Thus, a haptic interface or a glove equipped with sensors is available.

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Application:

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