システム情報工学研究科修士論文概要

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論文題目

Shooting Manipulation Inspired by Chameleon
(カメレオンに着想を得たシューティングマニピュレーション)

論文概要

In this paper, we propose chameleon-like shooting manipulation systems for manipulating a distant object in an instant. The proposed systems mechanistically act on a remote target by constraining an end-effector catapulted by an impulse force such as impulsive air flow through a flexible string. A basic prototype which constrains the end-effector by an elastic cantilever through the string has high basic performances like high reaching accuracy, high motion quickness, resting motion at the target point and so on. This prototype with a magnetic end-effector realizes a quick capturing of a falling magnetic object 0.7[m] away within 0.3[s] with a high success rate of 92 percent. In addition, various constraining ways for the end-effector produce variety in the end-effector's motion. For example, by controlling spring-back timing of the cantilever we can adjust the resting time at the target point, and the rotational inertia constraint allows us to achieve blind-spot manipulation not only in a vertical direction but also in a lateral one. Simulation results based on 2-D model of the system clarify the robustness of the accuracy in trajectory for variation of some mechanical parameters. We also propose an artificial suction tongue inspired by a biological one of chameleons. The prototype of the suction tongue has large payload of 3.5[kg], despite its diameter is of 0.040[m] and its mass is of about 0.01[kg]. It can sticks to the surface of targets in a very short contact time of 0.005[s] without any bounce. Experimental results using the shooting manipulation system with the suction tongue show that we can quickly grasp and pull back non-magnetic objects at a remote site.

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