



ADAPTABLE SURFACES FOR THE GRASPING OF COMPLEX OBJECTS

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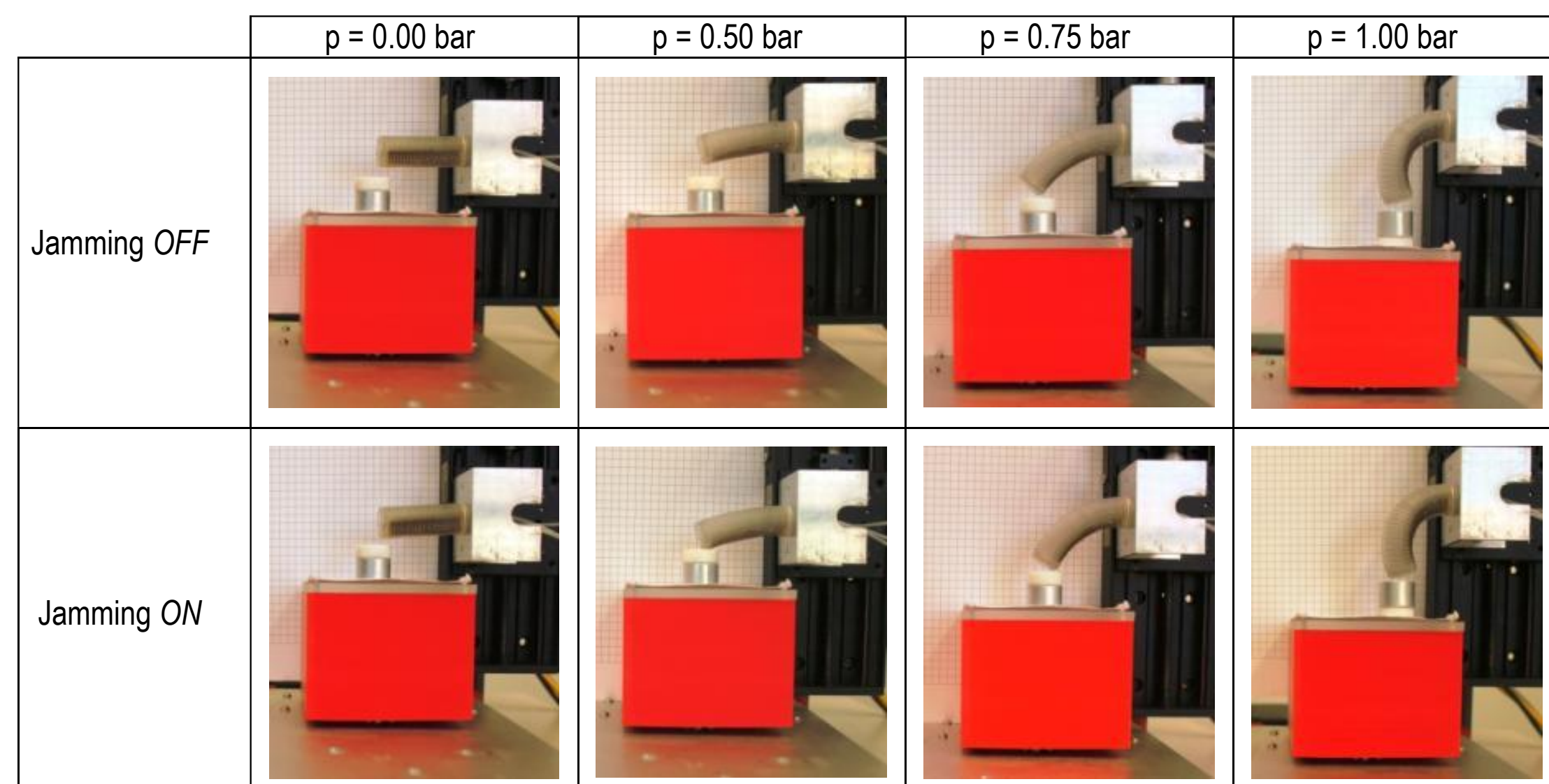
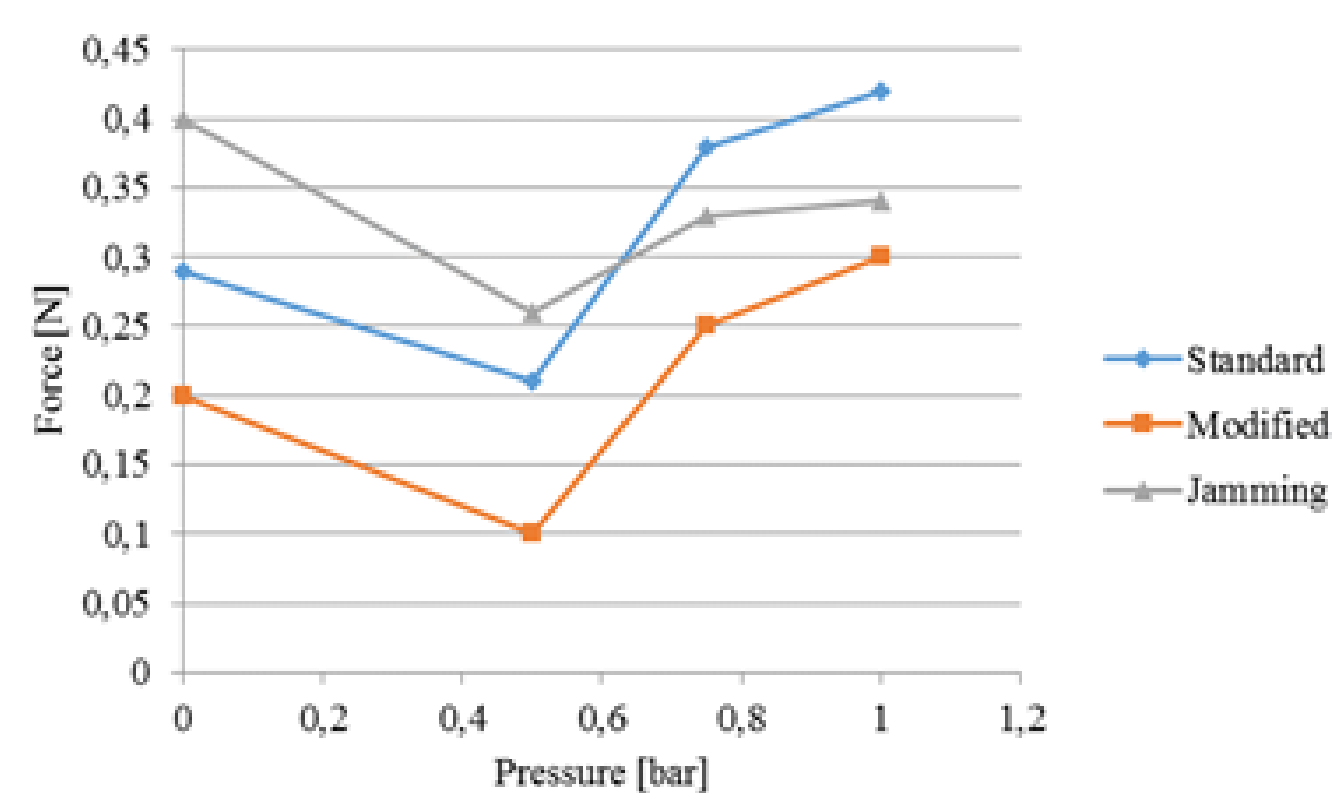
Overview

Second year research activities are the prosecution of themes studied during the first year of the PhD. In addition to the activities described more in detail in the poster, it is important to present other activities connected to the ones presented:

- *gripping principles*: research on existing gripping principles and application to different research fields. Study of innovative grippers. Other activities concerning this point are the creation of databases, the study of systems for grasping and study of adaptable surfaces
- *design for grasping*: together with a group of engineers from the management discipline area, the candidate developed the basis for the creation of an expert system
- *other activities*: support to activities of Centro Piaggio and DICI; monitoring of students; translation of terms for the CIRP Dictionary.

Pneumatic actuators with jamming technology

The goal of this activity was to develop a pneumatic gripper, considered as part of a mechanical hand, considering also the implementation of. The jamming technology can be exploited to increase the stiffness of the pneumatic gripper when required. The experiment pointed out at characterizing the behavior of the finger with and without the jamming system at four different actuation pressure. The actuator is composed two active chambers responsible for the bending and one jamming chamber. Both the pictures of the experimental layout and the graph with numerical values at a stroke of 5mm are reported below.

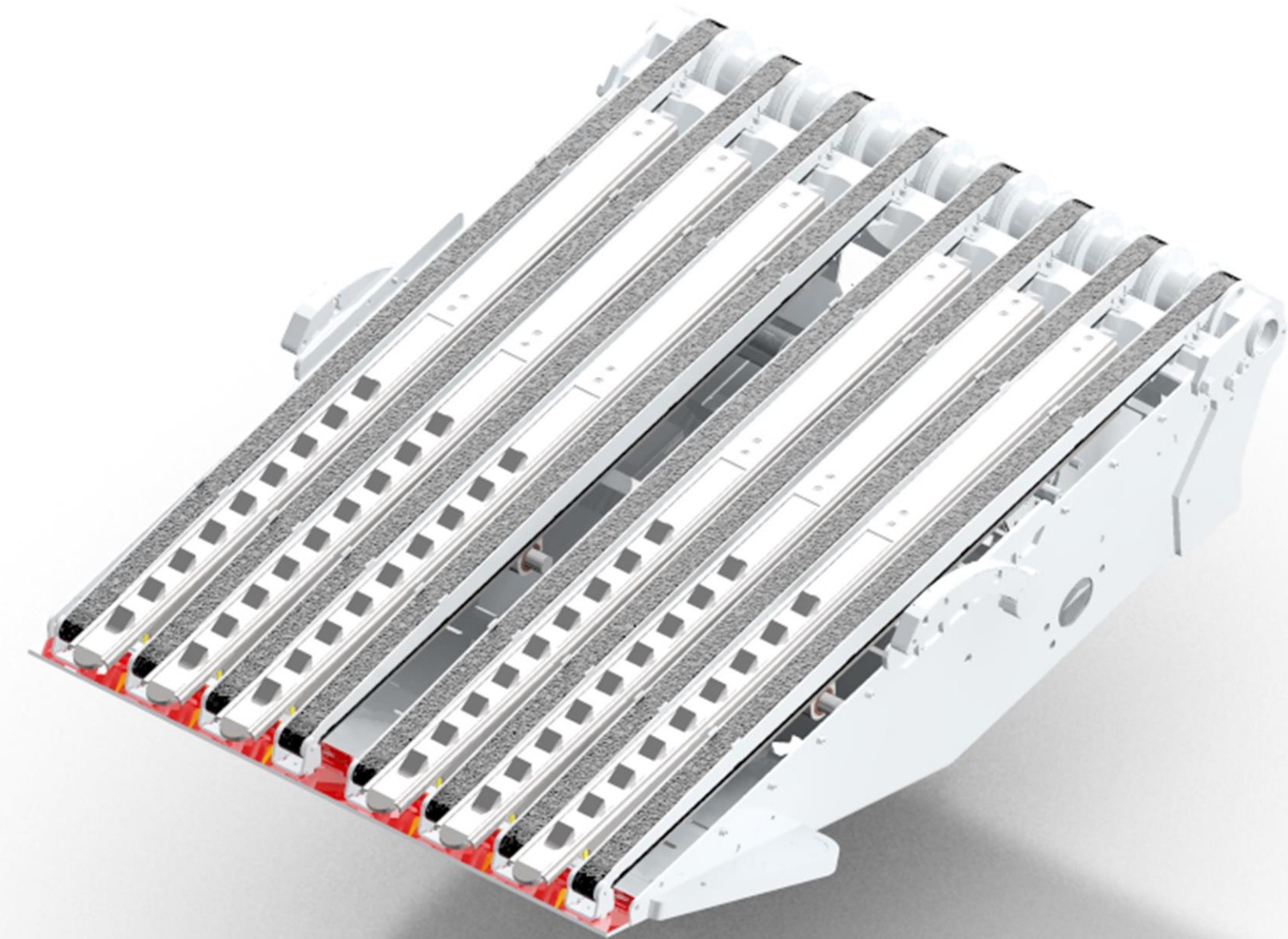


RobLog Project

Most of the activities of the second year of PhD focused on the development of a gripper to be used in the 4th Milestone of the RobLog Project. The goal of this activity is to design a gripper which is integrated with the final part of the Empticon for the grasping of light coffee sacks. The weight of a single light coffee sack is 10-15 kg, and the exterior material is jute.

The final output is a gripper named *shovel gripper*, which is based on the alternate motion of plates, having a specific triangular profile, under the coffee sack. The profile allows the relative motion between gripper and sack while moving toward the coffee sack, while the sack is grasped when the plates move backward.

The construction of the gripper is still on-going.



Future Works

During the last period of the second year, the candidate was involved in activities concerning the study of rapid prototyping techniques. This subject will be studied during the third year of PhD. The most interesting points for the future activities are:

- analysis of innovative rapid prototyping techniques and application to new fields of research and industry;
- creation of molds through the use of rapid prototyping techniques;
- feasibility analysis of biomedical apparatus directly from rapid prototyping machining.

The candidate will continue some supporting the RobLog team for what concerns the Industrial Scenario.

Notes

The candidate gratefully thanks Prof. M. Santochi and Rotary Club Pisa for the opportunity they gave him of participating to the Vocational Training Exchange. During the visiting period, the candidate observed and studied technical universities and research centers of Oklahoma.

Publications

1. D. Gabelloni, J. Tilli, G. Fantoni. *Concept design of new grippers using abstraction and analogy*. JoEM, Volume 227 Issue 10, October 2013
2. G. Fantoni, S. Capiferri, J. Tilli. *Method for supporting the selection of robot grippers*. Submitted to CIRP 24th Design Conference
3. J. Tilli, A. Brando, G. Fantoni. *Gripping device for heavy and deformable materials handling: concept, design, selection and test*. Submitted to CIRP 24th Design Conference
4. M. Rohde, G. Fantoni, J. Tilli, R. Mortenses Ernits. *A challenge for automation in logistics: gripping systems for automatically unloading of coffee sacks*. Submitted to the 4th International Conference on Dynamics in Logistics
5. J. Tilli, G. Fantoni, S. Gorini, A. Serio. *Pneumatic finger based on jamming technology*. To be submitted