Logistic device

INVENTORS: Garabini Manolo
Caporale Danilo
Settimi Alessandro
Pallottino Lucia
Bicchi Antonio
Gabelleri Chiara
Mannucci Anna
Grioli Giorgio
Catalano Manuel Giuseppe
Barbarossa Manuel

PATENT STATUS: PENDING

PRIORITY NUMBER: 102019000014328

PRIORITY DATE: 07/08/2019

PUBLISHED AS: WO

Invention

The invention concerns **a highly adaptive and flexible automatic system for the removal of the protective film used for the packaging of pallets**. The operation, in fact, is typically carried out by operators equipped with cutting tools or automated systems designed specifically for the product/ pallet and not suitable for the use of pallets of different types as those required in the intra-logistics supply chain. The machines currently on the market include completely the pallet and are characterized by a large footprint on the ground, they are also suitable to operate on pallets of particular shape, therefore not equipped with flexibility to operate on pallets of different types.

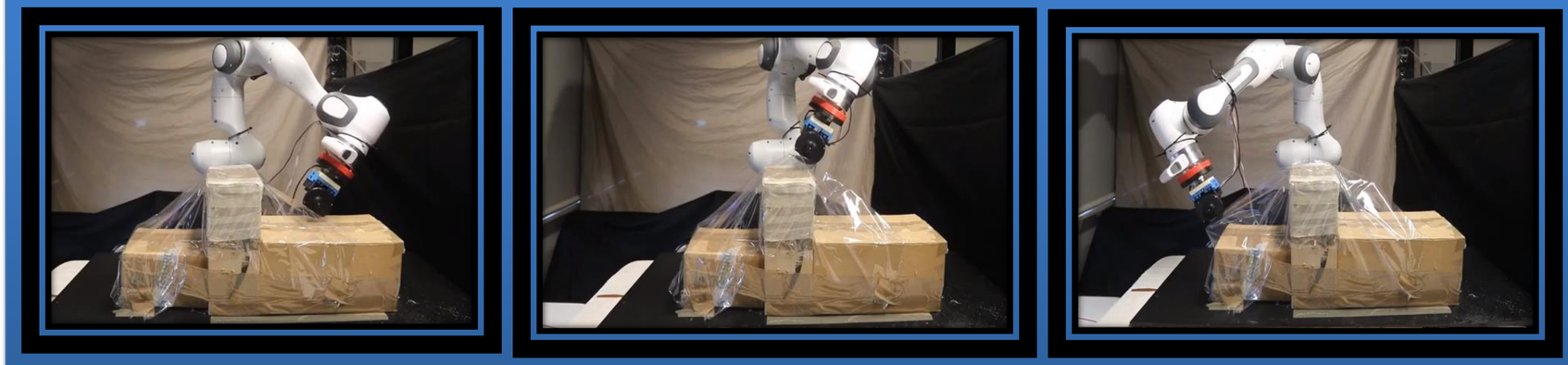
The proposed device consists of a robotic manipulator with 7 degrees of freedom equipped with an end-effector equipped with a blade to cut the protective film.

The device is **flexible** because it allows to cut protective films on pallets of very different nature, shape and size without modifications of the equipment, eliminating the conversion times. The device consists of a **robotic manipulator of medium-small size and therefore with a reduced footprint on the ground**, also considering a possible mounting on a mobile basis to increase the working space.

The device can be integrated with a second manipulator equipped with an end-effector that includes a **gripper to take and manipulate the protective film**.

IIT – ITALIAN INSTITUTE OF TECHNOLOGY is also a patent applicant.

Drawings & pictures



Industrial applications

The area of use for the device is the intra-logistics that consists of operations to be carried out to handle the packages inside a warehouse usually to compose pallets multi-product. Preliminary operation necessary for picking objects is the one in which the pallet is freed from a protective film (usually plastic). A **prototype** was developed which was experimentally validated in laboratory. Currently there are no devices on the market able to perform this type of operations with as much flexibility and reduced footprint. The main applications of the proposed technology concern the field of industrial and mechanical automation for transport for all those **industries that in the 4.0** paradigm want to introduce process innovations, in order to increase production by ensuring the integrity of the product on the pallet and the safety for the human operator who can be found working in the vicinity of the cutting device.

Possible developments

A laboratory prototype has been developed which has been tested both in case the film wraps the pallet only laterally and in case the wrapping of the film covers the pallet both laterally and on the upper surface (which, however, is not completely covered) showing a **success rate** of 100% and 76.92% respectively. The flexibility of the system has been demonstrated, relative to its ability to free pallets composed of objects of various shape and size independently. Algorithms have been developed and implemented to plan the impedance and Cartesian trajectory for the execution of the cutting operation, **without damaging the goods** in conditions of inaccurate information on the position of the film and the pallet. The robotic device has been integrated with a **vision system** able to recognize with a certain degree of precision the position of the pallet from which to remove the film.

A video demonstration of the technology is available at the following LINK.

For more information:

Tech Transfer Office of University of Pisa

Headquarters: Lungarno Pacinotti 43/44, Pisa (PI) 56126

Web site: www.unipi.it/index.php/trasferimento

E-mail: valorizzazionericerca@unipi.it

For more information:

Ufficio Regionale di Trasferimento Tecnologico

Headquarters: Via Luigi Carlo Farini, 8 50121 Firenze (FI)

E-mail: urtt@regione.toscana.it

UNIVERSITÀ DI PISA

REGIONE TOSCANA

urtt Ufficio Regionale di Trasferimento Tecnologico