Intelligent Industrial Robots: perception and planning in human-robot collaboration

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**Context of the research activity**

The research activity will be developed in the context of the DrapeBot European project ([https://www.drapebot.eu/](https://www.drapebot.eu/)), that aims to develop a technology based on collaborative robots for draping large parts in carbon and glass fiber fabric. This collaboration requires that the robot and the human are handling the fabric at the same time, which creates several challenges:

- When handling a large patch of material, the robot and the human are loosely coupled through a quite sensitive piece of fabric, which requires a complex interaction;
- Efficiency of the process is important, which will require predictive capabilities of the robot and hard real-time behaviour.

The University of Padova is the partner in charge of developing the perception system required to ensure an efficient and effective collaboration between robot and human(s).

**Objectives**

The main goals of the perception system that will be developed during the PhD are: i) to detect the presence of operators in the robot’s working area; ii) to analyse the body posture of the operator; iii) to recognize the operators’ body parts, to understand the human actions. The PhD candidate shall develop an integrated approach to body detection and parsing that enables a reliable understanding of the actions that the human is performing. The system shall be able to face the working conditions of a typical human-robot interaction setup, where the human is often occluded. Moreover, a study dedicated to gestures shall be also included.

The sensory information will be mainly acquired by means of an RGB-D camera network that can observe the working area under multiple perspectives, thus overcoming occlusions and providing multiple measurements. The research activity shall take advantage of the multi-camera system.

**Skills and competencies for the development of the activity**

The ideal candidate shall have a degree in computer engineering, a strong knowledge in computer vision, with a background on human perception and/or human parsing. Prior experience on RGB-D camera networks would also be desirable. The candidate should also have very strong programming skills in C++ or Python.