PRESS RELEASE

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For immediate release

Rossini's recent advances in the cognitive layer for collaborative robot control

The *Rossini* project aims to increase industrial efficiency by making the most of the collaboration between robot and human operator, improving the synergy between them. In modern collaborative robotic cells, indeed, a human operator and a robot share the workspace in order to execute a common job, consisting of a set of tasks. A proper allocation and scheduling of the tasks for the human and for the robot is crucial for achieving an efficient human-robot collaboration.

Project partner UNIMORE focuses on the "cognitive layer" of the project, which receives data from the "perception layer" and generates an optimal schedule for the human operator and the robot. Moreover, in order to deal with the dynamic and unpredictable behaviour of the human and for allowing the human and the robot to negotiate about the tasks to be executed, the "cognitive layer" adapts online the schedule. However, continuously and automatically changing the order of the tasks assigned to the human can lead to confusion and poor efficiency of the operator. Thus, the "cognitive layer" reschedules online only the list of tasks assigned to the robot. The list of tasks assigned to the human changes only when the human decides to execute a task assigned to the robot or when the robot cannot execute a task and asks for the help of the human.

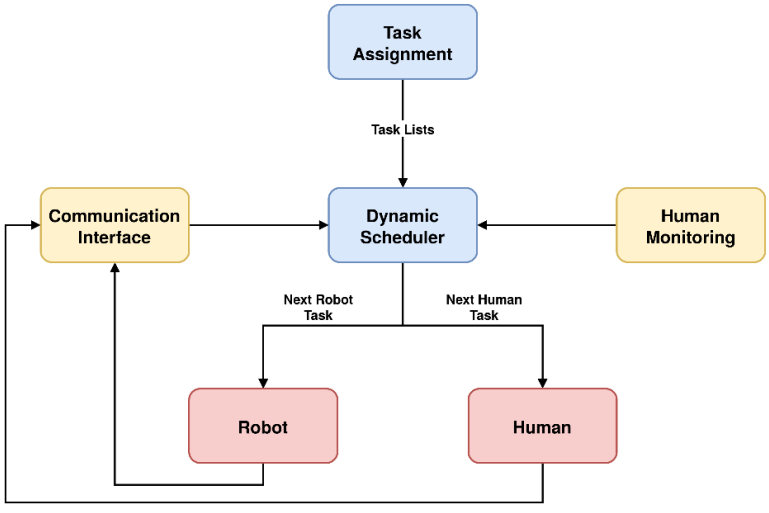

Figure 1 / The overall architecture. The blue blocks represent the two layers. The yellow blocks, instead, symbolize the strategies implemented to provide richer information to the Dynamic Scheduler. The red blocks represent the two agents.

The proposed architecture is shown in *Figure 1*, where two main layers can be distinguished:

- **Task Assignment**. It is responsible for generating initial nominal schedules for the robot and the human, based on the maximum parallelism criterion. This first layer optimally solves a multi-objective *Mixed Integer Linear Programming* (MIP) problem considering nominal execution times of tasks.
- **Dynamic Scheduler**. It is responsible for scheduling the tasks, considering the real execution time and the requests coming from the human and from the robot.

The Dynamic Scheduler aims at creating an effective and intuitive cooperation in a human-robot collaboration scenario. To achieve that, it firstly exploits a **Human Monitoring** algorithm, in order to estimate the real execution time of the human operator. If the human operator is late, the Dynamic Scheduler reschedules a new task for the robot based on the more time required by the human operator. Subsequently, it investigates a **Communication Interface** in order to understand if both the human operator and the robot are taking decisions about their activities. Based on this communication, the Dynamic Scheduler improves the schedule, making the collaboration more natural.

About the project

ROSSINI is a project funded by Horizon2020 EU's research and innovation programme, with an aim to design, develop and demonstrate a modular and scalable platform for the integration of human-centred robotic technologies in industrial production environments.

Project title: RObot enhanced SenSing, INtelligence and actuation to Improve job quality in manufacturing

Project ID: 818087

Start Date: 01/10/2018

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Project Consortium:

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For additional information please contact
Project Coordinator: DATALOGIC
Matteo Zanaroli matteo.zanaroli@datalogic.com