Thesis proposal in collaboration with COMAU

Master degree in Computer Engineering
Master degree in Mechatronic Engineering
Master degree in Electronic Engineering - curriculum in Electronics for Industrial Applications

Proposal 1: Advanced Motion Planning for Welding Processes

Thesis Objective:

- The primary goal of the thesis is to generate collision-free motion plans for welding applications.
- This involves incorporating welding process parameters during the motion generation stage to compute a collision/singularity-free trajectory that satisfies process constraints.

Motion Planning Functionality:

- The thesis focuses on the motion planning stage, which is crucial for ensuring the safe and efficient movement of the welding tool.
- The algorithm will consider specific parameters related to the welding process. These could include factors such as welding speed, welding gun inclination, and other relevant parameters that influence the welding operation.

Singularity-Free Trajectory:

- The algorithm's objective is to compute a trajectory that is free from singularities. In robotics, singularities are configurations where the robot loses one or more degrees of freedom, potentially leading to erratic behavior or limitations in motion.
- By ensuring a singularity-free trajectory, the welding process can be carried out smoothly and accurately without encountering issues related to the robot's movement limitations.

Collision-Free Welding Trajectory:

- The generated trajectory will be designed to avoid collisions with obstacles or other elements in the environment.
- Collision-free trajectories are crucial in unstructured environments where the robot may encounter unexpected obstacles. Avoiding collisions ensures both the safety of the robotic system and the quality of the welding process.

One-Step Procedure for Unstructured Environments:

- The main benefit highlighted is the development of a one-step procedure for generating welding trajectories in unstructured environments.
- This implies that the algorithm, by considering welding process parameters and ensuring collision and singularity-free trajectories, simplifies the motion planning process. The one-step procedure enhances efficiency and ease of use in generating welding trajectories, particularly in environments where the structure is not well-defined.

In summary, the thesis aims to develop an algorithm for generating collision-free motion plans for welding. By incorporating welding process parameters and computing singularity-free trajectories, the algorithm provides a one-step procedure for efficiently generating welding trajectories, especially in unstructured environments.

Requirements:

Direct and inverse kinematics, motion planning, basic control theory, C/C++, Python, ROS, MoveIt!

Duration:

6-9 month

For further info refer to:

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To apply:

Send a SINGLE email to marina.indri@polito.it and enrico.civitelli@comau.com, with a complete CV in attachment (including the full list of exams with scores and all the information about competences, experiences and software skills useful for the thesis)