ABSTRACT

Design of a gripping system in a Human Robot Collaborative assembly scenario

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This thesis deals with the design of a gripping system able to support assembly operations in human robot collaborative environments. The study focuses on designing a gripping tool to enable the manipulation of heavy parts by high payload industrial robots. The latter, complying to the safety requirements indicated by the relevant EU legislations, can cooperate with human operators in a fenceless environment to complete a set of assembly tasks. The most essential criteria for choosing the appropriate gripping tools are the weight of the working piece, its geometry as well as the usability by the selected high payload collaborative robots. Upon selection of the gripping tool, customized gripping fingers have been designed in order to comply with the geometrical requirements of automotive parts. The system has been designed and validated in a use case inspired from the automotive industry involving the assembly of the gearbox to the motor. Considering the high weight of the parts, reaching up to 130 Kgs, a structural analysis on the gripper's fingers has been performed in order to select the optimal solution, considering fingers geometry and material. Because of high yield strength and low displacement, steel-37 has been selected. The final solution has been simulated in a 3D simulation environment in order to validate the applicability and efficiency of the designed gripping system in the selected use case.

Keywords:

Gripping system, human - robot collaboration, automotive assembly line, flexibility of tools, structural analysis