

Proposed Virtual Commissioning of Robotic Cells based on the context of Industry 4.0

Mr. Rogerio Adas Pereira Vitalli

Robotics Advanced Institute, I.A.R., Department of Special Projects, São Paulo, Brazil.

Email: vitalli@iar.eng.br

Abstract:

The objective of this research is to develop a methodology that makes use of the Digital Twin calibration and virtual commissioning to digitally validate robotic mechatronic cells, and minimize the time of installation and implementation of the project on the “factory floor” in the context of Industry 4.0. The project is based on a proposed approach to combine 3D depth data - measured by means of accurate CAD models and by CAE - so that it is possible to calibrate the data obtained from the Digital Twin through virtual commissioning before being transferred of virtual to the system real physical. The methodology will be based on innovative procedures for: (i) calibration of the Digital Twin; (ii) optimization of the factory layout; (iii) elimination of the possibility of collision between robots, grippers and devices, (iv) specification of the necessary interlocks involving the exchange of signals, operation logic and generation of all the specific offline programming of each industrial robot, considering the safety of the equipment of the robotic cell, during the processes. We intend to research, investigate and integrate a solution (figure 1) with commercial software from Siemens Digital Industries Software (formerly SIEMENS PLM) called “Tecnomatix Process Simulate” so that it is possible to test: the quality of the solutions and algorithms surveyed; computational complexity and adequate dimensioning of the necessary automation resources.

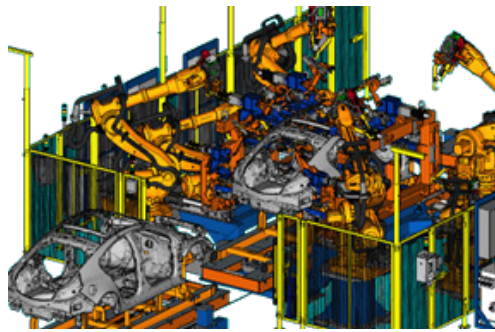


Figure 1: Figure illustrating the the virtual commissioning of a robotic cell in an assembly plant in the city of São Bernardo do Campo, São Paulo, Brazil. It is essential to note that all mechatronic subsets are finalized, for example: robot grippers, advanced kinematics, device security, customization according to the client's "standard" and finally all the programming.

Keywords:

Digital Twin, Virtual Commissioning, Tecnomatix Process Simulate, Factory Floor, Robotic Engineering.

References:

1. C. Eguti and G. Trabasso, “The virtual commissioning technology applied in the design process of a flexible automation system,” *Journal of the Brazilian Society of Mechanical Sciences and Engineering*, vol. 40(8), pp. 396, 2018.
2. EThOS Integrated Library System. [Online]. Available: <http://ethos.bl.uk/Home.do>
3. E. Eros et al, “Integrated virtual commissioning of a ROS2-based collaborative and intelligent automation system,” in *Proceedings of the 24th IEEE International Conference on Emerging Technologies and Factory Automation (ETFA)*, Spain, 2019, pp. 407-413.
4. F. Damrath, A. Strahilov, T. Bar and M. Vielhaber, “Method for energy-efficient assembly system design within physics-based virtual engineering in the automotive industry,” in *Proceedings of the IEEE 48th CIRP Conference on Manufacturing Systems*, Germany, vol. 41, 2016, pp. 307-312.

Biography:

Mechatronic Engineer, master in Industrial Robotics at ITA. He was responsible for the Research and Training Division of MOTOMAN ROBÓTICA DO BRASIL and the Department of Projects and Development of KUKA ROBOTER DO BRASIL. He is Executive Director of the Advanced Institute of Robotics - I.A.R. and Examiner of the Mechatronics Bank Committee of the Brazil-Germany Chamber of Commerce and Industry (AHK).