

Automating Processes in Laboratories with the Support of Dobot Magician

Miruna Dalila CIULU^{a,*}, Lăcrămioara STOICU-TIVADAR^b, and Arriel BENIS^{c,d}

^a Politehnica University of Timișoara, Faculty of Automation and Computers, Romania

^b Politehnica University of Timișoara, Faculty of Automation and Computers, Department of Automation and Applied Informatics, Romania

^c Faculty of Industrial Engineering and Technology Management, Holon Institute of Technology, Holon 5810201, Israel

^d Faculty of Digital Technologies in Medicine, Holon Institute of Technology, Holon 5810201, Israel
E-mails: miruna.ciulu@gmail.com; lacramioara.stoicu-tivadar@upt.ro; arriellb@hit.ac.il

* Author to whom correspondence should be addressed

Abstract

Background and Aim: There is an increasing interest in deploying robotic systems in the medical field and especially in laboratories, where they do not have to interact with humans and can prove of help in the automation process. Moreover, the recent breakout of Covid-19 has given rise to many universities and private companies trying to develop robots with the intention of increasing the Sars-Cov-2 testing capacity and limit the exposure of humans to possibly contaminated samples. This paper presents two main scenarios where a robot can be beneficial to perform repetitive, well-defined tasks in a medical laboratory: sorting tubes and mixing up solutions for testing or vaccine research. *Materials and Methods:* As case study, Dobot Magician was chosen both as a collaboration between Politehnica University of Timișoara, Romania and Holon Institute of Technology, Israel as well as being an educational robot. Considering the distance between the two university sites, we started by creating a digital twin for Dobot using CoppeliaSim as simulator, with the purpose of investigating the capability of Dobot to perform the proposed scenarios. *Results:* More simulations were conducted for each scenario to determine the correctness of the sorting algorithms, and the correlation between Dobot's behavior inside simulation and the one in reality. Overall, the simulation environment replicated quite precise the real world and the digital twin proved suitable for the proposed scenarios. *Conclusions:* The experimental results are promising and open the possibility of reproducing the scenarios in real conditions. Further, integrating a robot in a laboratory can strengthen the bond between robotics, software engineering and medicine and therefore increase medical quality.

Keywords: Robot; Laboratory; Automation; Simulation; Dobot