

	FORM FOR PROPOSING A TOPIC IN THE SECOND CYCLE OF STUDIES	Oznaka	
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Department	Electrical and Electronics Engineering
Master thesis title:	The Impact of Advanced Automation Softwares on the Programming and Virtual Testing of the PLC
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Thesis background:	<p>Programmable Logic Controller (PLC) is a small digital computer that is present in industries for more than 50 years and still is used as a common way for controlling of the certain processes. Advances in technology are constantly providing more efficiency when it comes to developing new solutions in the world of automation. New technological innovations are growing every day and one of them is the <i>Factory I/O</i> software as a PLC training platform that visualizes industrial control. This software is a new generation of the 3D factory simulator that provides wide range of electronic components, industrial parts, robots and machines as well as many scenes that resemble typical industrial applications such as the Pick&Place robot station, different types of conveyors, water tanks, etc. Most parts include digital and analog I/O that are used for control via Programmable Logic Controller (PLC). <i>Factory I/O</i> also supports control via microcontrollers, SoftPLC, Modbus TCP/IP, among other technologies. Important features of the <i>Factory I/O</i> are the total interactivity with the environment, allowing the disturbances on the controlled plant as well as simulating faults in sensors and actuators (troubleshooting). It supports wide range of PLC manufacturers like Siemens, Allen-Bradley, Beckhoff, ABB and Mitsubishi Motors. It makes PLC testing an easy work, allowing to test different programs quickly without damage or injury, which makes it an ideal tool for PLC debugging and education. A growing number of companies showed interest in this software because evaluation of the production systems in industry is very important so this type of approach reduces cost and time before releasing the system in real production.</p>
Thesis objective:	<p>The aim for this thesis is the understanding on how the virtual environments for PLC program testing can improve efficiency and quality of the project itself. This paper will first investigate previous implementations of such softwares and analyse the final results. All of the gathered knowledge from the related literature will be used for creating the</p>

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	<p>virtual factory for testing of the Siemens S7-1200 PLC. In the experimental part of the thesis, <i>Factory I/O</i> software will be used to test the PLC program developed in <i>TIA Portal (Totally Integrated Automation)</i>. Communication of these two softwares is achieved via <i>PLCSim Virtual Switch</i> that allows simulating the working of the PLC and its communication with other devices.</p>
<p>Literature:</p>	<ol style="list-style-type: none"> 1. B.Riera, „HOME I/O and FACTORY I/O: A Virtual House and Virtual Plant for Control Education“, University of Reins Champagne Ardenne, Science Direct 2017. 2. Olga Ruban, „Analysis and Development of the PLC Control System with the Distributed I/Os“, Tallinn University of Technology 2008. 3. Reinhard Langmann, Michael Stiller, „The PLC as a Smart Service in Industry 4.0 Production Systems“, Hochschule Duesseldorf University of Applied Sciences, 2019. 4. Siddharth Chithadka, „A PLC Based Real-Time Material Flow Controller/Calculator in Warehouse Management System“, Technical University Dortmund, 2018. 5. Suman Adhikari, „Operator Machine Control using Siemens PLC and HMI“, The University of Toledo, 2018. 6. Nyan Phyo Aung, „Model of Metal Sorting Conveyor System Using Siemens S7-1200 PLC“, International Journal of Scientific & Technology Research Volume, 2018. 7. I.Ostrowski, „Lesson Learned from Semester of Online Teaching of Automation using Simulators“, Warsaw University of Technology, 2021.