Study and Simulation of a Dynamic System Using Digital Twin

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Abstract : Industry 4.0, or the Fourth Industrial Revolution, is transforming the relationship between people and machines. In this scenario, some technologies such as Cloud Computing, Internet of Things, Augmented Reality, Artificial Intelligence, Additive Manufacturing, among others, are making industries and devices increasingly intelligent. One of the most powerful technologies of this new revolution is the Digital Twin, which allows the virtualization of a real system or process. In this context, the present paper addresses the linear and nonlinear dynamic study of a didactic level plant using Digital Twin. In the first part of the work, the level plant is identified at a fixed point of operation, BY using the existing method of least squares means. The linearized model is embedded in a Digital Twin using Automation Studio® from Famous Technologies. Finally, in order to validate the usage of the Digital Twin in the linearized study of the plant, the dynamic response of the real system is compared to the Digital Twin. Furthermore, in order to develop the nonlinear model on a Digital Twin, the didactic level plant is identified by using the method proposed by Hammerstein. Different steps are applied to the plant, and from the Hammerstein algorithm, the nonlinear model is obtained for all operating ranges of the plant. As for the linear approach, the nonlinear model is embedded in the Digital Twin, and the dynamic response is compared to the real system in different points of operation. Finally, yet importantly, from the practical results obtained, one can conclude that the usage of Digital Twin to study the dynamic systems is extremely useful in the industrial environment, taking into account that it is possible to develop and tune controllers BY using the virtual model of the real systems.

Keywords : industry 4.0, digital twin, system identification, linear and nonlinear models
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