Announces the Ph.D. Dissertation Defense of

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for the degree of Doctor of Philosophy (Ph.D.)

“Models and Implementations of Online Laboratories; A definition of a Standard Architecture to Integrate Distributed Remote Experiments”

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ABSTRACT OF DISSERTATION
Models and Implementations of Online Laboratories; A definition of a Standard Architecture to Integrate Distributed Remote Experiments

Remote laboratories have been under development for more than 20 years and are part of a bigger category called online laboratories, which includes also virtual laboratories. Remote laboratories use real physical laboratories which are capable of being accessed through a network. The instruments can be accessed, monitored and controlled at distance. In comparison, virtual laboratories are basically simulations which mimic the behaviors of real laboratory artifacts. The results of the virtual experimentation process should be similar to those obtained in a real laboratory, but results are mostly based on calculations and mathematical formulas. Most advanced virtual laboratories include in the data processing information of previous experiments made in real laboratories to create a more realistic and reliable environment that considers behavior of real components. Development of remote laboratories in academic settings has been held back because of the lack of standardization of technology, processes,
operation and their integration with formal educational environments. Remote laboratories are used in educational settings for a variety of reasons, for instance, when the equipment is not available in the physical laboratory; when the physical laboratory space available is not sufficient to either set up the experiments or permit access to all on-site students in the course; or when the teacher needs to provide online laboratory experiences to students taking courses via distance education. Centers around the world have been developing platforms that grant remote access to a collection of physical experiments that provide alternatives to educational institutions to reduce budgets of not only equipment purchases but also other expenses, such as, people, space, maintenance, and electricity consumption. This thesis proposes a new approach for the development and deployment of online laboratories over online platforms. The research activities include: The design of an architecture of a system for Smart Adaptive Remote Laboratories (SARL) integrated to educational environments to improve the remote laboratory users experience through the implementation of a modular architecture and the use of context information about the users and laboratory activities; the definition of a design pattern for Remote Laboratory Management System (RLMS); the definition of Smart Laboratory Learning Object (SLLO) capable of being integrated in different educational environments; the definition of a reliability model to detect and report failures and possible causes and countermeasures applying ruled based systems; a prototype implementation of the architecture and remote labs demos that have been used as a proof-of-concept by the IEEE P1876 Networked Smart Learning Objects for Online Laboratories Standard and the Actionable Data Book (ADB) presented at the 2017 Frankfurt book fair in Germany.

BIOGRAPHICAL SKETCH
Born in Caldas, Antioquia - Colombia
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CONCERNING PERIOD OF PREPARATION & QUALIFYING EXAMINATION
Time in Preparation: 2015 - 2019
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Published Papers (Online Laboratories):


L. F. Zapata-Rivera, P. Weinthal and M. M. Larrondo-Petrie Generation of Multiple interfaces for Hybrid Online Laboratory experiments based on Smart Laboratory Learning Objects. IEEE Frontiers in Education Conference (FIE). 2019 (Submitted).