



Ph.D. DISSERTATION DEFENSE

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Date: Tuesday, August 15th, 2023
Time/Location: 9AM ET / <https://stevens.zoom.us/j/92450212915>
Title: Assessment of Systems Engineering Competencies using Simulations and Automated Tools

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ABSTRACT

Systems engineering and technical leadership (SETL) is a multidisciplinary practice that is as much an art as a science. It is critical in facing the ever-changing challenges presented along with technological advancement and the increase of complexities in systems. This research provides educators and institutions with the tools to improve systems engineering competency assessment as well as provide a means to accelerate the education process. This research proposes a methodology that measures a subject's proficiency in a set of systems engineering competencies of students or practitioners using interactive computer simulations and automated tools. The vehicle that is used is the Systems Engineering Experience Accelerator which is a new approach to developing the systems engineering and technical leadership workforce, aimed at accelerating experience assimilation through immersive, simulated learning situations. The concept, design, and implementation of such a simulation environment is described, along with methodology to create additional experiences and assessment methods that can be used more widely.

Overall, this research developed a conceptual methodology to assess the capabilities of systems engineers using an interactive simulation environment. Three different kinds of experiences were created, each targeting a unique problem area. Three pilot studies were conducted to evaluate the learning and competency assessment capabilities of the proposed methodology, with students and working professional participants each spending about a week to finish the experience. Finally, the dissertation contributes to the systems engineering discipline by presenting a transferable methodology to assess competencies and to develop interactive simulation environments for accelerated learning.