Cyber-Physical Digital Twins — Georgia Tech Smart Campus Case Studies

Prof Dimitri Mavris

Regents Professor
School of Aerospace Engineering
Georgia Institute of Technology, USA,

2 March 2023, 2 – 3PM
RMIT Storey Hall

https://bit.ly/EIP-CP-DTw

Abstract

Digital Transformation requires the ability to explore new digital technologies while exploiting existing resources. This in turn means that the benefits of digital technologies on the design, development and operations of non-digital systems need to be properly assessed and understood. Key to this capability is the concept of Digital Twin. While initially developed for industrial systems, Digital Twins are now being implemented for socio-cyber-physical systems (e.g. smart buildings, smart cities, etc.) due to their ability to leverage the benefits of digital technologies to non-digital systems. From a systems engineering perspectives, digital twins leverage artificial intelligence, machine learning, along with data and visual analytics to provide many analytical and reasoning capabilities: (1) Descriptive (what happened/what is happening?), (2) Diagnostics (why did it happen?), (3) Predictive (what is likely to happen?), and (4) Prescriptive (how to act in response?). These capabilities stem from the connection between the models and system data, which is the essence of a digital twin.

In his presentation, Professor Dimitri Mavris will first present a multi-scale, integrated environment that supports situational awareness, optimization, as well as forecasting and virtual experimentation at the Georgia Institute of Technology campus level. He will then discuss recent efforts in developing a Digital Twin of GT's Kendeda Building for Innovative Sustainable Design (KBISD). The use of the Digital Twin made it possible for KBISD to receive certification in 2021 as a "Living Building" from the International Living Futures Institute (ILFI). Finally, Prof. Mavris will address the shortcomings of current approaches to the development of Digital Twins and introduce an ongoing NASA-sponsored research effort aimed at providing a structured, model-based approach to the definition and development of Institutional Management Digital Twins, which leverages the practices and principles of both Enterprise Architectures and Model Based Systems Engineering (MBSE).

Biography

Dimitri Mavris is a Regents' Professor, Boeing Professor of Advanced Aerospace Systems Analysis, and an S.P. Langley Distinguished Professor. He also serves as the director of the Aerospace Systems Design Laboratory (ASDL) and executive director of the Professional Master's in Applied Systems Engineering (PMASE).

Prof Mavris' expertise includes advanced design methods, aircraft conceptual and preliminary design, multi-disciplinary analysis, design and optimization. Prof Mavris has chaired and served in several Technical and Program Committees for the American Institute of Aeronautics and Astronautics (AIAA) and served on the AIAA Board of Directors and Institute Development Committee. He is the US representative to the International Council of the Aeronautical Sciences (ICAS) Board and the principal investigator for the Airbus/Georgia Tech Center for MBSE-enabled Overall Aircraft Design. He has co-authored excess of 700 scholarly publications.

Prof Mavris' awards and recognition include the 2021 AIAA Sustained Service Award; Fellow of the Royal Aeronautical Society; Fellow of the AIAA; Fellow of the National Institute of Aerospace; Member of ICAS Executive Committee; NASA Blue Marble Award; Bauhaus Luftfahrt Senior Research Fellowship recipient (2008); Ralph T. Teetor Education Award (2000); National Science Foundation Faculty Early Career Development (CAREER) Award (1997); and SGA Faculty of the Year Award (2012–2013).