Toward Digital Twin Verification and Validation: Software Testing Approach

Milad Zahediyami[*1], Simon Gorecki[1], and Mamadou Kaba Traore[1]

[1]Universite de Bordeaux – IMS Laboratory, CNRS, UMR 5218 – France

Résumé

The rapid deployment of Digital Twin (DT) technology across various fields necessitates robust Verification and Validation (V&V) methodologies to ensure its successful real-world implementation. However, existing practices primarily focus on validating the DT model itself, neglecting crucial aspects such as data integration and the services provided by the DT. V&V methods need to extend beyond simulation models and encompass a broader scope. Therefore, precise identification of the V&V scope encompassing data integration, model fidelity and service functionality is crucial for comprehensive V&V. This paper proposes a generic software testing approach for V&V of DTs. The approach employs unit, integration and system testing in a bottom-up fashion. Leveraging testing techniques from software engineering holds significant potential for V&V of DTs, given their inherent similarities and modular architecture. Finally, beyond V&V using simulation and modeling, formal methods and automatic AI-driven software testing approaches are mentioned as potential areas for future work and further exploration.