Software Testing Approach for Digital Twin Verification and Validation

Milad ZAHEDIYAMI, Simon GORECKI, Mamadou Kaba TRAORE
IMS Laboratory, University of Bordeaux, CNRS UMR 5218, Bordeaux INP,
33405 Talence, France
{milad.zahediyami,simon.gorecki,mamadou-kaba.traore}@u-bordeaux.fr

Abstract. Digital Twin (DT) is a well-known decision support system which allows for coping with unpredictability in collaborative networks. Utilizing DT technology in collaborative networks can increase the resilience of the system. The increasing use of DT solutions in different domains demands for development of Verification and Validation (V&V) frameworks to guarantee the effectiveness of the implemented DTs. However, a considerable research gap has been identified in this field. Current state of the research is mainly concentrated on V&V of models in DTs and excluded important aspects such as data interoperability and functionality of DT services. To extend the scope of V&V, it is crucial to include these aspects. This paper presents a novel framework for V&V of DTs that considers all the mentioned aspects. It combines formal methods with software testing methods for V&V. It utilizes formal methods in a top-down manner and it will then use the software testing methods in a bottom-up manner.

Keywords: Digital Twin · Verification and Validation · Software Testing Techniques . Formal Methods . Software Development Life Cycle .