Associazione Italiana delle Tecnologie Manifatturiere

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Scheda sintetica tesi

Titolo tesi: Real-time validation of Discrete Event Simulation models in a digital twin framework: an approach based on sequence comparison techniques

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Abstract del lavoro di tesi: The Digital Twin technology is considered an important tool to optimize production and support decision-making. To benefit from the Digital Twin functionalities, it is essential to reach a correct mirroring between the physical system and the associated Discrete Event Simulation (DES) model. This condition is achieved by means of a validation procedure repeated over time. This type of validation is referred to as real-time validation, it should be conducted rapidly, with one replication and a limited dataset available; in addition, the whole system behaviour in time must be analysed. This work aims at proposing a validation methodology to assess similarity between the physical system and the model by comparing sequences of events and sequences of Key Performance Indicators (KPIs). The following work is conducted treating both information types as sequences, hence sequence comparison techniques are exploited to measure the similarity. Finally, the proposed methodology is applied in real-time on a lab-scale manufacturing system in order to reach a proof-of-concept Digital Twin.

Immagini illustrative:

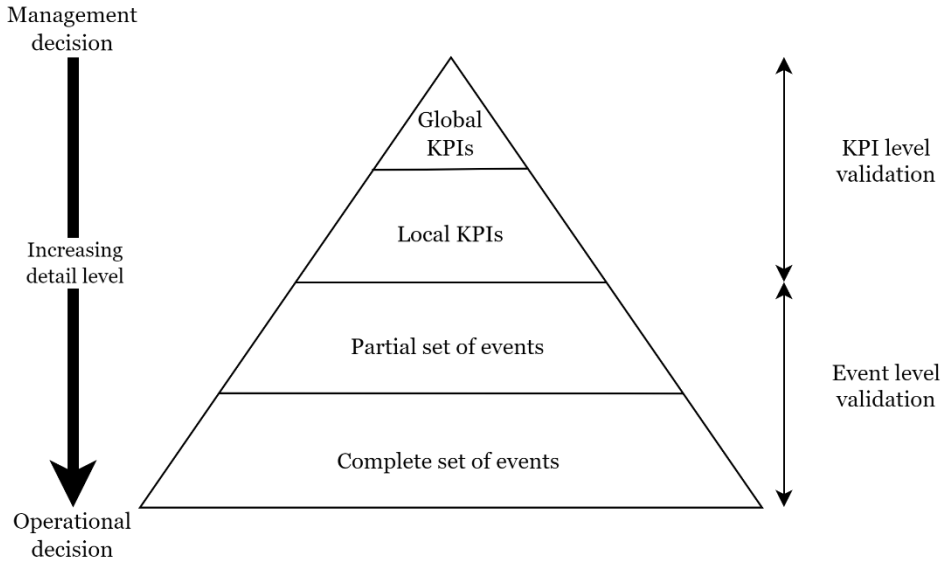

Figure 1: Levels of detail of the proposed methodology to assess model validity.

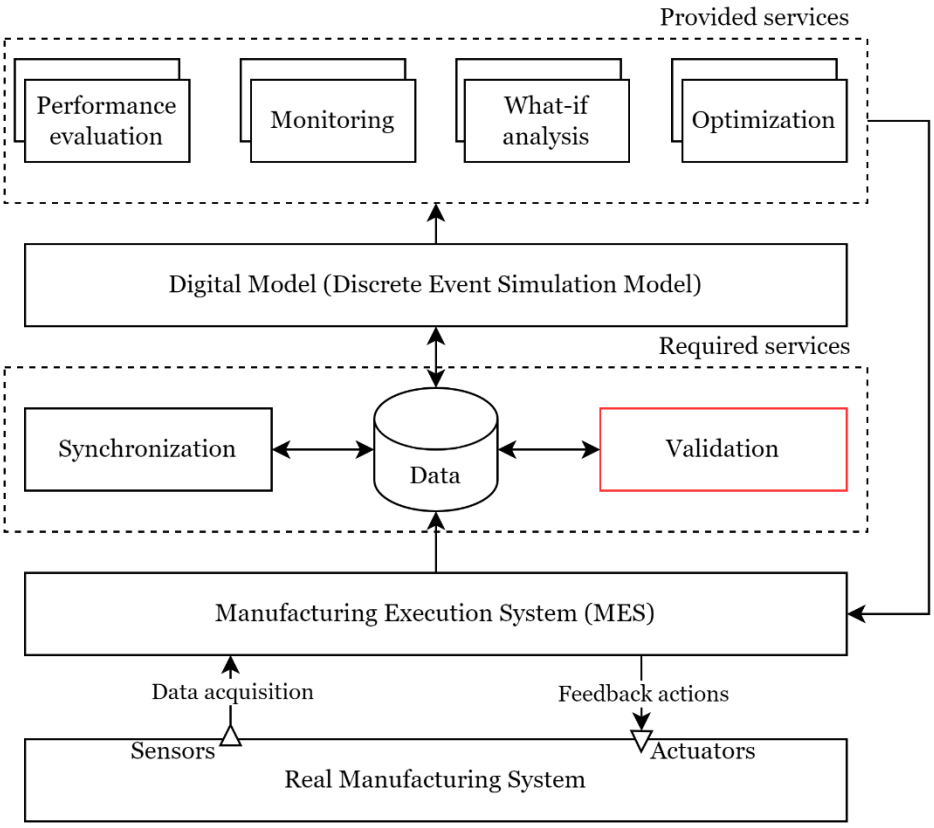

Figure 2: Digital Twin framework.

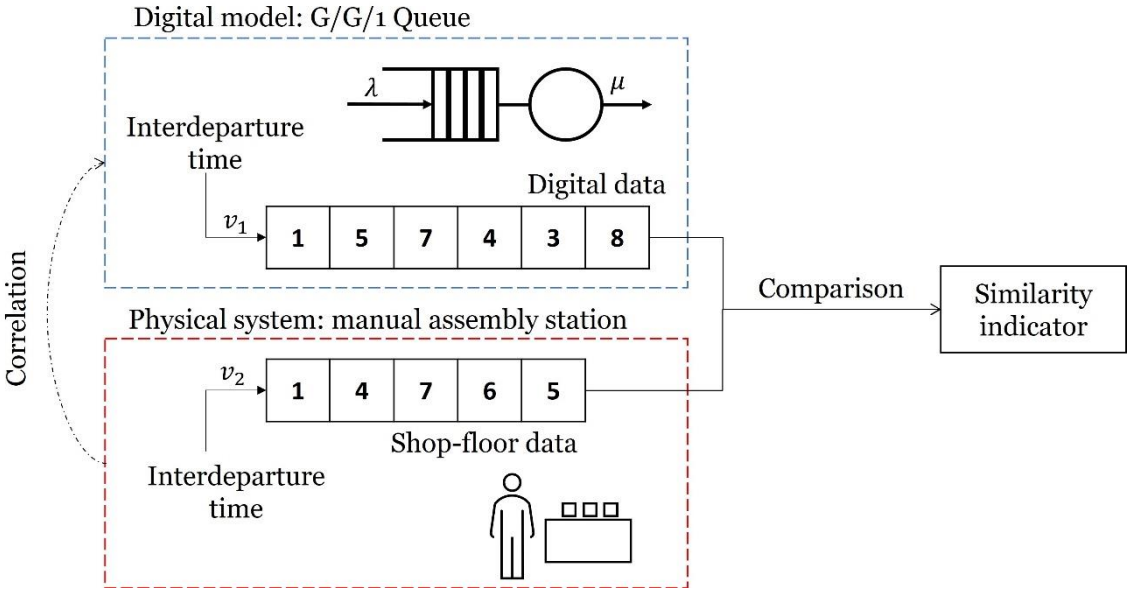

Figure 3: Comparison of data sequences generated by a real and a digital system.