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A Building-Block Approach for Enabling Modularity in System Dynamics

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Abstract

Simulation modeling holds great potential to improve the quality of decision-making through ex-ante exploration of "what-if" scenarios and decision actions. However, its adoption is often hindered by the significant time, resources, and expertise required to develop useful models. In addition, literature on the reuse of structures is dispersed, and procedures are informally retained in the minds of experienced modelers. To address these constraints, a building-block-based modeling approach (BBMA) is proposed to reuse and customize system dynamics model structures. This paper aims to facilitate the widespread adoption of BBMA by (i.) reviewing the system dynamics literature on the reuse of generic components to elicit design requirements for constructing and customizing model structures, (ii.) applying BBMA in a modeling exercise based on an inductive case study in shared mobility and (iii.) critically evaluating the outcomes against the proposed design requirements. By providing insights into building-block-based modeling, this research intends to spark the community`s interest in scalable approaches for modular modeling and reusability of structures.

Keywords: modular modeling, building-blocks, model building and validation, reusability