

TOWARDS A THEORY OF MULTI-METHOD M&S APPROACH: PART II

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ABSTRACT

This extended abstract presents general method formats (MFs) as a continuation of the exploration of theoretical components of multi-method M&S approach. A MF can be defined as a basic arrangement of methods and their relations overlaid with system and/or phenomena. Transitions toward a format must seek justifications in order to increase research objectivity and transparency.

1 MULTI-METHOD SIMULATION MODEL STRUCTURE

Chahal (2010) propose three formats for SD and DES. Swinerd and McNaught (2012) propose three common formats for SD and ABM called hybrid design classes. Borshchev (2013) discussed six common formats for combined SD, ABM, and DES methods called architectures. Each of the presented approaches provides insights, but they do not offer general view for MFs. All formats for combining methods proposed by Chahal (2010) can be generalized as a format in which methods are associated to exchange data within their interaction points during simulation. Swinerd and McNaught (2012) add a format where embedding of one method into another takes place. Subsequently, Borshchev (2013) specified beyond those two formats, adding the concept of dual existence of an actor within different methods. It is not difficult to map those formats to UML notations (Eriksson et al. 2003). In UML terms, first relation is the most general association where data exchange takes place. Second relation is a more specific association where aggregation describes how parts relate to the whole, components have their own identity, may be owned by more than a single aggregate, and their ownership can change over time. Last relation is a more specific form of the second relation and restricts identity of components to the composite, so components must be referenced and owned by a unique composite.

2 PROPOSED METHOD FORMATS

Balaban and Hester (2013) proposed an initial concept of MFs derived from empirical mixed method approach based on Greene (2007). Previous section introduced three general relations derived from M&S

relevant literature with support of UML relations. Transitions toward MFs can be used to design research that can involve multiple modeling methods (see Figure 1).

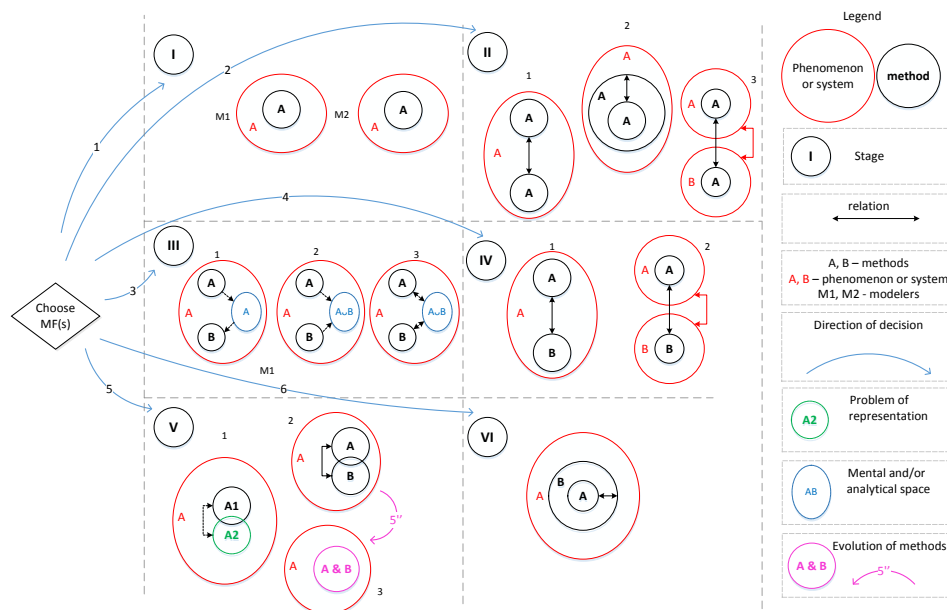


Figure 1. MFs and transitions

MFs III, IV, V, and VI fall under a multi-method M&S approach based on definition of multi-method M&S approach (Balaban, Hester, and Diallo 2014). MF II on its own provides an alternative to multi-method path. MF I depicts the purpose of triangulation using the same method or a set of the same methods. MF III is realized by different methods not joined by a simulation engine. MFs II, IV, V, and VI can be used to create a larger structure of a multi-method simulation model. This means that MFs IV, V, and VI can be used multiple times by different components of a multi-method simulation model, and can be also combined with MF II. On the other hand, MF II on its own is a single method simulation model.

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