Modeling and Simulation Body of Knowledge (M&SBOK) - Index

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M&S: Trends and Challenges

Several publications document description of the trends as well as normative views on where M&S should be heading. The challenges can be grouped in two categories: demand-based pull and advancement-based push.

Demand-based pull includes higher expectations from the advanced user's community such as "We raised the bar; now we have to have to leap to new heights" (Numrich 2004). Some other points raised by Numrich are:

- *Complexity* of today's environments
- *Emerging integration environments*, federation of federations similar to system of systems
- Respond to increased demands for *rapid, reconfigurable, adaptive M&S capability*
- HLA is necessary but not sufficient, *composable frameworks* address needs beyond HLA.

Demand-based pull is very desirable for the M&S discipline and will definitely influence advancement hence usefulness of the field.

***Advancement-based push*:**

- Interest areas in M&S are shifting with the advancements in enabling technologies such as types of computers, advances in software engineering, and application of system theoretic knowledge.
- System-theory based simulation has been advocated since early 1970s (Ören 1971; Zeigler 1976).
- The fact that DEVS (Discrete Event System Specification) formalism developed by Zeigler (1984) is well accepted by the simulation community (by both researchers and advanced practitioners) is one of the signs of maturity of the field of M&S.

Some other challenges to expand the existing capabilities of M&S are expressed in the literature.

Some challenges are still open:

- Concepts, methodologies, standards, and tools are needed for computer processable documentation of specifications of requirements, models, and experimental conditions to be able to assure consistency between software code and documentation.

- Explicit and implicit assumptions in specifications of models, experimental frames, and (model, experimental frame) pairs need to be documented. Their implications are important for reusability and reliability.
- V&V methodologies and techniques are well spread; however new approaches (methodologies and techniques) are needed for built-in reliability to assure reliability while specifying and computerization of the problem. System theory based modeling offer concepts applicable for this purpose (Ören 1991).
- Integrated tools need to be developed to check existence of categories of errors that may occur in M&S studies.