M&S: Science/methodology - Model Behavior

Behavior-related issues are:

1. Behavior of dynamic systems
2. Behavior generation
3. Behavior processing and
4. Behavior representation

1. Behavior of Dynamic Systems:

The following table is a taxonomy of simulation based on the nature of model behavior.

Table - A Taxonomy of Simulation Based on the Nature of Model Behavior

Criteria	Type of simulation
Behavior is trajectory	- Trajectory simulation
Behavior is structure	- Structural simulation

2. Behavior Generation:

The following table is a taxonomy of simulation based on the generation characteristics of model behavior.

Table - A Taxonomy of Simulation Based on the Generation Characteristics of Model Behavior.

Criteria	Type of simulation
Hardware use - Hardware is - used - not used	- Simulator (human-in-the-loop simulation) - Simulation
Time: Real-time Compressed time Expanded time	- Real-time simulation - Compressed time simulation - Expanded-time simulation
Purpose: *Value-free decision* Descriptive decision Explanatory decision Predictive decision	- Value-free simulation - Descriptive simulation - Explanatory simulation - Predictive simulation
Normative decision Evaluation Prescription	- Normative simulation - Evaluative simulation - Prescriptive simulation
Procedure:	Simulation run (single-run simulation study)
Continuous generation of model behavior	- [Multiple-run] simulation study Antithetic run - Regenerative simulation - Sensitivity simulation

- Nested simulation	- Optimizing simulation
	  -- simulation within optimization
	  -- optimization within simulation

	- Expert system (ES) & Simulation
	  -- simulation within ES
	  -- ES within simulation

- Interaction among decision makers	- Gaming simulation (game-theoretic simulation)
	-- competition (zero-sum games)
	  wargaming
	  (netcentric war gaming)
	  business gaming
	-- cooperation
	  Peace game
	-- coopetition
	  conflict management simulation

- Interaction between model behavior generation and the real system	- Stand-alone simulation - Integrated simulation

Some additional topics related with behavior generation are: Behavior generation techniques for each modeling formalism. Cellier and Kofman (2006) is an excellent reference for behavior generation for continuous systems.

<p style="text-align:center"><strong style="color:red">3. Behavior Processing includes:</p>

Behavior analysis:
   - compression (statistical, numerical, qualitative)
   - confidence intervals
   - variance reduction

 Behavior display
   - visualization
  - animation
   - virtuality (virtual reality, augmented reality)

Behavior explanation (in intelligent simulation environments)