The Art of Designing Model Based Experiments

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Abstract

In this presentation I will guide the would be researcher through the phases of designing a model driven experiment and its conduct. What I describe are basic to the conduct of any model derived experiments, whether it be oriented toward military or civilian applications, or individual or team performance. Note, however, if the basic tenets of experimentation are not adhered to, little in the way of meaningful results will be achieved. Thus, these tenets are stressed. I will drawn on the adaptive architecture for command and control experiments as a model.

There are a number of critical step necessary to conduct a reliable and valid experiment. Initial to a model driven experiments is the derivation of the research question to be addressed and the implied hypothesis from the model or theory. The hypothesis becomes the bases for independent variable development. Independent variables are then operationalized to produce manipulable, observable, and/or measurable entities. A cover story or scenario is developed to serve as environment or background of the experiment. Typically a simulated environment is used to capture a reasonable abstraction of reality. Subjects are randomly (if possible) selected to from a representative sample of the population from which they were drawn and randomly assigned to the various treatment levels of the independent variable(s). Whatever counterbalancing is necessary to ensure equal experience across conditions is carried out. The model, research question, and hypothesis drives development of dependent variables. Observers, if called for to assess dependent measures, are trained and assigned to conditions (trials) in a counterbalanced of randomized manner. Using a check list or action script the experimenter conducts the experiment and collects the data.