An Integrated Simulation Environment Combining Process-Driven and Event-Driven Models

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A simulation framework that integrates process-driven and event-driven approaches offers a powerful combination of tools to the modeler. In process-driven simulation models, the system can be represented by block diagrams or system networks through which entities flow to mimic real life system objects. In event-driven models, the system can be represented by event graphs, which focus on the abstraction of the event rather than on observable physical entities. In this research, a simulation environment is proposed to integrate both the approaches, i.e. process and event. Students typically learn discrete event simulation at either the event level or the process level. A simulation tool that effectively preserves both the levels would be useful for the simulation educator.

A framework based on an Integrated Entity/Event (IE2) approach explicitly represents entities at the event-driven level. The usage of entities in the event-driven layer serves two purpose, a) reduces the abstraction by manipulating entity objects instead of working with parameters as in a programming language, and b) gives the intuitive feel of process-driven models to modelers at the event level, which enhances the appeal of the event-driven models. At the event level, entities are handled as objects in a way that is analogous to their treatment in the process models. Instead of passing information as event parameters to other nodes as in a programming language, the IE2 model defines them explicitly as attributes of entities that are associated with events as they are scheduled.

The essential elements discussed by Kuljis (1996) were considered in the research as guidelines for constructing user interface for the IE2 simulation framework. The interface developed for the IE2 model explicitly defines the role of process- and event-driven models in the IE2 simulation framework.

The research has successfully integrated two different models i.e. process- and event-driven, in the simulation framework as hierarchical layers. The simulation framework is designed to handle the processing of entities and events. A formal relationship among process-driven models, event-driven models and resident entities, like resources and queues, has been established. This formalism enables the DES (Discrete Event Simulation) models in the integrated simulation framework to be more accurate and elegant by using both process- and event-driven components in a logically consistent way. In an effort to build models that accurately represent real-world structure, this ability is critical.