TOPICS

Integrated Support System for Manufacturing Simulation

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1. Introduction

Industry has been using manufacturing simulation with increasing frequency as a prior evaluation tool for product system design and improvement. However, at present simulators are used commonly only by experts, and only as a "verification tool" because significant expertise is required in order to properly use a simulation, and there rarely exists a framework that would be useful to a production system designer in the design of a production system. Seeing this need, we have developed a support system based on the TOPQ (**T**oyota CRDL Agent-**O**riented **P**lanning for **Q**ueueing System) simulation software.

2. Outline of the support system

First we analyzed the heuristics of the use of manufacturing simulation. We found, that there are three key points required for the analyst to successfully use a simulator.

(1)Establish and use a knowledge base built from previous experience

(2)Automate the operation and processing

(3)Utilize advanced analysis functions to understand the line behavior and propose actions for design improvement

The system layout for achieving these goals is shown in **Fig. 1**. The system consists of the following modules:

- *The navigator*, which interacts with the users and provides access to the knowledge database and the automation tools
- *The model generator*, which generates a simulation model automatically based on process design information
- *The analyzer*, which performs a statistical analysis of the simulation results and determines bottlenecks, confidence intervals, etc.
- *The case base* for accumulating and reusing the analysis examples

3. Simulation process description language EPML

In order to support the automated analysis, it is necessary to model the control method of a procedure, the know-how, and the various tools in a format that can be understood by a computer. For this purpose, we decided to use the Engineering Process Markup Language (EPML), an XML schema for simulation process modeling. In an analysis scenario it is crucial to understand the procedures in order to automate the use of these tools. EPML defines scenarios using hierarchical sub tasks. Furthermore, each sub task has a GUI, a variable, and a method group. Thereby, a navigator represents an interface agent, and supports users for these tasks, as shown **Fig. 2**.

4. Conclusion

We modeled a simulation expert system, and proposed a support system for the system analyst. The system contains different modules and will be demonstrated using an actual line design example.

References

1) Nakano, M., et al. : Jpn.-USA Symp. on Flexible Autom., (1994), 201-208

2) Roser, C., et al. : 2002 Winter Simulation Conf., (2002), 1087-1094

(Report received on Nov. 3, 2003)

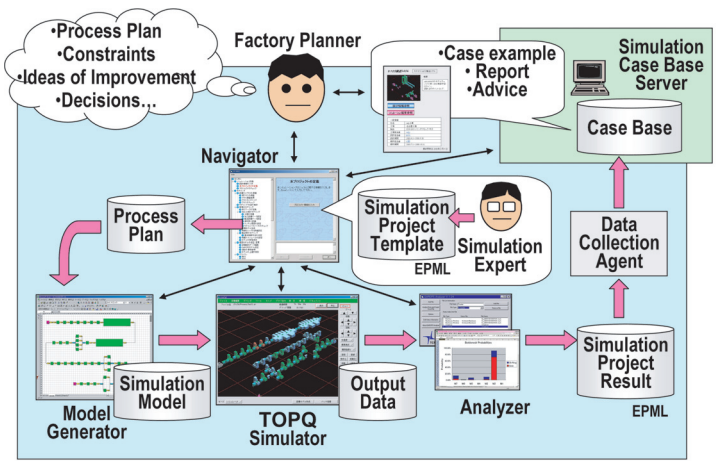

Fig. 1 Outline of the support system.

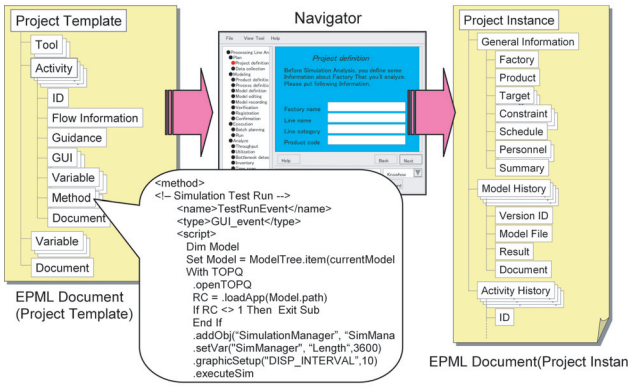

Fig. 2 EPML file and navigator.