SINDBAD: A Simulation Modeling Methodology Integrating Distributed Simulation Objects Using JIDL and CORBA

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Abstract

Web-based simulation is one of the most interesting field of simulation research. There are several directions that one can take in creating a marriage buween the web and simulation field. Two directions involve 1) parallel and distributed model execution (PDES on the web), and 2) distributed model repositories (Fishwick 1997). As he was, we do focus more on the area of distributed model repositories since there has been less research in the area than in the more mature field of PDES on the web.

Creating comprehensive simulation models can be expensive and time consuming. This paper discusses how to integrate distributed simulation sub-models as objects for constructing the required simulation model which is more large and complex.

There are some issues related with using distributed objects on the web as a infrastructure of repositories: 1) how to find appropriate models on the web, 2) how to integrate distributed objects (models) which may be mostly heterogeneous, 3) formalization information of models or objects which is dispersed over the web, and 4) which is the better policy and the efficient way, performing parallel simulation as they are distributed over many sites or performing simulation of composite model after transferring the objects to simulation server on a site.

Our approach for overcoming these problems is based on the principles of object-oriented design concept, especially Design Patterns. A definition which more closely reflects its use within the patterns community is: A pattern is a named nugget of instructive information that captures the essential structure and insight of a successful family of proven ┌ lutions to a recurring problem that arises within a certain context and system of forces. Due to using design patterns as a shared language for communicating insight and experience about their problems and solutions, one can take great advantages that design patterns allow programmers to collaborate and combine their wisdom more effectively and also enable to extend the reusability of the previous made objects and their design.

Today Java is the most powerful and popular language implementing web-based simulation. It provides two key capabilities which are portability and automatic software distribution. These portable and distributable capabilities are applied for the agent. Agent helps simulation modeler ease to establish the

appropriate model and conduct naturally parallel distributed simulation.

Java Interface Definition Language (IDL) gives very useful technology to solve the above mentioned problems because of using the many advantages of CORBA for dealing with distributed objects. Moreover we tried to introduce the concepts of plug and play, adapters like capsules for heterogeneous distributed objects, and data mining for searching the most suitable simulation model. Figure 1 shows the illustration of our methodology for web-based simulation.

Our research effort has been divided into three major tasks:

1) Developing a standard methodology to transform individual distributed simulation models into objects worth full network communication abilities,

2) Creating agents which use a data mining technique for effectiveness and efficiency of searching and assisting in selection and integration of models,

3) And developing an environment that brings together the tools and mechanisms to construct model networks, to monitor and control their interaction in performing a simulation.

SINDBAD is a simulation environment (tool) which we made up for enabling all of the above. It has basically a three-tiered client/server architecture which is constituted of user interface (presentation component), application logic (business rules component), and data management.

At the end of this paper, an example will be shown on the premise that all the distributed objects are originally composed in a CORBA-compatible way.
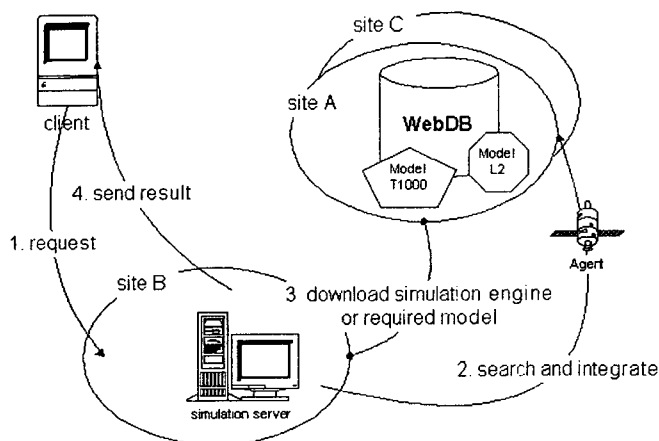
[Figure 1]
How to implement integrating for constructing simulation model and to perform simulation.

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