Chapter IV

Using Natural Language Modeling for Business Simulation

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Abstract

Natural language modeling (NLM) is a conceptual modeling language that can be used for requirements determination for business application systems. In this chapter we will show how the NLM methodology for requirements determination can be extended to serve as a blueprint for business (or management) simulation by providing an initial model for creating a business simulation. We will do this by defining the content of the communication documents for runtime management and we will subsequently show how this meta-UoD can be incorporated into an application UoD. This allows us to capitalize on conceptual models in a business that have been created for requirements determination by extending them with the conceptual model of runtime management. Subsequently, we will incorporate the simulation requirements into the latter UoD and we will give some guidelines on how the conceptual models for the “real life” runtime application can serve as a starting point for the conceptual sub-models for the simulation UoD.
Introduction

In the simulation literature, there’s a growing number of articles that discuss the interdependence between a conceptual model (or operational model) of a subject area and a simulation model (de Swaan Arons & Boer, 2001; de Vreede, Verbraeck, & van Eijck, 2003; Floss, 1997; Gregoriades & Karakostas, 2004; Julka, Lendermann, Chong, & Liow, 2004). In parallel other authors indicate the interdependence between the simulation data sources and the operational business data sources that are contained in the corporate business systems (Perera & Liyanage, 2000; Robertson & Perera, 2002). These authors commonly identify the need for an integrated approach towards (the design of) business simulations and the (design of) operational information systems. Another stream of research is concerned with the definition of a methodology for business (process) simulation (Greasly, 2006; Hlupic & Robinson, 1998; Sol, 1982) that can be used for assessing potential “to-be” business process designs (Giagles, Paul, & Hlupic, 1999) and in which structural validation of a simulation with the actors in the system is advocated (Berends & Romme, 1999). Nidumolo, Menon, & Zeigler (1998) discuss the application of information systems architecture-based (ISA) approaches for object-oriented modeling and simulation (OOMS) in which they conclude that the strong roots of these approaches in static IS modeling, amongst other factors, limits them to be used for business process simulation (Nidumolu, Menon, & Zeigler, 1998). In this chapter we will challenge Nidumolu, Menon, and Zeigler’s position and take the application of ISA approaches for business simulation one step further by providing an integrated framework for the three levels (information base, schema and meta-schema) and three perspectives (information, process and behavioural) for information systems (Nijssen, 1989). We will apply this framework on a subject area or Universe of Discourse (UoD), by defining the communication documents for runtime management and by incorporating the simulation requirements into the application requirements documents. A requirements determination approach in which a strong modeling methodology is contained that has been developed within the architecture of this framework is natural language modeling [NLM] (Bollen, 2002, 2004, 2005).

Chapter Structure

In this chapter we will first focus on the modeling constructs in NLM for the information-oriented, process-oriented perspective and on the NLM modeling constructs and methodology in the behaviour-oriented perspective (Olle, Hagelstein, Macdonald, Rolland, Sol, van Asche, & Verrijn-Stuart, 1988). In the next part of this chapter we will show how the meta concept in the event perspective—runtime management—can be incorporated into the conceptual application models. In the next section we will specify how the derived documents for a “real” application subject area can be used as an initial model for the definition of a simulation model and how the elements of this initial model can be used to define a business simulation for the behaviour in an application area.