Model Inspection in the Context of a Distributed DSS

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ABSTRACT

Dicodess is a model-based distributed cooperative decision support system framework. It encapsulates the underlying model in a graphical user interface shielding users from the technical details of model configuration and optimization. However, a model usually evolves over time and therefore needs verification and validation accordingly. Furthermore, users sometimes might want to have a better insight into the model to better understand a “strange” solution. Model views are a new concept for modeling language and domain independent model visualization. The focus is not primarily on visualizing model input or model output but on the model’s structure, the formalized knowledge. Modelers as well as domain experts are able to inspect a model visually in order to get a better understanding and to have a common base of discussion. The improvement of model understanding and communication among the people involved will lead to models of better quality. In the last part of this article we are proposing an example integration of model views into Dicodess. This is enabled through the careful design of our model visualization concept. The integration provides mutual benefit: Dicodess users get direct access to model visualization, which through Dicodess’ cooperative functionality can be done even in collaboration.

Keywords: Distributed Decision Support System, Information Visualization, Knowledge Visualization, Meta Model, Model Visualization, Optimization Software Architecture, System Integration

INTRODUCTION

Decision support systems (DSS) assist a user in making decisions in a potentially complex environment. Most of these systems shield the user from the technical details (models, documents, data, etc.) that lie behind the user interface. In some cases however it would be very useful to know these details to get a better understanding of the system’s behavior. In the concrete case of a model-based DSS during activities such as model verification it would be helpful to know how a particular aspect has been modeled. The current situation in optimization model visualization is not satisfying. Commercial integrated development environments (IDE) for optimization models often provide powerful visualization tools but mainly for more or less domain specific visualization of model output, not its structure. Approaches that represent model structure visually however are regularly – with respect to several aspects – too specific, and thus often usable just in one particular context.

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In this article we will introduce a generic and extensible concept for visual inspection of optimization models. We will demonstrate in particular how a prototype implementation of the concept, the model inspector, has been successfully integrated into Dicodess, a model-based DSS framework. The integration has been enabled through the careful design of an open system architecture and provides mutual benefit for both systems. The model inspector makes the model that Dicodess encapsulates accessible to non-modelers. Dicodess’ collaboration aids enable model inspection and knowledge sharing performed in groups.

In order to understand the integration of Dicodess and the model inspector we need to introduce each beforehand. The next section introduces the concepts and principles of the Distributed Cooperative Decision Support System (Dicodess). The following section gives an introduction into our concept for model inspection. Then, the most important elements of the prototype implementation of the concept are described. Finally, the last section details how the prototype has been integrated into Dicodess for collaborative model visualization in the context of decision support.

**DICODESS**

Dicodess is a framework for building model-based distributed cooperative decision support systems. At first we will present the underlying principles that need to be understood when dealing with Dicodess. We will then discuss collaboration when using the DSS. The interested reader may get more information about Dicodess at (Gachet, 2004, 2009).

**Principles**

Dicodess encapsulates the underlying mathematical model into a graphical user interface (GUI) which spares the user from the technical details of a modeling language. By doing manipulations in the GUI the user actually specifies and finally generates a complete decision support model. This process is called *structuring semi-structured problems*. Figure 1 shows the abstractions Dicodess uses to support the process.

To structure a problem completely three things need to be specified: The situation (which is based on facts, but could also comprise hypotheses and assumptions), the task (which can be influenced by the problem statement), and exogenous decisions (which are dependent on

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Figure 1. Abstraction of the decision process

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