Testing a KBS using a conceptual model

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Abstract

We propose a KBS testing procedure that uses a KADS conceptual model (CM). The set of *Valid Inference Paths* is derived from the inference structure, and, a "high level" trace, representing the *Current Inference Path*, is built using the links established between the CM and the KBS. The comparison of this trace to the VIP can lead to modify either the code or the CM.

Introduction

The lack of specifications while developing a knowledge-based system (KBS) makes the KBS validation a hard task. We investigate the use of an *inference structure*, which is part of a KADS (Knowledge Acquisition and Design Support (Wielinga, Schreiber, & Breuker 1992)) conceptual model (CM), as a set of specifications in order to conduct parts of the validation process. An inference structure describes existing links between *roles* through *inferences*. A role is a class of concepts that have the same behavior in a given problem. An inference is a reasoning step. We focus on **testing the KBS behavior** using this structure. The white box approach to test KBS uses a structural description of the system under test (e.g. (Preece *et al.* 1993)) and studies whether the test cases permit to "cover" all the parts of a KB. Our approach is close to this approach in the sense that we use a description of the KBS, but it is different regarding the nature of this description and the way we use it. In fact, we use an implemented representation of the inference structure of a KADS CM of a KBS, to validate this KBS. We assume that this CM is valid but that it can still evolve. The set of *Valid Inference Paths* is derived from the inference structure and, a "high level" trace, representing the *Current Inference Path*, is built using the links established between the CM and the KBS. The comparison of this trace to the VIP can lead to modify either the code or the CM.

Testing with an inference structure

We describe hereafter our procedure to use the inference structure during the testing phase. All the infer-

ence paths between initial roles, *ie* roles that are not outputs for any inference, and final roles, *ie* roles that either are not inputs for an inference or are specified as final roles, are derived automatically. These paths are correct from a syntactic point of view. Clearly, that means that each time an inference follows another, it is added to the path that is being built. However, these paths have to be checked for semantic correctness. This step is done in cooperation with the domain expert and provides the VIP.

- All the *Valid Inference Paths* (VIP) are derived from the inference structure.
- When the KBS is used on a set of data, the links between the code and the inference structure are used to build the *Current Inference Path* (CIP).
- *If* CIP $\in$ VIP *then* the process is applied on another data case, *else* either the KBS or the CM have to be modified by the expert and the knowledge engineer.

Discussion and perspectives

This procedure is currently being tested on a real world KBS for which we developed a CM (Haouche 1993). Testing a system using its CM becomes easier because, on the one hand, we have access to a trace which is easily understood, and on the other hand, the errors made are more easily localized thanks to the explicited links that are established between the CM and the KBS. Furthermore, we think that this CM is valuable to address the classical "coverage" problems and to provide criteria to stop the testing process.

References

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