The Components for Intelligent Tutoring Systems

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The concept of software components has received relatively little attention so far by the researchers in the field of AIED. This paper is an attempt to bring more light on this important concept and to describe the benefits that component-based ITSs can bring to the field. Surprisingly enough, there is still no consensus on the notion of component among AIED researchers. There are many open questions and unclear issues. By carefully structuring the description of software components in general, as well as by showing some examples of components for ITS design, the paper presents several important related issues, like functionality of components, their granularity, generality, interoperability, and reusability. Special attention is given to the architectural and communication considerations, as well as to the relation between components and ontologies for ITS design.

The purpose of this paper is threefold:

1. It is supposed to describe from different viewpoints (architectural, design, software engineering, and utility) the concept of software components that may be useful for development of Intelligent Tutoring Systems (ITSs).

2. It is also intended to be a survey of important problems, questions and issues related to such components.

3. It should draw the reader's attention to the possibilities that component-software technology can offer to the field of ITSs.

Although the concept of components has been largely used in the area of software engineering during the last decade (see, for example, [Adler, 1995]), it is only since recently that it draws significant attention in the community of researchers working in the area of Artificial Intelligence in Education (AIED). Exceptions from this rule include relatively few people from the AIED community (some examples are the work of Murray [Murray, 1996], Munroe [Munroe et al., 1994] and Devedzic et al., 1997]).

The paper has been inspired by an informal discussion on the topic of software components, held during the AIED'97 conference in Kobe, Japan . Starting from some conclusions of that discussion, as well as from the relevant literature both in the area of ITSs and from the area of software engineering, and from our own previous work, we have elaborated on the idea of software components for ITSs and organized the paper as follows. First the usual process of ITS development is overviewed, with some comments on its inherent difficulties. Then some requirements are enumerated that would significantly alleviate the process of ITS development. This is followed by a description and a discussion of the concept of software component and the most important issues related to it. Examples of software components that we have identified in our own work are also shown. Architectural and communication aspects of components for ITSs are shown next. The Discussion Section comments on the relationship between the concept of components and component of ontologies for ITS design. Finally, some conclusions and open questions are presented.

References

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