AXIOMATIC INFORMATION MODELING

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1. Introduction

The obvious task in information modeling is to arrive at a model which is correct. However, the concept of correctness has many faces e g the model must correctly reflect the properties of the application at hand, and it must adequately select relevant parts of the application. The former case requires that the information model is "satisfied by the application". The latter case is dependent on the intended use of the model. The problem of satisfyability is, in most information modeling approaches, considered to be an intuitive task. From logic we know that a theory, here seen as an information model, can only be satisfied if it is consistent. Thus, by applying predicate logic to information modeling, we should have a possibility of checking the satisfyability of an information model. However, in order to ensure that the information model is satisfied by the application in mind, requires an intuitive reasoning.

Consequently, our plans include to further elaborate the use of predicate logic in information modeling. It furthermore includes a study of possibilities and limitations of such an approach. The results obtained so far will be shortly reviewed in the following.

2. The concept of an information model.

By an information model we mean a model of statements, which can be made about an application, and their relations. Note that we do not include processes as such in an information model. An information model is expressed in a language which reflects a set of basic concepts. The language and the basic concepts constitute a "metamodel" for information modeling. Because of the complexity of most applications, we need a set of methods for modeling. The methods together with the metamodel constitute an information modeling approach. (Information modeling methods will, however, not be discussed here).

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3. The information metamodel.

As a language for information modeling we intend to use the language of first-order predicate logic, possibly extended with, for example, set theory. Thus, an information model will be represented as a first-order theory. This choice of language immediately implies two basic concepts to be used, namely: an object and an association (between objects). An object is something that is considered to have an independent existence, e g "the person Jim", "the marriage 123", "the time point 1980-04-18", etc. When we consider objects to be "connected" to each other, we say that an association exists between them, e g "Jim is the husband of the marriage 123". Another basic concept for information modeling is the "event". An event normally establishes a relationship between a time-point and associations or objects, where the time-point denotes the establishment of the construct. A typical event is "Jim is the man of the marriage 123, which was established on 1980-04-18". An event, thus, expresses a fact, about some application. The fact that Jim became the man of the marriage 123 on 1980-04-18 will, further never become false, even if he divorces at some later time. By having an event as a basic concept, we are able to non-procedurally express the relation between facts as "monthly salary" and "accumulated salary" without getting involved in problems of manipulating "state images", which is required in snapshot databases. Further, updates or deletions are not relevant in this approach, only the insertions of new events.

4. Advantages of the approach.

Besides the above mentioned advantages of using an event as a basic concept some other advantages can be identified. The language of the information model has a firm theoretical basis with deductive support. By the presence of the deductive support it will be possible to show, to some extent, that an information model is consistent. However, theories including, e g natural number arithemetic are not decidable, which implies that we only can hope to show that an information model is not inconsistent. Another important advantage of the approach of using predicate logic for modeling is that it should be

possible to further elaborate the formal definition of the semantics of a theory, i e by defining a structure for the theory. The advantages of our approach from a practical point of view are that we are able to exactly describe an application to the desired extent and to check that no contradictions are present in the description. The value of such a description is manifested in subsequent stages of the system development process.