A Propagation Strategy Implemented in Communicative Environment

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Abstract. The need for propagation mechanism in distributed environment is increasing in applications such as distributed databases, collaborative editing of Web documents, cooperative software developments etc. The propagation function required in these applications are often very different from the traditional approach. Hence, a flexible way of specifying and implementing propagation function on individual objects in distributed systems is required. We show how a propagation model with multi-class facilities can be constructed.

The motivation for the presented work is to make the propagation process as easy as possible. As a part of the data manipulation language, we have developed reusable operators for object propagation. The approach can be extended to object evolution in the context of mobile intelligent environment.

1 Introduction

In the last years, many research has been carried out in developing the Migration and Propagation Theory (M&PT). M&PT has emerged to be a powerful tool for solving various practical problems like schema evolution [13] and [17], constraint maintenance [15], supervised learning algorithms [16], activity coordination, collaboration and cooperation [12], error detection [11] and mobile data migration [10]. From the many object architectures proposed, the Multi-class Object Model is found to be effective for solving a number of real integration problems (see [9]). Several researchers have developed propagations algorithms for implementing in different types of distributed and mobile systems. A detailed survey on adequate examples is given in Section 4.

The most important feature for our propagation model is that it enables the use of existing manipulation language. Furthermore, these methods can be shared with other systems that require them, for example object migration and data replication. The intention of the presented work is to remove propagation traditional backward restrictions by focusing on the development of a efficient language extension.

To satisfy the growing needs of such advanced applications, the propagation model should be flexible, general, and extensible. Conventional model designs are neither general nor extensible. The object-oriented frameworks allow new
features of the distributed objects to be incorporated dynamically without much effort.

In order to fulfill the object evolution requirements [3], the value propagation approach is presented. Concerning physical implementation, propagation functions are specified to assure the correct object propagation and allow the user to handle all objects consistently in both backward and forward changing.

The main contributions of this paper are as follows:

1. The proposed evolution strategy is based on a uniform Multi-class Object Model with a solution for constraint definition.
2. In addition to data manipulation language, a definition of forward and backward propagate operator using the same basic algorithms is given.
3. The strategy supports propagation updates with a prototype implementation of SQL statements.

In this work, we present an adaptive propagation operator that can incrementally propagate data changes from the source to the target using multi-object framework as enabling technology. To our knowledge, this propagation strategy is the first that achieves unified value propagation: backward and forward.

The rest of this paper is structured as follows. Section 2 shows an overview of the value propagation example. The adequate operator is described in Section 3. Section 4 cites some related work. Section 5 summarizes the main ideas and give the main topics for the future.

2 Motivating Value Propagation Example

To illustrate the problem, consider the following example. Suppose we have a distributed system of a factory assembling vehicles. The vehicles are built up of components imported from various countries. The schema of all classes are shown in Figure 1, arrows indicate superclass-subclass relationships.

Fig. 1. The schema of objects