Arden-Based Clinical Decision Support in an Object-Oriented World

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INTRODUCTION

We have developed a Clinical Decision Support (CDS) system to allow medical logic modules (MLMs), written in Arden Syntax, to be integrated with an object-oriented clinical data repository system (CareVISION). The Arden Syntax was extended to implement the event triggers and data accessing mechanism which work with the repository's Domain Object Layer (DOL).

SYSTEM OVERVIEW

CDS includes four major components: The **Knowledge Base** is comprised of the MLMs used by the system. The **Editor** is used to add, modify or delete MLMs in the Knowledge Base. The **Manager** interfaces with the object layer, and manages the compiling, triggering and execution of MLMs. The **Notifier** is responsible for providing the user of the system with messages generated by MLMs.

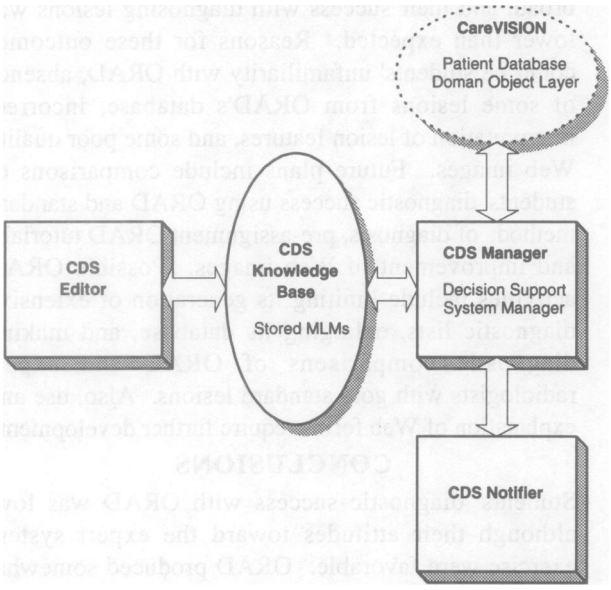

Figure 1 CDS System Components

EVOKE TRIGGERS

Triggering events are specified in terms of DOL object attributes and object statuses. These are registered in an evoke table when MLMs are compiled. The DOL generates an evoke trigger when a change is detected in an evoking object.

DATA ACCESS

The CareVISION database is designed to be accessed strictly via member function calls of OLE-exposed persistent objects. The access layer (DOL) supplies object-oriented capabilities and behaviors that allow database records to appear to an application as persistent objects. Database records can be accessed as objects from C++ or Visual Basic applications running on Windows NT or Windows 95.

Integrating Arden Syntax with the object-oriented DOL was not straightforward, because accessing the database requires execution of logic interspersed with queries, and the ability to retain intermediate query results as handles to DOL's persistent objects. The solution used in the implementation of CDS required a small extension to the Arden Syntax. The extension supports storing handles to persistent objects in Arden local variables. This is restricted to the data slot of the MLM, to maintain portability of the medical logic in the logic slot.

DISCUSSION

CareVISION is in use at several medical facilities in the United States and Canada. We have developed MLMs that are integrated into CareVISION through the CDS system. The MLMs monitor abnormal conditions in areas of order entry, lab results, and allergies. Since the rules are written in Arden, medical facilities can easily change them or develop their own using CDS.

Although Arden was designed before the object technology became widely used, several aspects of the syntax enable it to be used well with object oriented systems. The dynamic nature of the data items in Arden is easily extensible to object references, and the fact that database access is restricted to specific areas of the module allows maximum portability of the medical logic to be retained.

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