Model-Based Query Language for Analyzing Clinical Processes

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Abstract and Objective

Nowadays large databases of clinical process data exist in hospitals. However, these data are rarely used in full scope. In order to perform queries on hospital processes, one must either choose from the predefined queries or develop queries using MS Excel-type software system, which is not always a trivial task. In this paper we propose a new query language for analyzing clinical processes that is easily perceptible also by non-IT professionals. We develop this language based on a process modeling language which is also described in this paper. Prototypes of both languages have already been verified using real examples from hospitals.

Keywords: Hospital, Management, Modeling languages, Query languages.

Introduction

Hospitals are expert organizations, and one of problems is how many different expert groups (managers, doctors) are able to collaborate. Since medical professionals but not the managers carry the ultimate responsibility for the patient's outcomes, the management has a limited control over the doctors' individual bedside decisions. Therefore, a more profound involvement of the doctors in transforming the processes within their health care organizations has been widely regarded as a factor that is critical for their success [1-4]. In contrast to the professional managers who have received an appropriate training and who control the administrative resources, doctors so far have benefited to a much lesser degree from the advantages of health information technologies (HIT) for better understanding of clinical patterns. The goal of our research is to develop a business model-based method for hospital use, which would allow doctors to retrieve directly the ad-hoc information from various hospital databases which is needed in building their process-oriented knowledge for their managerial roles.

Methods

We propose a new domain-specific modeling language for hospital modeling (called MEDMOD), which borrows the most useful features from UML Class, Activity and Use-case diagrams. Formally, we define the MEDMOD as UML profile (see Fig. 1). Based on the MEDMOD language, we next propose a Process Query Language (PQL), whose purpose is to allow a doctor interested in clinical processes querying (filtering) runtime data of hospital's processes described using MEDMOD. Querying begins with choosing the MEDMOD process diagram, which describes the process under inspection, switching to the filter-

ing mode. Every activity node has an indicator showing the number of instances in *the initial dataset*.
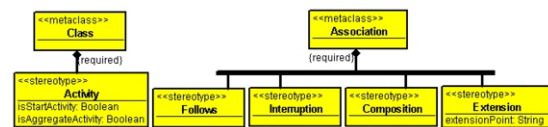

Figure 1 - The UML profile defining the MEDMOD language

Now the doctor can undertake two types of actions – she can **set filtering conditions** or **retrieve data**. Immediately after the filtering condition has been created or updated, it is applied on the dataset. *The filtered dataset* contains all instances from those transactions which contains instances conforming to the filtering condition. As a consequence, all data displayed in the diagram (e.g. the indicators of number of instances) are updated. Other data the doctor may retrieve are **time intervals, aggregate values**, like, *number of instances, sum* or *average,* meaning respectively number of instances within dataset, sum of the given attribute values over all instances in the dataset and the average of the given attribute values over all instances, and **lists** of all instances corresponding to the selected activity.

Results

The main advantages of the PQL are: 1) the view on data through "glasses" of familiar process, 2) the simple and easy-to-perceive means of setting filtering conditions require no more expertise than using spreadsheet applications (like *MS Excel*), and 3) the dynamic response to each step in construction of the query showing immediate reaction to every action.

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