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Utilization of Essential Object Description Capabilities for the Management of Virtual Higher University Processes

József Gáti, Gyula Kártyás, Attila L. Bencsik

Budapest Tech, Bécsi út 96/B, H-1034 Budapest, Hungary
gati@bmf.hu
kartyas@bmf.hu
bencsik.attila@bgk.bmf.hu

Abstract: Higher education programs on the Internet have become very popular. They make it possible to utilize advanced information and communication technology mainly at distance education. Research in this area is aimed at application of proven methodologies from information technology. One of these methodologies is model description of objects and processes about them. Basically, higher education programs fit well to model description. However, high number of highly interrelated objects must be handled and objects are local program, subject area, geographic, industry, university, and student group specific. Description is needed that can cope with this task. A modeling has been published recently that drew the attention of the authors of this paper. They analyzed that modeling considering predefined demands by practical application. This paper gives an evaluation of a recent approach to virtual higher education environments. Following this, the proposed modeling is evaluated from the point of view of description of real world cases in distance education of engineers. Finally, a possible implementation of the proposed modeling within the organization of higher education Internet portals is analyzed.

Keywords: distance higher education, virtual classroom, modeling of higher education courses, teaching of virtual engineering, Internet portal based collaboration

1 Introduction

A vision of higher education that works on the Internet, offers versatile programs instantly, can be adapted to very special student, teacher, and accreditation demands, and provides instant access to all knowledge and consultation sources is turning to reality in these days. This is possible only by a computer modeling based education system that utilizes advanced information and communication technology mainly at distance education. To reach software suitable for the demands from practice, recent works in development in virtual higher education

turn towards advanced and proven methodology in informatics. Most promising results are offered by model description of higher education objects and object based higher education processes.

Higher education programs demand description of interrelated objects for program elements, student education profiles, lectures, teaching materials, etc. At the same time, these objects require interrelations in complex objects and object related processes. Computer modeling is well suitable for this purpose. However, high number of highly interrelated objects must be handled and objects are local program, subject area, geographic, industry, university, and student group specific.

Virtual higher education installations support programs from single modules to comprehensive choice of courses. Typically, they are well-organized sites on the Internet and do not use too much advanced information and knowledge processing. This is why one of the key issues at their development is access to knowledge and application of new information technologies [1]. Because higher education is communication intensive and groups receive special programs, objectives are building learning communities in the cyberspace and development of on line classroom features [2]. Importance of virtual higher education environments is especially high in learning of employee at companies [3]. Internet and networking technologies assure learning without limits [4]. Virtual campus technology changes technical aspect of higher education both in its distance and campus types [5]. In virtual classroom, methods for self-study can also be integrated [9].

A course modeling for higher education has been published by the authors of [6]. In [7] and [8], several essential issues are analyzed and modeling methods are proposed. The authors of this paper analyzed the proposed modeling methods. They considered some predefined demands by practical application of course modeling. This paper gives an evaluation of a recent approach to virtual higher education environments. Following this, the proposed modeling is evaluated from the point of view of description of real world cases in distance education of engineers. Finally, a possible implementation of the proposed modeling within the organization of higher education Internet portal is analyzed.

2 How Model based Approach is Suitable for Every Day Practice

Development of computer aided distance education shows a trend of step-by-step introduction of advanced computer and information technology. Authors of [6] define conventional distance education, conventional virtual classroom, and model based virtual classroom as main stages of development of distance education. They compare teaching functions, teaching programs, teaching materials and

teacher contact of conventional distance education and conventional virtual classroom. It can be seen that conventional virtual classroom is not a true virtual system. Instead, it is result of efforts to replace manual activities with application of entry level computing (Figure 1).

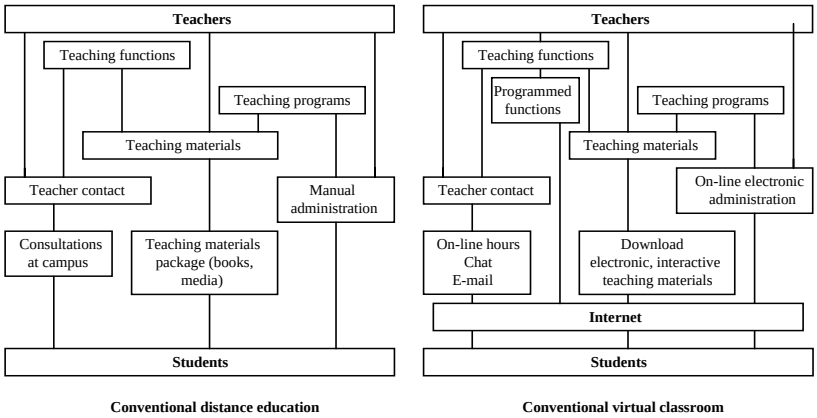

Figure 1
Comparison of conventional distance education and virtual classroom

Conventional virtual classroom is still has very important in distance education. However, it is not suitable for processing high number of organized information in order to gain a flexible and easily modifiable record of highly interrelated curriculum, teaching program, student demand, teaching process, and other information. A well-organized description of objects is proposed in [6] in the form of computer model. This model is intended as an integrator of generic teaching functions, programs, and materials as resources (Figure 2). Configured course model is constructed as a structure of instances of these resources. Classroom functions are controlled by course management programs.

The main question that what is the advancement offered by modeling. Figure 2 shows modeling resources, modeling processes and model entity instances in classroom model as three essential elements of the proposed modeling. Considering arbitrary relationships between attributes of objects described by entities, information for any situation can be recorded in a unified structure where meaning of any recorded information can be recalled, modified and completed at any time. Variants can be defined for special requirements. This is the main benefit of modeling.

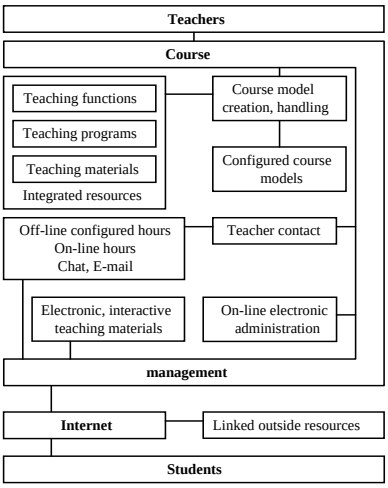

Figure 2
Modeling approach in [6]

3 Discussion on Classroom Model

Classroom model is demanded to have capabilities for description of all situations in the practice of a modeled classroom.

Virtual classroom is organized around specially configured Internet browser by using of modeling procedures for classroom and features for description of classroom objects, student profiles, and adaptive actions. Users, knowledge, and outside teaching environments are communicated by interfaces (Figure 3).

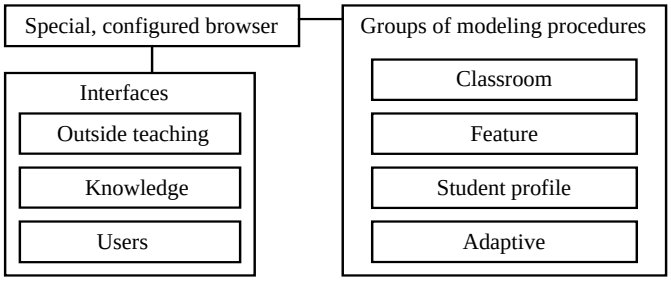

Figure 3
Environment for construction of classroom model

For the purposes of virtual classroom, an essential structure of classroom model is proposed in [7]. This structure consists of definitions for modeled objects,

modeling procedures, course model database, and feature definitions. Main advantage of this system is that classification of classroom objects supports practical applications and student profile specific model is constructed in the course of step-by-step modification of an initial model by features. Classroom, teaching procedure, database and classroom feature entities can be outlined in Fig. 4.

Characteristics of modeling in [7] includes feature-based representations of higher education objects according to demand of teaching, learning, and administrative practice, and classroom procedures for students and teachers in the form of software tools for construction and application of course models.

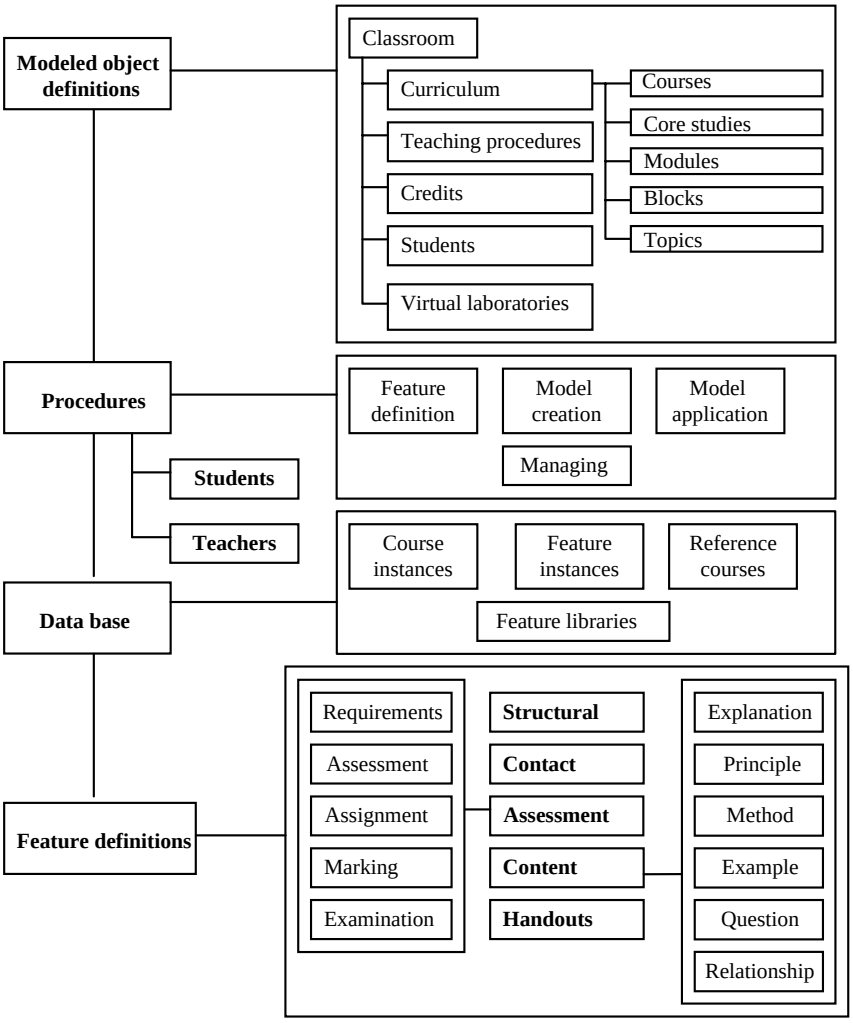

Figure 4
Essential structure of the proposed classroom model

4 About Higher Education Portal in Engineering

Model-based virtual classroom is to be implemented on the internet environment. In [8], an example of engineering for virtual classroom is outlined using industrial engineering system and one of the recent virtual classroom frameworks. Two extensions are applied, one for the virtual classroom framework, the other for the engineering system (Figure 5). Student projects can be established using Internet portal and group work functionality.

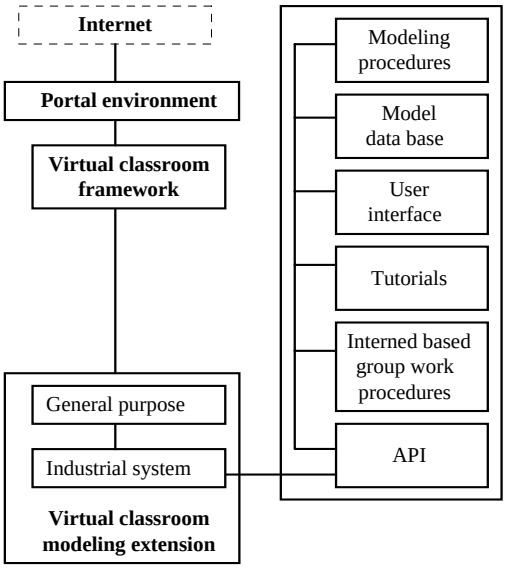

Figure 5
Virtual classroom extension to commercial software

Education in engineering relies upon laboratory exercises and student projects. In order to support laboratory activities in virtual classroom, authors of [7] proposed virtual laboratory. In the concept, workstations are configured for laboratory tasks. In the Internet portal system, product data and multi site management functions are supported by student project data and student profile information.

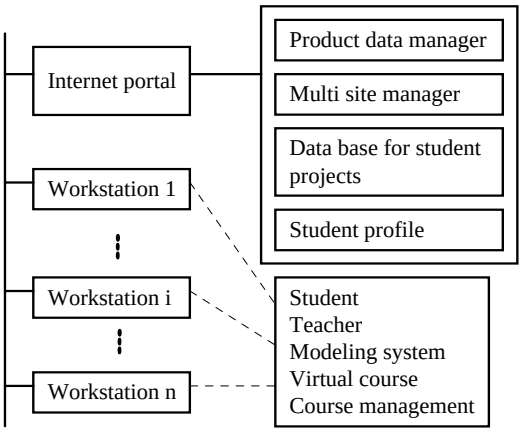

Figure 6
Concept of virtual laboratory

Conclusions

In this paper, model description of higher education objects and object-based higher education processes are emphasized and one of the recent developments in this area is analyzed. Modeling has proven as a powerful tool to establish description of high number of interrelated objects together with appropriate structural information in different areas. Arbitrary relationships between attributes of objects described by model entities can be defined in the model. Information for any situation can be recorded in a unified structure where meaning of any recorded information can be recalled, modified and completed at any time. Variants can be defined for special requirements. These are main benefits of modeling. The above advantages of modeling can be utilized by the modeling that is introduced and analyzed in this paper. Concept for integration of engineering modeling and classroom for engineering education makes establishment of virtual laboratory possible.

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