Model based Classroom for Higher Distance Education on the Internet

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Abstract: Several causes have led to a definite demand for advanced distance education where ideas, methods, and practices can be upgraded. People demanding regular learning of new advancements in different areas of practice increased the emphasis on distance learning in higher education during the last decade. Internet and modeling techniques from the advanced information technology offer high amount of methodological elements well appropriate for distance learning in an integrated virtual and Internet environment. One of the latest advancements in this area is published in [1] and [2]. Considering some basic concepts and methods from the proposals of the authors of these papers, this paper gives some methodological elements and details necessary for the implementation of the proposed method in the higher education practice. This paper starts with an introduction to characteristics of a classroom. Following this, some modeling techniques are proposed. Finally, some details of the course model description are discussed.

Keywords: Distance education, virtual classroom, Internet based higher education.

1 Introduction

Similarly to other virtual applications, virtual classroom is a classroom in the virtual world of computer [3]. Students communicate from their workstations. A high level of distance education is established. Resources of a classroom are published lectures, course materials, assignments for homework, on-line conferencing or consultation and live chats as [4]. Model of a classroom must include these resources. At the same time, virtual classroom is demanded to offer the same services as a conventional classroom. However, browseable teaching materials, links inserted for background information and other possibilities of an Internet based system facilitates introduction of much more services as a conventional classroom. At this point, the authors propose an emphasis on integrated application of virtual and conventional classrooms both in campus and

distance programs. Moreover, hybrid campus and distance programs can be configured.

The time that can be devoted by practicing people for this purpose is very restricted. This requires efficient Internet based solution and substantial computer resources both at classroom and student sides. Companies engaged in development, production or consult of engineering modeling and other areas are interested in participation of employee at efficient higher education courses. However, they may offer substantial computing and knowledge resources.

A virtual classroom concept and methodology are introduced in [1]. They involve application of managers for main virtual classroom functions. At the same time, a course model is proposed as a structure of modules and topics of the teaching program. This paper involves some additional considerations and methodological detail based on the above-cited concept. It starts with an introduction to characteristics of a classroom. Following this, some modeling techniques are proposed. Finally, some details of the course model description are discussed.

2 Managing a Virtual Classroom

A solution for a virtual classroom is presented in [1] where virtual classroom resources are under the control of cooperating managers. Each manager handles a well-defined functional area. Because student profile based versatile course is considered by the authors as a primary power of the proposed virtual classroom, role of the course manager is essential. It is very important to fit course descriptions and course handling procedures to practical demands of field teaching. This is possible only by effective communication between teachers and the virtual system. Two basic levels of a course model contain modules and topics (Fig. 1). Modules and topics are stored as objects in libraries. They are mapped to courses by single or multiple mapping. Mapping must be free for flexible configuration of courses by teachers. However, numerous constraints must be taken into account. Constraints restrict application of modules in courses and topics in modules. For example, modules are placed in courses considering prerequisite modules. Definition and description of a module may depend on the implementation environment.

Enrollment manager administrates mainly freshmen while main functional areas of the registrar manager are results of students and fees. Function area of these managers depends on the institution where the model is implemented. A serious mistake would be firm predefinition of functional areas of these managers. Communication manager controls and organizes teacher-student communication processes. Teaching material manager gives tools for download of materials, offers on line video service, sends materials by E-mail automatically and offers

links to outside sources of materials. The support and license manager establishes connection with producers of modeling and other application systems and administrates licenses. The data security manager controls data security processes.

Modules are arranged in courses or handled individually. Advanced achievements in virtual classrooms can be virtual lectures and laboratories in the future. The course manager handles them. Process manager supervises generally applicable as well as application area and implementation specific processes in managing of courses. Fixed or typical sequences of processes can be defined as complex managing tasks.

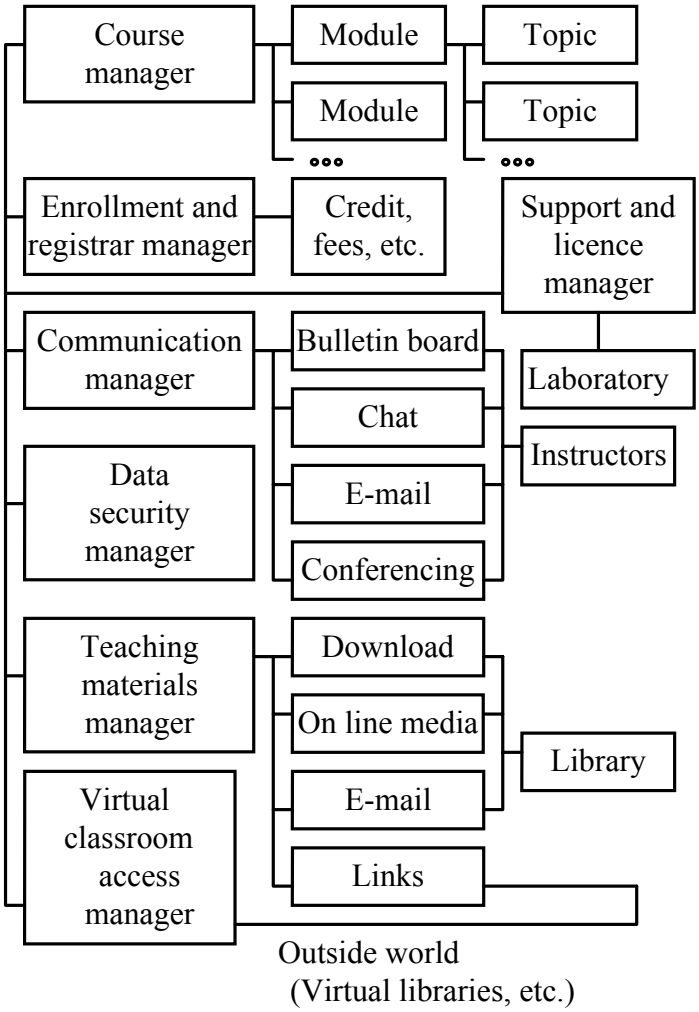

Figure 1
Set of managers

3 Courses for Classroom

Generic course definitions are applied in the method published in [2] to describe a set of similar courses. The course model for a student or a student group profile is created in the form of course instance during an evaluation of a generic course.

In the above-cited method, student demand based course definition applies three predefined resources. They are generic and earlier created instance courses and course modification features. In other words, instance courses are applied directly or they are modified by course features. Generic courses are used for creation of instance courses considering student profiles (Fig. 2). These new course instances can be modified by course features if this is necessary for making additional fine changes.

Definition and selection of courses (Fig. 2) are done by using of predefined course and course element definitions. These entities are available in the modeling system. Generic courses describe a set of similar courses. Course elements are arranged in network to be evaluated to gain course instance. Sometimes simple precedence rules can be used to create instances. It is not allowed to make any modification of instance courses by course modification features that contradict the related generic course definition. In other words, extension of custom tailoring is restricted by higher priority factors included in generic course definitions. At the same time, feature principle is also applied at definition of generic courses and creating course instances.

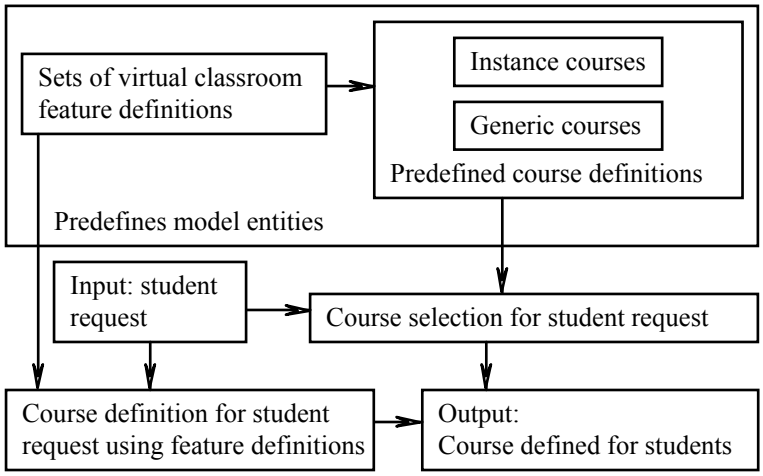

Figure 2
Definition of course

Restrictions of a course are defined as constraints (Fig. 3). Any participant of a higher education system may be authorized to define them. Previously decided

relationships and fixed entities, links and attribute values are represented in a classroom model as typical constraints. Other constraints can be originated by legislation and government act through higher education related laws, etc. Accreditation related constraints are applied at education for degrees. Measures within an institute also control teaching activities by constraints. Teacher requirements related constraints are active within modules. In a well-organized education, prospective or actual employers of students may also define constraints. Finally, students define what they would learn within a restricted area. Fig 3 shows a typical hierarchy of constraint sources.

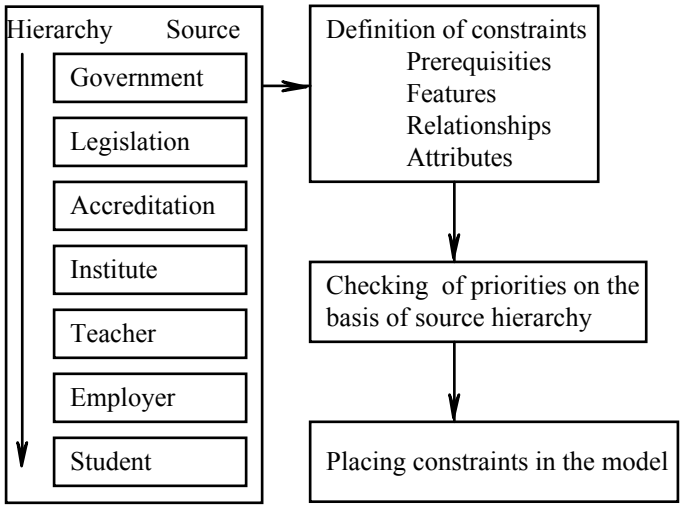

Figure 3
Application of Constraints

4 Course Model Entities

Authors of [1] applied course entity as a sequence or a network of modules. Block as an entity between module and topics can be introduced when it is demanded by complex structure of a module. A block consists of a group of topics. Authors of [1] decided application of principles, methods, relationships, questions and other practice related entities to describe a topic. This recognized as a method valuable for practicing teachers. Consequently, a topic is processed by using of topic related procedures for handling principles, methods, relationships, examples, questions, materials and instructor activities (Fig. 4). Links can be defined to other topics and outside world objects. Modules are arranged in courses or can be applied individually. Core studies can be defined for basic and essential

knowledge as modules or blocks. Finally, a course model offers a reduced choice of possible modules, blocks and topics.

Earlier analysis of classroom revealed its components and resulted entities of course model as curriculum, teaching processes, credits, students and virtual laboratories [2]. Consequently, a virtual classroom is much more than a set of course descriptions. Curriculum as an organized learning experience involves content of a degree program, provides conceptual structure and time frame to get that degree. The course is an organized learning experience in an area of the education. A curriculum is composed using courses or courses are defined according to predefined curriculum. Virtual laboratories are composed by using of software modules, software arrangements for assignments as well as results of student work as assignments and degree works. Virtual classroom is active in an environment where students, teachers and related humans and objects from the outside world are integrated. Classroom model, course instance model and outside world model communicate teachers, students and outside sites through the Internet.

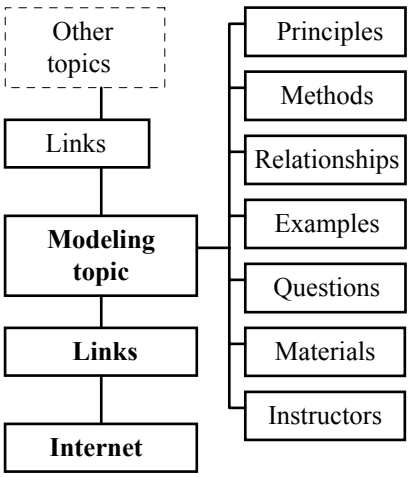

Figure 4
Content of a topic

In [2] a structured course is proposed in which modules can be grouped into tracks. This method facilitates a versatile means of modeling (Fig. 5). Great chance of implementation is assured by application of the feature principle well known from engineering modeling. A course model includes structure of its elements, feature driven construction of modules and associativities between course elements. A track has been introduced as a course element comprising a set of modules for a well-defined purpose. Tracks and modules may be applied in several course instances with no duplication of classroom model entity descriptions. By application of feature driven modeling, a module is considered as

a base feature modified by module modification features to create a customized module instance.

A purposefully selected choice of possible module modification features and allowed modifications constitute main content of a course. The teachers engaged in the related teaching program define this content. Customization provides modules that include student demand originated content in an extent as possible. Consequently, generic models are applied and used at creation their instances. At the same time, types of base and module modification features with basic model related characteristics are defined by course modeling experts. In this context base and module modification feature types are frames, final content of which are defined in feature instances.

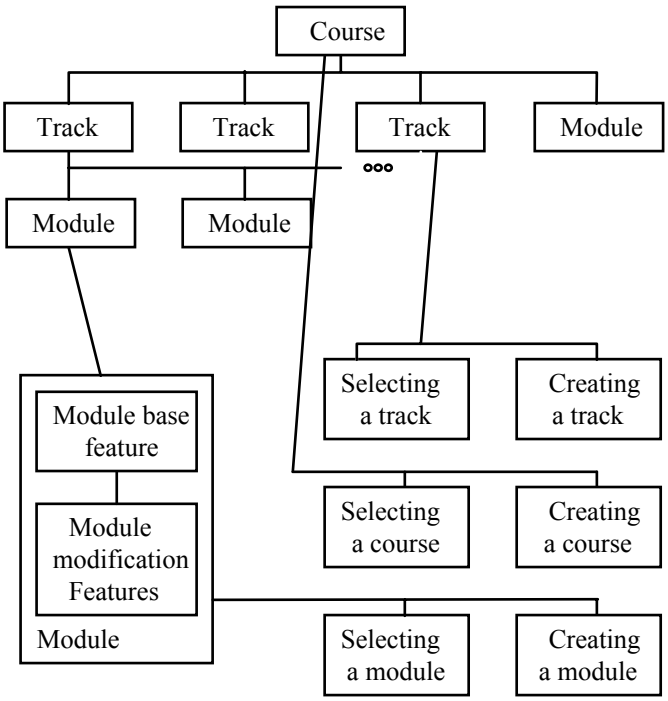

Figure 5
Construction of feature based course models

Virtual classroom procedures handle data structures for models and some auxiliary information. They are supervised by system management (Fig. 6) and are under control of accreditation in close connection with quality assurance. Teachers utilize system management and quality assurance tools at virtual classroom procedures. They define virtual classroom resources and control teaching and learning procedures. Students use special purpose browsers and application server

software for data base management, multimedia and other functions. They use Internet services to outside connections including remote teacher workstations.

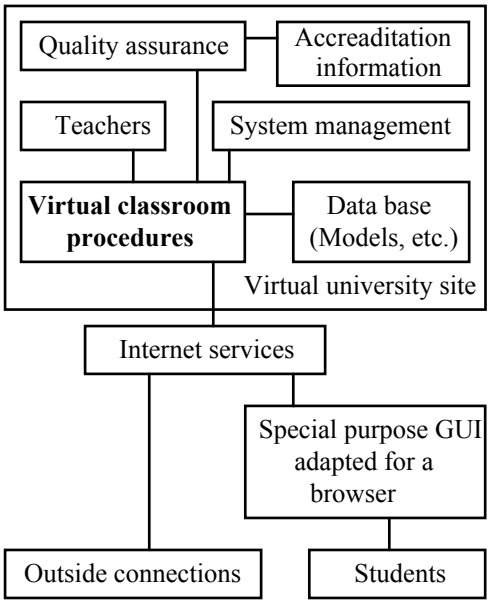

Figure 6
Virtual classroom procedures

Conclusions

Versatile and flexible higher education can be established by utilizing recent advancements of information technology urges development and implementation of virtual courses in distance education, campus based education and mainly in a mix of these basic forms of education. In this paper, some aspects and details of a virtual classroom are discussed considering the strong theoretical and methodological basics offered by an earlier published concept and methodology. Virtual classroom is composed by several groups of entities, as well as procedures controlled by managers. The most important entities are components of virtual courses as tracks, modules, blocks, topics and elements of topics. Generic and feature modeling techniques represent recent achievements in modeling. These techniques are applied to give the required characteristics of classroom models and modeling procedures.

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