The French Virtual Medical University

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Abstract

This paper is the description of a French Virtual Medical University based on the federation of existing or currently being developed resources in several Medical Schools in France. The objectives of the project is not only to share experiences across the country but also to integrate several resources using the New Information and Communication Technologies to support new pedagogical approaches for medical students and also for continuing medical education. The project includes : A virtual Medical Campus using secure access from several sites, The Integration of new interactive resources based on pedagogical methods, Implementation of new indexing and search engines based on medical vocabularies and ontologies, The definition of general and specific portals, the evaluation of the system for ergonomics and contents

Keywords:
Virtual Campus, Virtual University, Internet, Web, Medical pedagogy, Computer Assisted education, Document Indexing, Search engine

1 Introduction

Like any human activity, the initial and continuous medical education must face up to the economic constraints. It must also be reactive with the fast evolution of the organizations, of the production of knowledge and technology. Providing good quality medical training needs to use not only the educational institutions but also the New Technologies of Information and Communication (NTIC). Since 1995, several Medical School have developed tools and contents accessible by Internet for this aim. This university " Without walls " makes it possible to structure the individual projects and to offer tools allowing:

- **The teachers**
  - to prepare teaching supports,
  - to test and modify their courses.
- **The students**
  - to find relevant support systems and content for training
  - to permanently have a set of self training methods available and a variety of evaluation systems.
- **The medical school,**
  - to manage the whole education process, by choosing the method of teaching the most

adapted to the aim in view,
- to evaluate the effectiveness of this remote formation according to the services offered and their use.

2 Context

To present in a simple way the tools used on the Internet for pedagogy and teaching, we will classify them **in lesson modules** such as clinical teaching cases or knowledge bases and in **training tools** where the interaction between the users and the system or teacher is important.

The teaching modules, relate to all the medical specialties and all the training levels. It is obviously not possible to quote them in an exhaustive way, but we will retain here :
- The project such as "The Visible Human dated Set "[1] from the National Library of Medicine, which is used as support for many sites of anatomy and inspired other projects.
- The simulation clinical cases bases of the American universities such as Web Doctor[2], The Patient Simulation[3], The Interactive Patient[4], the assisted reading of Loyola at Chicago[5] or in Europe, dermatology at Erlangen [6]. On the French sites, some universities offer medical lessons with accompanying notes (radiology, histology, etc) [7].

The Internet training tools, include the general communication tools and all the knowledge research and knowledge base projects.
- University sites propose interactions between teachers and students including the electronic mail, forums, the virtual meeting, the learning assistant, problem based learning modules [8]
- Other projects developed mediation tools between users (student and teaching) [9] and users of the knowledge bases [10].
- We also classify within this framework, work on factual biomedical bases in a teaching environment [11, 12] or work on virtual organs [13].

In the medical university projects, associating the criteria selected, we will quote "The Learning Center of Interactive Technology "[14], Mayo Clinic [15] and in France, the virtual universities of Grenoble [16], Lille [17], Marseille [18], Nancy [19], Paris [20], Rennes [7] and Rouen [21].

3 The French Virtual Medical University

3.1 Objectives

With the tools and contents already available or under development, this Medical Virtual University (MVU) project aims : to conceive tools to index the resources and to seek contents in a conceptual and contextual way (what one could call intelligent search engines adapted to the medical language), to develop various teaching approaches using the contents of the clinical and factual data bases and finally to take into account the scientific results of Evidence Based Medicine in the diagnostic and/or therapeutic decision-making.

3.2 Distributed Knowledge bases

The NTIC [22, 23] support the organization and the diffusion of encyclopedic knowledge bases. These bulky bases of rough resources, now available on Internet are used in our project, but they are raising some obstacles to their use:

- These knowledge bases did not integrate in an explicit way a teaching project [24]
- The only commercial search engines, based on the indexing of the words of the text, do not allow anymore the selection of relevant documents in large sets of resources. The introduction of semantic concepts into specific medical dictionaries [25] [26] must allow a natural language search [27] [28].

3.3 The distributed training

The initial medical training must support the acquisition of knowledge and qualification while integrating the moral, physical, psychological and socioeconomic range of actions and decisions. It must also develop the autonomy of the student in her training to prepare her/his continuous training.

3.4 Quality standards of sources of information

The multiplication of the documents in electronic form on the Web requires the use of criteria of evaluation. Recent publications show the need for controlling the quality of health information on Internet [29, 30]. Others tackle the problem of the quality of delivered information. They propose a set of criteria making it possible to evaluate the quality of the medical Web sites regularly [31, 32].

4 Description of the project

4.1   The Virtual Campus

The installation of a virtual university requires to ensure administrative management and especially the teaching management on the lessons. The virtual campus takes all its interest if it allows, not only to support the access of the teachers and the students to the resource servers of their university, but also to carry out inter-academic courses.

It must be based for small teaching groups, managed by an appointed professor, sharing common resources, following a common teaching course, but freed from time (the course of each student can be individualized) and space (by Internet technologies). This project rests on Extranet protected network, usable by the teachers and taught as well on the University Campuses or University hospital or from any wandering station.

The management of the students must be organized in working group according to their profile and lessons which they wish to follow. A given teaching group must be able to reach a given group of resources, defined by the teacher. This group of resources can be found in a site, or call upon resources disseminated on several sites.

The management of the lesson rests on the concept of 'tutorat' : medical teaching, being based on fundamental knowledge, aims at the acquisition of a practice.

The Resources servers allows to acquire, manage and file the medical multi-media resources (images, texts , documents,...) according to descriptive, semantic and pathological criteria's. This server must become a resource for the teachers in order to build teaching supports adapted to the various types of students or to create new teaching helps using the resources of the NTIC. Thus, these supports will be usable for initial or continuous teaching and particularly in remote teaching.

The resources server has an architecture in three levels, including a web server that represents the interface between the navigator of the teacher and the resources server. Developed in Java,

it consists in six principal services : creation of resources, creation of classifications, classification of there sources, seeking resources, administration and statistics and a directory which will manage the links between the resources and their three types of objects. It will be based on the X500 standard.

4.2 Indexing documents

The indexing is declined according to two layers , the indexing of the medical sites and the indexing of the contents, i.e. the documents delivered by the sites.
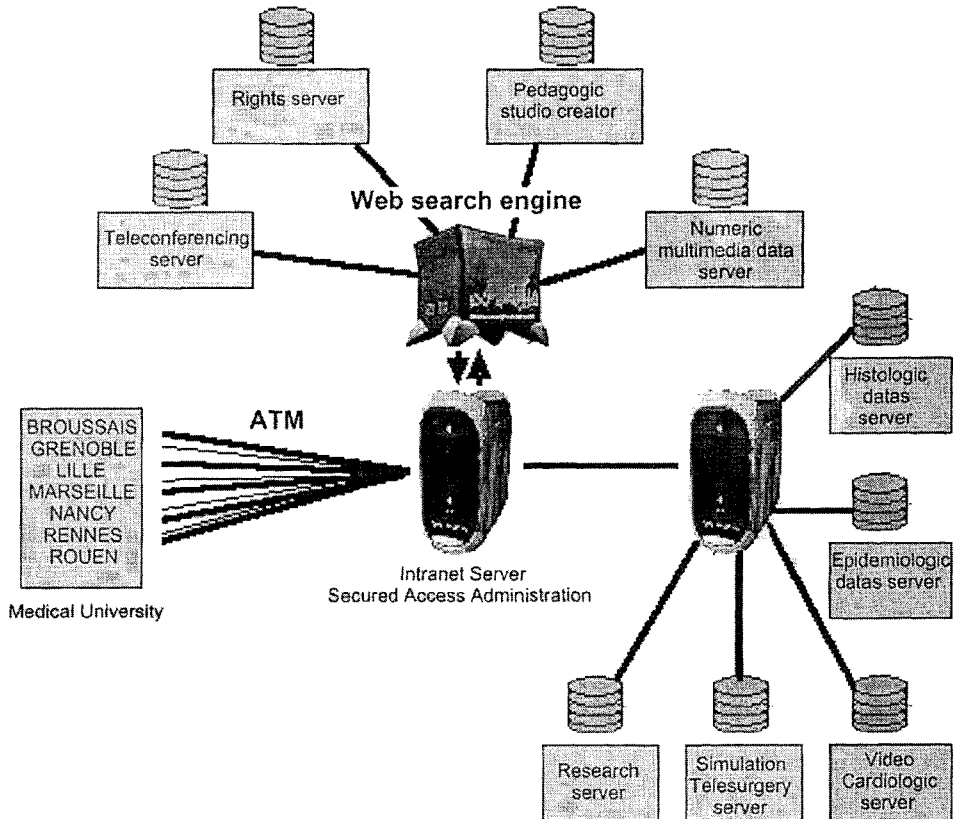

Figure 1: The resources server architecture.

4.2.1 Indexing of the medical sites

The first objective of this work is at the same time to represent the elements making it possible to characterize medical sites according to several dimensions, for example medical specialty, public concerned, standard of contents, etc. Another objective is to organize these elements in order to meet the needs of the various users of the MVU and then to integrate this description according to several dimensions in the functionalities of the MVU by

automating the indexing for the sites . This " knowledge available " makes it possible to better direct the user within a large and multiform knowledge. It will be formalized for the needs for the MVU.

4.2.2 Indexing of the contents

To optimize the access to relevant information in the layers of medical knowledge, it is necessary to take into account the 3 following points: a common reference frame, a suitable organization of medical knowledge and an effective access to the data.

- Common reference frame

The exploitable collection of information and their search through networks require a standardization of the vocabulary used. The constitution of a reference frame to which all the actors will use **a common semantic description.** The MVU Thesaurus will be based on Unified Medical Language System developed by the National Library of Medicine with an aim of reaching sources of different information with a single unified language. MVU will use an another standard tool for organizing information: the Dublin Core meta data format. The preliminary work undertaken by the teams taking part in the project showed the interest of this approach [33].

- Organization of medical knowledge

The homogenization of the access to medical knowledge requires first that their organization is in agreement with the conceptual organization of the common reference frame. This way of computer-supported cooperative work makes it possible to guarantee quality in contents (indexing, semantic relations) and the relevance of the access.

- Access to the data

The problem which a user encounters lies in the fact that each source of information offers means of access which is clean for him, which obliges it to be familiarized with each one of them. Our objective is here to facilitate and make easier, and if possible, give more transparency in the access to specialized but heterogeneous sources of information.

4.3   Virtual desk of the student

In this application, the installation of tools and powerful co-operative interfaces (for example, the CSWEB developed within the framework of IconoWeb in Rennes [23]) in the management of the Man-Machine interactions takes a central place.

4.3.1   Cognitive and ergonomics aspects

The interfaces suggested to the student in the existing virtual campuses remain poor and suffer from the language in which they are developed. If they can be used by motivated scientific students, they quickly become unbearable for all the rest of the students. A study of the activities of the students in period of training with the assistance of ergonom makes it possible to study the constraints which the interfaces must support so that the student manages her/his documents and her/his training under the optimal conditions.

4.3.2   Organization of virtual space and man –machine interface

The realization of the virtual desk depends at the same time on the disciplines that results of the preceding point : thus the anatomy can be taught not only with "boards "which one can find in paper form but also with 3dimensions anatomical objects

associated with the possibility of visualizing different structures (bodies, structures, vessels, nerves...), to make cuts... In the same way physiology is based on dynamic and interactive models . Finally all the clinical disciplines call upon tools and "virtual patients " using all the media (Images, sound, video) which must be taken into account by the interfaces.

4.3.3   Evaluation of knowledge and new docimologies

In the context of the initial formation, the traditional techniques of medical knowledge evaluation (Quizz) remain of course available but simulation systems already exist to conceive virtual clinical cases starting from the answers to the questions or actions suggested. Thus it is possible to follow the advance of each student learning. In this context, a Virtual Medical University must be able to innovate as regards docimology while putting in an interactive way new controls of knowledge acquisition. The student would pass her/his examinations to the Medical school, on a microcomputer placed at his disposal.

4.4   The office of the teacher

The Man-Machine interface must be able to answer the same requirements as the student desk with some changes related to the needs of the medicine teachers.

4.4.1   Cognitive and ergonomics aspects

The use of the experiment of the ergonomists to the benefit of the teaching activities is a need. The interfaces have to manage the teaching space of work and the access in an optimal way to the documents and resources to organize them in lessons. Models proposing a preset framework, make it possible to adapt simply to the type of selected formation and the level of student (course, clinical case, training by problem, self-teaching, control of knowledge, written document).

4.4.2   Creation and re-use of knowledge and encyclopedic bases coupled to a teaching project

This coupling requires three stages:

- To undertake a research on the methods and tools necessary for teaching taking into account cognitive aspects.
- To produce generic tools which will be placed at the disposal of the teachers of the MVU, for teaching purpose. These tools will allow two types of activities : the creation of new bases or the re-use of encyclopedic knowledge bases within the framework of a teaching project.
- To try out and evaluate these tools in the course of the medical studies.

4.4.3   Producing teaching documents including the new teaching approaches PBL, TCR

The goal of the PBL (Problem Based Learning) is to support the training of fundamental sciences by the students while enabling them to create cognitive links. The objective of the TCR (Training of the Clinical Reasoning) is the acquisition of clinical competence. In both cases, the students are brought to use a variety documentary resources. They especially need to establish links between these resources which requires homogeneous teaching documents validated by the teachers and an indexing of the teaching resources [34].

4.4.4 Knowledge and Empirical practice of expert

A teaching assistance, structured according to the method of Evidence Based Medicine is facilitated by the installation of standardized tools making it possible to the professors to set up their lessons. We will analyze it in 4 successive stages :

- *The first stage of this standardization relates to the identification of the medical field to which the method is applied*
- *The second stage concerns, once the isolated field, the installation of the course.*
- *The third stage, consists in extracting from the literature the relevant data making it possible to clarify the contents of teaching.*
- *The last stage will determine how it will be possible to pass from a scientific document to the problems of a precise patient.*

4.5   Quality standards

The MVU as a whole must respect the same quality standards of information and knowledge. A single grid of quality standards within the MVU is endorsed by the steering committee. We have the objective that the latter becomes a "de facto standard" for the evaluation of the quality of the health and medical information in France. This grid must be accessible by each future user from the MVU, that it is student, teacher or part of "general public". Each resource of the MVU can then be assessed with this grid of quality standards. The leading committee of the MVU remains the guaranteeing one of this fundamental role. The role of this grid is to improve the quality, the reliability of the resources of the MVU and consequently the confidence of its users in this one.

5   Discussion

This ideal project of pedagogy adapted to new communication and information technologies must be able to structure and federate the existing efforts of the teams of the project to create a true" French-speaking Virtual Medical University " using common tools and functionalities. The realization of this project consists in the interfacing of existing products, around a convivial platform.   The existence of resources and important medical contents, makes it possible to consider a real use by the teachers and students during the beginning of the experimental phase.

The awaited benefits of this work are multiple .

For the students in initial formation, such a project calls upon diversified training resources helping him to get her (his) autonomy. The Virtual University in Medicine will not be able to replace the training given by the teachers, but it should make it possible to reconsider their place in teaching. The student must be gradually brought to control the contents and the tools for his future continuous training. This project, by the diversity of the approaches, the settings in situation, will help the students to identify their needs, to find information necessary and to integrate the strategies of decision actively. All the tools and documents used are usable in further medical education, where the University must preserve a privileged place. Indeed, the modules of further training developed by several universities will reinforce the attractivity and the personalization of this continuous training. The "Virtual Medical University" must take part in the research undertaken in medical pedagogy, in particular by avoiding a drift towards the reproduction of the models of current formation. All the actors must invest themselves and take an active part in the existing groups and become partners of this evolution.

We will insist also on the general repercussions of the medical informatics aspects of this project. The installation of common reference frames, powerful Man–machine interface, inter working for indexing and search of the basic bases and work on the quality of the resources will be reusable in all the medical fields apart from the teaching aspect. We will also be able for example, to use it for the applications intended for general public which will be able to benefit quickly from these developments.

6   Conclusion

The project as a whole takes part in the French-speaking virtual university ambition which will give access on the Internet network to teaching and data-processing quality resources. It is based on a consortium of Medical schools which already produced prototypes of the tools and methods recommended in the project. However the consortium is opened to other partners on the basis of co-operative and complementary project both at the content level and at the tools level.

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