

# Architecture of a Learning System for Between-Peers Distance Continuing Medical Education: the DIACOM Forum

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## Abstract

*A large part of the Computer Supported Collaborative Learning systems proposes learning for students in initial education, at school or university. Consequently, an interesting research problem consists of developing and evaluating the use of a distance computer mediated between-peers learning system dedicated to professionals in continuing education.*

*For this study, the medical domain is very interesting in order to experiment with this kind of system. In fact, in medical education it is current to use methods of learning based on problem solving. This learning is mainly performed in meetings during which discussions take place*

*The DIACOM forum enables the distant computer mediated operation of these learning meetings. The aim of this paper is to describe the DIACOM forum functioning and the DIACOM architecture.*

## 1. Introduction

Computer Supported Collaborative Learning (CSCL) systems are between-peers learning systems, mainly dedicated to teach problem solving [3]. Nevertheless, a large part of the CSCL systems proposes a focus on students in initial education, i.e. education at school or at university. Consequently, a research problem consists of developing and evaluating the use of a distant computer mediated between-peers learning system dedicated to professional continuing education.

The medical domain is very interesting to experiment with this kind of system. In fact, in medical education it is current to use learning problem-solving methods through meetings during which discussions take place. These discussions aim to evoke and debate diagnosis problems about clinical cases.

The DIACOM forum offers a distance continuous between-peers training activity, dedicated to Continuing Medical Education (CME). Its principle is based on the sharing, confrontation and discussion about clinical cases.

Its first function is to allow physicians to describe their own cases. Thus, it permits them to be in touch with other practitioners whose cases share common subject and important point of view differences.

Thus the aim of this paper is to present the DIACOM forum functioning and its modular architecture.

## 2. Between-peers computer mediated distance education

Few years ago, research in Computer Supported Human Learning (CSHL) are interested in the distributed and collaborative angle of learning. Interaction functions like chats or discussion forums are largely under-exploited [10]. Consequently, it is interesting to construct tools to be integrated into distance education platforms, and to favor between-peers distance learning.

The research domain called CSCL « Computer Supported Collaborative Learning » aims to define and experiment group learning environments using collective activities like problem solving [4]. Most of these environments are focused on proposing group problem solving activities, more or less supervised by teachers. Some of these systems are particularly interested in interactions that take place between learners during CSCL sessions [1].

One of the theoretical fundaments of these betweenpeers learning systems is the socio-cognitive conflict. So, to obtain a socio-cognitive conflict, learners' answers need to be heterogenous. This heterogeneity enables a student to note the existence of other alternatives [5]. Thus, the conflict solving allows the different interaction partners to develop a new cognitive individual competence.

It is also important to underline the positive effects of argumentation on the learning of partners during the conflict resolution. According to [2], a student in interaction with others learns from their different points of view, but also from his or her own formulation, explanation, and argumentation efforts (self-explanation effect). Obviously, argumentation is more efficient when each participant has had previous individual reflection on

the subject.

### 3. Medical Context

Usually, between-peers learning are realized through studying and discussing concrete problems. In the medical context, these problems are mainly clinical cases. These are examples of solutions reached through the diagnosis and therapy of patients. Thus, between-peers learning in the CME framework is first based on casebased learning. A current approach consists of having physicians study cases described by experts. Many books and medical web sites are then dedicated to clinical cases descriptions. However, the more a physician experiments, the less interesting the explanations of the clinical cases are to study. In fact, physicians prefer to be more able to share cases with their peers. This is why continuing medical associations organize periodical meetings during which cases are brought up and discussed. These meetings enable physician mainly to think about a problem, and then to debate his opinion with other participants. The sociocognitive conflict between learners is thus very important.

Therefore, meetings during which this kind of learning is possible are periodical and physicians are present. Then, practitioners frequently have not had enough time to frequently participate in this kind of meeting. Some research aims to develop between-peers learning CSHL systems in the medical domain.

The interest for the design of between-peers computer mediated distance learning is very recent in the medical domain. Some recent research is dedicated to the design of CSCL medical systems ([8],[9]). Nevertheless, the main part of the projects are particularly interested in initial education. In CME, few tools aim to support online interactions between peers in an educational framework. Obviously, discussion forums are considered as a support used more and more by CME associations. However, generally these discussion forums contain a huge number of contributions. Therefore, frequently, a participant prefers to put a new question online instead of making contact with somebody who has previously asked a similar question.

This is why there exists a real opportunity to permit the distance sharing of clinical cases and the confrontation of physicians' points of views about these cases. This is possible by designing a system managing concrete experiences and by inciting discussions around themes proposed by these experiences. It is the DIACOM forum objective. The DIACOM forum is an information system for distance education that enables between-peers learning, based on discussions about clinical cases.

### 4. The DIACOM forum

The DIACOM forum is mainly based on a clinical case description. Moreover, it encourages discussions among physicians whose cases share common points of interest.

We would like to interest new medical domains and new medical practices. Therefore, we have chosen the pediatric pain management domain. In fact, it is difficult for a physician to diagnose a disease in a young patient. Children are frequently not able to describe their symptoms and the physician must consult the parents about their particular behavior. Moreover, before a physician can treat the pain, he must evaluate it. Strategies and pain evaluation methods are frequently complicated by the youth of patients [6]. The DIACOM forum is dedicated to this specific domain.

Thus, the DIACOM forum offers physicians the opportunity to submit new clinical cases. In the DIACOM forum, a clinical case is considered as a sequence of steps called *scenes*. Each of these scenes represents a collection of elementary concepts called *entities* that describe the patient's features. In order to proceed to the following scene, a scene must contain a conclusive *action* too. This action represents the decision the physician has taken or would take in faced with this situation.

Once a physician enters a new case, the underlying system performs, a pairing process between new and previous cases. This pairing process is based on domain dependent criteria. The first criterion is called the *pathology* of the case. The second criterion is called the *object* of the case and represents its objective related to pain management (evaluation or treatment). Finally, the third criterion is the problem solving *strategy* elaborated by the physician in the case.

This pairing process aims to encourage discussions between the authors of similar cases. As well as being linked through their similarities, the cases are also identified by the differences in opinions expressed by the physicians. The aim here is to introduce people who deal with the same problems but who have different approaches in solving them. This provides discussions based on a socio-cognitive conflict.

### 5. Forum Modules

The DIACOM forum is made up of three modules : the *interface module* that manages interactions between users and the system; the *data module* is designed to make a list of various data's models used by the system; and, finally, the *pairing module* which is in charged of the processing realized by the system to manage pairing between cases.

#### 5.1. The Interface Module

The interface module proposes two user interfaces. The

author interface, DIACOM-IA (DIACOM Interface for Authors) allows a physician to simply describe his experience. The current author interface version is developed in Java.

The discussion interface, DIACOM-ID (DIACOM Interface for Discussion), constitutes the part of the interface module that enables the management of discussions between learners. Obviously, discussions proposed on the forum are asynchronous. In fact, the aim of the DIACOM forum is to provide a tool for physicians that is easy to use and that works without any time or place constraints. Moreover, in the first step, an authorized physician accesses a *customized page* in which he is informed about pairing related to his own cases. Then he can link to the paired case description or directly to the related discussion page, corresponding to a pairing. He can also link to all the current discussions in the DIACOM forum. These two interfaces are at the center of the collaboration management.

## 5.2. The Domain layer and model layer

The domain layer manages all the data manipulated in the DIACOM forum. This data layer is modeled by a model layer that has been previously detailed in [7]. This model layer contains two models: a generic model and a specific model.

The generic model is independent from the DIACOM forum application domain. It allows one to generate a case structure model, through the *case level*. A case mainly contains a series of scenes. When an author depicts a scene, he describes entities about his patient. In addition, the physician has to describe the *Action* performed in this scene. Moreover, the generic model suggests a model of entity types and action types. This model is called *Concept types level*.

The specific model contains all the domain dependant data, according to the pediatric pain management domain. This model aims to structure the information extracted from cases and necessary for the pairing, and also the information about pairing.

Therefore, the domain layer contains all the data manipulated in the forum. These data are constituted according to this model layer. Thus, in the domain layer, we can find four levels. The first one aims to store cases described by physicians. It is called the case level. The second one stores all the concepts described and manipulated in cases (entity types and action types). This level is called the concept type level. The third one contains all the criteria extracted from cases and necessary for executing the pairing (criteria level). And finally, the fourth level maintains a list of pairings that have been underlined by the system (pairing level).

The pairing module of the DIACOM forum mainly

updates these two last levels.

## 5.3. The Pairing Module

The pairing module manages the process realized on cases to constitute couples of relevant cases. These couples of cases are those that present not only similarities in accordance with sure criteria, but moreover, important differences in accordance with other ones.

By the way, the pairing module executes two main algorithms. The first one is named *criteria extracting algorithm*. It allows the extraction of the pairing criteria from cases (the pathology, the object and the strategy). Next, the second algorithm is the *pairing algorithm*. It makes use of the last extracted criteria in order to compare them with those from the criteria level. The pairing module selects cases with similar pathologies and objects but distant strategies, then those with distant pathologies but similar strategies and object, and finally those with similar objects but distant pathologies and strategies.

Once a relevant case is extracted, the information concerning the pairing and the reasons for this pairing are stored in the pairing level. Discussions can now take place.

## 6. Conclusion

Once the DIACOM forum generic modeling was realized, a first experimentation phase was carried out on the pediatric pain management, in order to test the efficiency of models and of the architecture. These experiences have allowed us to finalize the specific model and the pairing module. On the other hand, the author interface might be completed soon in order to be tested by experts of the pediatric pain management. Once this interface is validated, a second experimental corpus will be ready to be collected. This corpus will validate our conclusions on the pairing module. A complete prototype of the DIACOM forum will then be finalized and validated by the users, physicians in continuing education.

## 7. References

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