AGENT BASED ADAPTIVE EDUCATIONAL CHAT TOOL MODEL

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ABSTRACT

There are many adaptive educational systems . These systems depend mainly on the student model that stores information related to the student, including the level of knowledge the student has in concepts , Domain model which organizes the sequence and the structure of the educational materials, and also the adaptation model which performs the adaptation paln. Some of these systems use in its functions additional tools such as chat rooms. The problem of the chat rooms in these systems that they present the participants either students or teachers in the same format. Since the majority of students in open education do not know each other personally because they don't attend traditional class ,it is impossible to identify the most appropriate peer to discuss the concept with .Therefore, all students will discuss directly with the teacher about the concept , causing high pressure on the teacher prevented him from answering all inquiries of the students and thus lose a lot of the students their chance of discussion.

Through this paper we present a model to solve this problem. Model depends mainly on the student model and domain model to arrange the students with different colors within the chat room . These colors indicate the level of knowledge of the student participate in the chat room, and thus show in better way the most appropriate peer for discussion with him about the concept. This will distribute the discussion within the chat room among students and reduce the strain on the teacher. The model depends on a variety of smart agents to perform the function required. 1) Adaptation agent   2) Interface and 3) monitoring agent .

Key words: *Collaborative Adaptive, Open University , AHA! , Agent ,Adaptation*

1. INTRODUCTION

Several years ago universities started to use E-learning, concentrating on online teaching materials delivery to their students distributed in different geographical areas, researchers tried always to find out solutions for the problems usually face the pedagogical process within the online education, starting from building web sites for courses, online exams, online feedback, and finally adaptation of pedagogical process according to many factors take place within this environment, such as student learning style, preferences, constraints, etc. researchers in this field tried to find solution for two adaptive problems, one related to the way by which the teaching material will be presented to the student and the second to the way by which the student will follow web site links.

Open universities need exactly theses two techniques of adaptation, since it has students from diverse background, different learning style and preferences, but its not enough in such university, OU has other pedagogical methodologies beside online courses, OU generally conducts direct meeting and discussion among students as well as their teacher [20]. This approach is considered as one of the most important element in the online education structure in the university. In such collaborative discussion technique the teacher and also the students usually face many problems which can strongly make this technology loose its effectiveness and weaken its performance in achieving the objective of use. The following points summarize these problems:

- Guiding the discussion and controlling it by the teacher within the whole session may makes it difficult for him to answer all inquiries submitted by the students and thereby a lot of students will loose the right of discussion and get the required information, this often leads to the loss of many questions raised by students because of the overloaded questions submitted in the discussion room.

- Most students usually enter to the discussion room, without any kind of orientation and thus begin dealing with the discussion room as ordinary

chat room, discussion is often without specific goals and this leads inevitably to a loss of required interest.

- The discussion in the discussion room does not have any kind of monitoring or even evaluation, therefore not possible to know the knowledge obtained by students through the discussion.

This paper is looking for the appropriate methods and techniques to state the solutions for these problems, shouldn't that focus the discussion on the teacher but making a collaborative discussion among students as well as the teacher, since the students in open education rarely have their own personal knowledge about other students. The proposed system should provide the suitable technical methods to guide the students to choose the right person in the discussion room. This person must have the necessary knowledge to be able to provide for other students and the system must give the student the appropriate interface in the discussion room by which the student can determine the level of knowledge of other students. For those students who do not have enough knowledge may be useful to the student, there is no importance to their presence in the discussion room but vice versa is not the same case, this student may appears to the other student discussion room whether he has the necessary knowledge to provide for others. The system must also specify the subject of discussion and not let the discussion be opened in various concepts. This may be under the control of the teacher who must be present in all discussion rooms that appear to all students.
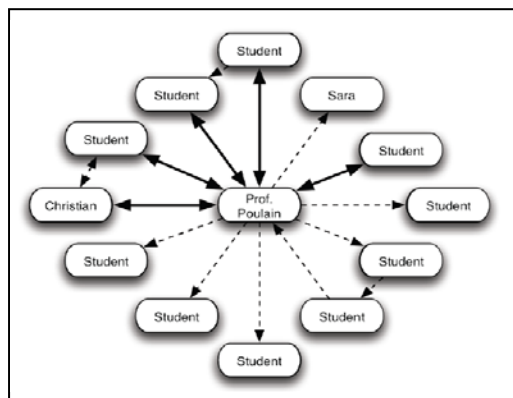
2. Background and related work

2.1. Chat rooms in education
The Chat feature allows participants to have a real-time discussion via the web. This is a useful way to get a different understanding of each other and the topic being discussed the mode of using a chat room is quite different from typical internet forums. Chat contains a number of features for managing and reviewing chat discussions .The chat is used usually in the universities which has e-learning systems . The difference between discussion in face-to-face classrooms and virtual classrooms is shown in figur1 and 2 .

Figure 1: *Traditional Discussion With Teacher*
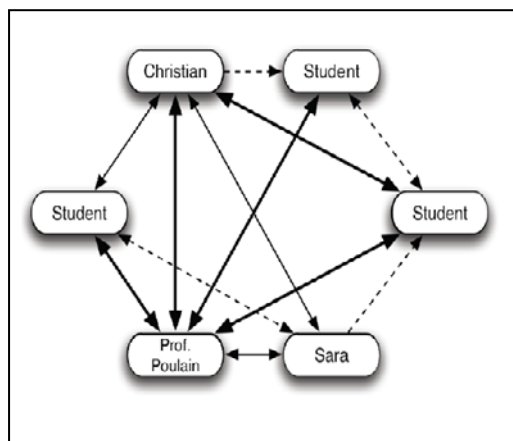
Figure 2: *Online Discussion With Teacher And*

2.2. Instant Messaging (IM)
It is an Internet-based protocol application that allows one-to-one communication between users employing a variety of devices [30] .As shown in figure 3 the basic architecture of IM is described .
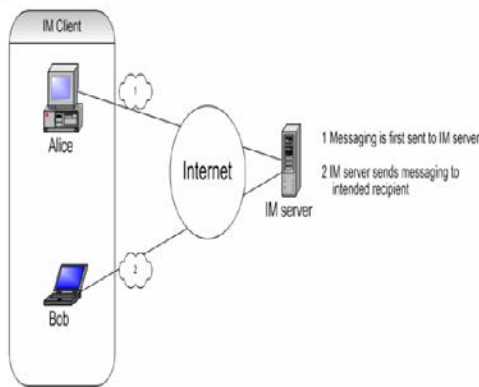
Figure 3 : Basic Architecture Of IM System

Linan Zheng in [21] made a comparison between several systems of IM . This comparison is described in table 1.

Table 1 : IM Systems Comparison .

System	Advantage	Disadvantage
Jabber	open-source XML-based decentralized server architecture	More or less a concept, not complete and so popular
	ICQ	not an open-source protocol security aspect synchronous communication leads to slower many operations on client-side
MSN Messenger	asynchronous protocol(SIMPLE) many functionalities centralized server architecture	not an open-source protocol Integrates heavily with Windows target for viruses/hackers
Yahoo! Messenger	centralized server architecture excellent integration with Web powerful chat room	not an open-source protocol many distractions for user: games, advertising, radio weak security features

In figure 4 we can see the interface of Jabber IM system .

Figure 4 :Jabber Messenger

2.3. Adaptive systems:

Adaptive systems are systems which can alter aspects of their structure, functionality or interface, in order to accommodate the different needs of individuals or group of users and the changing needs of users over time [1], adaptive systems consider many factors such as user characteristics, user modeling techniques, tasks are being performed and information characteristics, these characteristics should be arranged in models in order to use them in the adaptation process, these models are different from system to system, but generally most systems use models like user model, domain model, and interface or interaction model [6]. Brusilovsky in 2001 divided the adaptive hypermedia into two parts, one is adaptive presentation and one is adaptive navigation, most of adaptive hypermedia systems built on this taxonomy, generally adaptive presentation is the most known adaptive systems, adaptive presentation means tailoring the user interface according to many factors related to the user and domain model, on the other hand, adaptive navigation tries to help the user to follow the suitable links which match his learning requirements and style, Brusilovsky in his taxonomy discussed many approaches for both adaptive presentation and adaptive navigation [3]. Some examples of adaptation systems are listed below .

- AHA!: Adaptive Hypermedia for All [7, 8, 11, 12].

ALE: Adaptive Learning Environment is an *Figure*
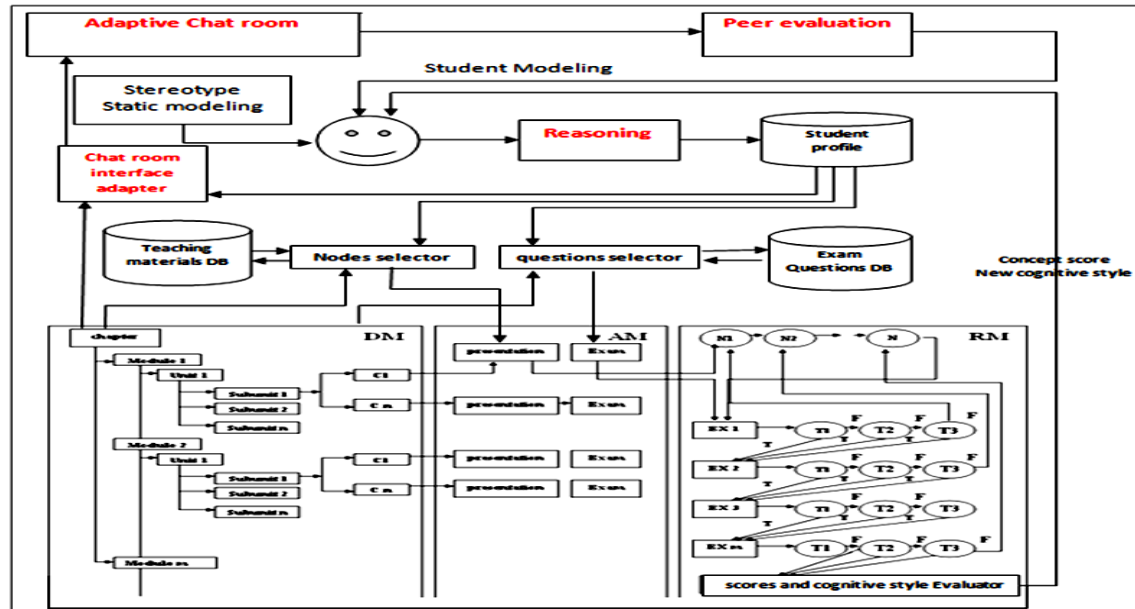
5 : Proposed Model For Virtual Classroom

- environment or a toolset and framework for creating adaptive courses [13].
- AMBAD: A tool that should simplify the creation and provide means for running adaptive courses on the base of information anthologies of domains [18].
- ELSA (formerly known as Hezinet): An adaptive hypermedia system used for Basque language learning. [9, 10].
- InterBook: is a tool for creation and presentation of adaptive electronic textbooks [14].
- SQL-Tutor: is an e-learning system for SQL language. It is built on a Constraint-Based Modeling [15].

Some other systems tried to involve intelligent agents to support adaptive hypermedia .Basing on previous models, most adaptive hypermedia

systems have three main components work together to provide adaptation, user modeler, adaptation engine, and interface components.

We discussed too in previous paper a model for adaptive virtual classroom called as adaptive presentation and e-testing based on student modeling and course sequencing in virtual classroom [22].This model is shown in figure 5 .

2.4. Student Overlay Modeling

Overlay model considers the user model as a subset of domain model [19]. It means that entries about the learner knowledge are related to each concept in the domain model, this way enables the system to evaluate the student knowledge level which can be used for adaptation techniques. Adaptive strategy consists of a set of rules like if-then rules; these rules can be used as the following syntax:

- UM.DM.attribue for User Model attributes, for example UM.C1. Know= 70%, it means the learner's knowledge about C1 is 70% from the total knowledge in the domain model.
- PM.DM.attribue for any attribute to be manipulated by the presentation model, example PM.C1. show= true.

3. AGENT BASED ADAPTIVE DISCUSSION ROOM .

As discussed before the chat room is another facility used by the Open University, AHA! Or even any other adaptive system included our proposed model in figure 5 can be suitable for online adaptive courses in such university . As we are designing integrated online virtual classroom we can use our model as a base for adaptive learning . It has the main component which we need to run our proposed chat room , the user model and user profile which is a database to store student knowledge level and cognitive style in addition to some other information .

The proposed chat system has three main objectives:

1. Invest the functions provided by our proposed model in figure 5 as adaptive online presentation

and navigation in the open university to state the knowledge level about the concept to be discussed in the chat room .

2.   Introduce a proposal to add a discussion room as another element of the adaptive systems works to create customized user interface for each student according to his needs that allows making the collaborative discussion between students and not concentrated towards the teacher. The system must take into account the capabilities of other students in the discussion room and their knowledge about relevant topic of discussion.

3.   Find the optimal solution for the representation of knowledge acquired by the student through discussion with other students or with the teacher in order to update the student Profile for that student and append the new knowledge in relation with concept of discussion.

This system should establish adaptive interface depending on the user and domain models which collect their information originally through the student attendance of adaptive online courses. This information is the key element in building the proposed system and determining the performance of the proposed system .

Three agents are required to work within the system .They are described in the following :

A . Adaptation agent

This agent works on the server side . It is required to perform the following tasks :

1. Access the students profiles stored on the server and extract the last concept studied by the student and its score .
2. storing all the students score in a buffer and sort them in descend way .
3. exclude the students who don't have any knowledge about the current concept .

It is preferable to use bubble sort to sort the table which can be built as two dimension array .

B. Interface agent

Interface agent works on the client side . It will receive the sorted students score from adaptation agent . and determine the position of the current students within the line of the

scores as seen in figure 8 .The students who has knowledge lower than the current student will appear by the interface agent with red color , while the students who has higher knowledge will have green color ,the students who has equal knowledge level will have yellow color .

Student	A	B	C	D	E	G	H	I	J
Concept	C5	C5	C5	C5	C5	C5	C5	C5	C5
Score	92	88	83	79	78	66	63	56	53

Figure 8 : Sorted Students Score In The Current Concept From Adaptation Agent

Interface agent can use binary search to find the right position of current student .

C. Monitoring agent .

Monitoring agent is an agent also works on client side used for extended student modeling . The agent will provide the two peers involved in a discussion in the chat room with a questionnaire once one of them or both close the chat . The questionnaire has a multiple choice questions related to the knowledge level acquired by the students during the discussion . Monitoring agent also responsible of analyzing the answers of the questionnaire and give a score for both sides . This score will be added to the current concept score stored in the students profile . As an example : Current student : F with concept C5 = 72 will be inserted in after student E by interface agent . Interface agent will mark all students with different colors in the chat room interface . The students with higher knowledge will be in green color , Equal knowledge with yellow color and lower knowledge with red color . As a result of this discussion we can describe the overall architecture of the proposed adaptive chat room as in figure 9 .

As any Adaptive educational system User and Domain model are required to organize and store the data about the course content and student characteristics and knowledge .During
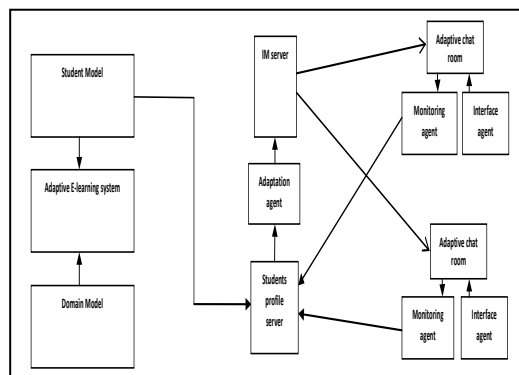

Figure 9 : Architecture Of The Proposed Adaptive Chat Room

the course the students learn concepts provided by the domain model .The students will have a score as a result of multiple choice exam . This score

which is stored in the student profile will be used to adapt the interface of the chat room .

4. EXAMPLE :

User model data related to concepts are stored with its weight, for example $CH1.c1 = 80$, this means that the student knows about the sub concept c1 belongs to chapter 1 80 points, this estimate reflects the degree of the knowledge obtained by the student during his study of the concept through online lessons. Table 2 shows an example for student X with other 3 students having a course of software engineering. This data about the students model are gathered and stored in the students profile during the online lectures using the suitable tools for user modeling .

Table 2. Domain And User Model For Students In The Discussion Room

Topic: software engineering (SW)					
DM		X	Y	Z	W
Ch	MR	weight	weight	weight	weight
CH1	75	63	82	64	94
c1	70	70	80	60	90
c2	60	50	70	40	92
c3	90	60	92	78	95
c4	80	70	85	75	96
CH2	73	17	23	19	25
c1	90	66	92	75	98
c2	80	0	0	0	0
c3	50	0	0	0	0
c4	70	0	0	0	0

According to this example the interface of the chat room will appear as in the following figure 10 for students X ,Y , Z and W respectively as we use customized Jabber chat room.

Interface agent will provide each student with one customized interface. Taking our previous example discussed in table 2, Each student has different interface introduced by interface agent based on adaptation agent table .

Figure. Adapted Interface For Student X ,Y ,W And Z

5. Conclusion :

Through this paper we tried to get solutions to the problems raised in the introduction, where we are trying to get support for the subject of direct discussion at the Open University, which is a fundamental element of pedagogy in such universities, after studying many adaptive systems we found that our proposed model in figure 5 could be the pedagogic system for open education. This model provide educational material in adaptive manner taking into account levels of students and their preferred method of education and also their background knowledge on the subject. These systems also retain important information about student progress in a certain concept using a weight for that progress. Since other adaptive educational systems do not support the direct online meeting or discussion we found that the addition of a new part to support this discussion is a necessary issue in open education, but this addition should be integrated fully with the previous system and provide adaptive environment for the student discussion to solve the problems mentioned in the introduction, through the idea that the discussion would be a cooperative, that is, among students in general and not with the teacher only this intends to solve the first problem, while the second problem concerning the lack of students pre-knowledge about the subject of discussion, we found that setting the discussion for a single concept is an optimum solution, also the sort and color metaphor of the participant list in the

discussion room according to the knowledge weight extracted from the student model and comparing with current student leads to help the student to determine quickly and easily other students who possess the necessary knowledge and is able to assist the student, in the third problem and final, which related to control of the discussion and to reflect the result on the student model. Proposed solution is through the evaluation of the discussion process. All of these processes will be implemented by the creation of intelligent agents and without interference from any person.

6. FUTURE WORK

In the future work , the implementation for all smart agents described above showed be executed .In addition to the integration process between the adaptive educational system and the adaptive chat as shown in figure 5 .

7. ACKNOWLEDGEMENT

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