A framework of the seminar-typed virtual classroom system for asynchronous participants

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Abstract: This paper proposes a framework for AVC (Asynchronous Virtual Classroom) that allows each learner to communicate with others in a classroom at anytime. Many seminar-typed VC systems to solve the geographical distance problem have been studied. However, most of them are limited with the necessity of time-sharing. Therefore, we focused on the solution of its time-sharing problem by means of asynchronous learning environment with video and simulative discussion. In these environments, a learner is able to refer the learning material or the past discussions, to communicate with others at anytime, and to make notes of the lecture with the personal/shared notebook tool. The system accumulates and manages these interactions in order to reuse for later learners. In this way, AVC system encourages both individual and collaborative learning. Especially in this paper, we describe our framework and its prototype system.

Keywords: Virtual classroom, distance learning, video on demand, asynchronous communication

1. Introduction

It is getting more and more common to communicate with each other in a cyber-space. This movement, called CMC (Computer Mediated Communication), makes ordinary school-based classroom change into virtual one [1]. Some researchers apply CMC to the lifelong learning environment [2-4]. There are various studies of virtual classroom/school [5-7]. Some researchers studies a cognitive model in the collaborative environment [8-10], others studies how to realize the ideal virtual classroom. For instances, Murray studies on ideal virtual classroom designing [11]. A kind of such “virtual classroom” in the cyber-space has the availability to solve not only spatial problem but also time-sharing problem among users in essence.

It is evidently convenient for users including learners and teachers that they can study in a virtual classroom/school at anytime. There are lots of well-known commercial software for authoring a seminar-typed courseware system. They have the purpose to encourage individual learning using WWW and to support instructor’s making, editing and authoring materials. Most of them might apply to integrate popular asynchronous communication tools like e-mail or bulletin board in order to propose asynchronous communication spaces. However, the ways to utilize the results of the communication

among users in these systems are mostly to display plain text as communication log [12]. We think it rather better to use these log more convenient and practical in order to increase opportunities to communicate with others. Hence we have been developing the system AVC (Asynchronous Virtual Classroom) that allows the learners to participate in it at anytime [13]. The idea is that these logs can be used as animated reproduction in which each statement is displayed by a series of relative time in asynchronous learning environment. This paper describes about AVC's framework, virtual classroom organizing and its latest experimental use.

2. Asynchronous virtual classroom

2.1 The scenario of AVC

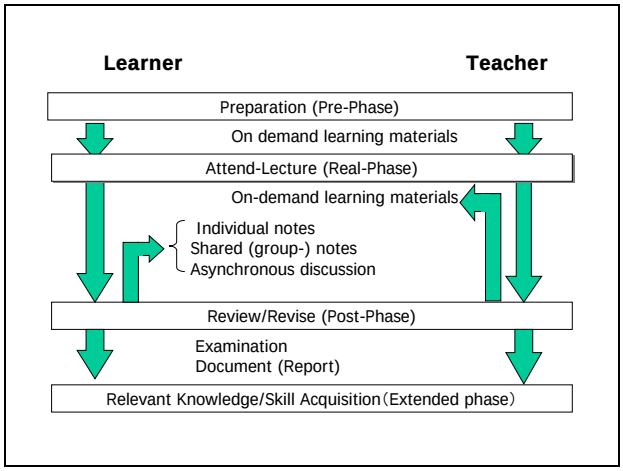

Figure.1 Lecture phases

The AVC system aims at supporting the total classroom activities. In general, the lecture has three or four phases (See Figure 1), e.g. pre-phase (preparation for the lecture), real-phase (attending a lecture), post-phase (reporting or summarizing about the lecture), and self learning-phase (relevant knowledge or skill acquisition individually). We have applied these phases to the AVC.

- Pre-phase: A teacher prepares the material, makes the story of the lecture, or collects additional materials. Meanwhile, a learner has the preparation, e.g. reading the text, retrieving on the internet, etc.
- Real-phase: The virtual seminar environment proposes to the learner that they can refer the learning materials on demand and past discussions and so on as mentioned in the later paragraph. Then, the outcome of this phase would be individual/shared notes and text-based/objective discussions. In this phase, a learner may join the same classroom again and detect the differences between the one of last login time and the current classroom. On the other hand, a teacher can revise the learning materials through watching and analyzing the outcome of the participants. In this way, both the outcomes of the participants and learning materials will be revised.
- Post-Phase: If a teacher constrains learners to report the lecture or to take an examination through the AVC, the system must propose the function to edit and to be submitted these on-line documents.
- Extended-phase: It seems sometimes necessary to acquire the profound or broad knowledge/skill concerned with some topic of the lecture. However, as this phase depends on each learner's fashion to learn, AVC does not support explicitly.

2.2 Concept of AVC

Figure.2 shows the concept of AVC. Its main purpose is to demonstrate asynchronous virtual learning environment. A learner is proposed learning materials that are video, simultaneous slides and some

advices in a virtual community space. The instructor may be seen in the video material like school-based lecture. A learner is able to join the asynchronous communication space among other learners. To monitor the learner's action, especially communication with others, enables to reuse these action. If a learner wants to take notes, s/he is able to use a notebook-tool. This action also reuse to the later participants. All action-logs/knowledge are open to public in the AVC.

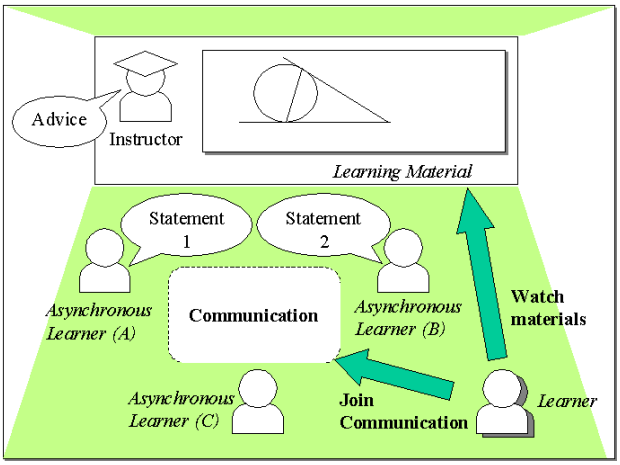

Figure. 2 Concept of AVC

2.3 Simulative Reproduction of others' action

Figure.3 shows the time flow in AVC. If learner-A gives an utterance (1) at certain time of the lecture by keyboard, her/his action is acquired in the server-side database as an action log. This utterance appears on the later learners' user interface (B's, C's, and D's) with the picture of her/his face. Learner B can be aware of assumed learner-A's asynchronous existence and her/his statement. In case learner-B replies to the statement in the AVC system, a dialogue between A and B will be appeared on learner-C's virtual classroom. Then, C might reply to the dialogue, or give new utterance additionally. Of course answerer may be the instructor. The virtual dialogue interval used later classroom are not absolute but relative time. In this way, dialogues among asynchronous participants are acquired and reuse in AVC's environment.

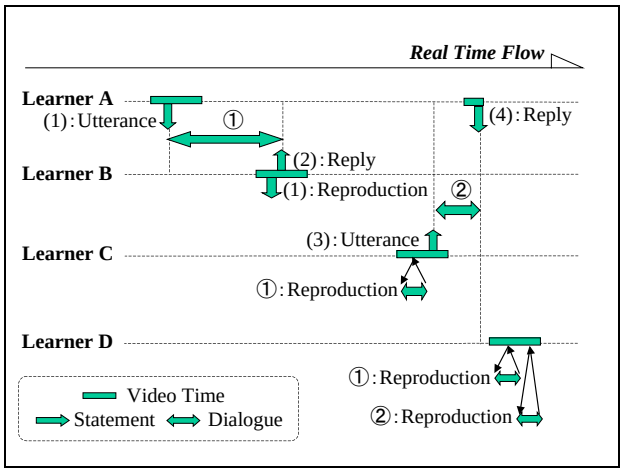

Figure. 3 Time flow in AVC

Since AVC system abbreviates the past discussion, each statement that past learners have made in synchronous or asynchronous communication tools has to go to the tune to the relative time in each lecture. The first statement in a discussion goes at the relative time (RT) from the beginning of the lecture. As to other statements, the system calculates the start time in the way to summate RT plus each statement's calculated interval time. AVC system allows user to register under an assumed name and picture. Then each statement is displayed on the statement's owner picture in RT order (See Figure.3). In that environment, there are some cases that a learner wants to ask some questions or to comment on his/her opinion during watching a discussion. Of course, s/he can, but without stopping its discussion. Then the statement is added at the relative time of the discussion. If s/he wants to cut into the discussion, s/he must start new discussion with a new title. In this way, asynchronous discussion will spread or continue.

3. Organizing a virtual classroom

3.1 Virtual Classmates

The number of members in the classroom is small at the beginning. However, a number of participants may join it as time goes on. The problem is that appearing all virtual classmates or reproducing all dialogues is complicated for both human being and workstation. There are various ways of realizing how to filter classmates. For example, it is available to construct by fixed members or all members through a lecture. But there are no constrains in AVC cause a learner can participate in it alone. Therefore AVC adopts a way to construct the classmates of non-fixed members through a lecture. The system elects and changes classmates when a certain dialogue is requested to display by a learner. Learners to be elected are those who made statements at the past lecture. Then a current learner refers the dialogue among them and joins it if s/he wants.

3.2 Filtering the dialogues

It is taken it for granted that AVC enables learners to retrieve topics from past utterances among users. Otherwise, we have another supporting method that AVC filters dialogues appeared in the user interface. The dialogues' topics as titles are come into view as relative time goes on with video material in a lecture. Our continuous experimental use made us found that so many dialogues were started in a lecture at a time. Therefore, the system has to have a function of filtering dialogues adjusted a learner's interest. In order to do so, the system must detect the interests of the learner. The AVC system has 2 methods to detect them as follows:

(1) The learner can register the interesting topics or keywords to the system at the time to join the AVC system (explicitly detection).

(2) Monitoring the learner's action and analyze them throughout a lecture makes the system to detect the interests (implicitly detection).

The result of these methods will be reflected in the user interface, in which the titles of discussions are indicated at each time range area. If a learner wants to see each statement, s/he can push these buttons. But otherwise, a learner can also see the list of the titles of past discussions and their statements.

Figure. 4 An example of user interface

Figure. 4 shows an example of user interface implemented classmates and dialogue organization when a learner requests a certain dialogue. As the system proposes the environment to be registered the nickname, picture (URL), comments etc. of each learner, the system displays them. Furthermore, the system detects the current state of each learner (e.g. log-off, chatting, referring materials) and the icon on the right side of the picture shows the state. The statements in the past discussion are shown in the balloon area in turn based on the relative time in the discussion.

4. Experimental use

Table. 1 Abstract of the evaluation

	Participant	*Communication Tools*	*Function*
1st day	Synchronous	Chat	-
2nd day	Asynchronous	E-mail Bulletin board	-
3rd day	Both	Chat E-mail Bulletin board	AVC's

To evaluate the effectiveness of AVC, we have experienced the system for 3 days with fifteen students continuously (See Table.1). At the points of subjective view, we have the results that compare two system of plain-text log displaying system (A) and animated reproduction system (B). About 69 % of the users answered that system B is better to see the past discussion and to recognize speaker. But only 6 % of the users feel stress of time and answered system A is rather better (see Figure. 5).

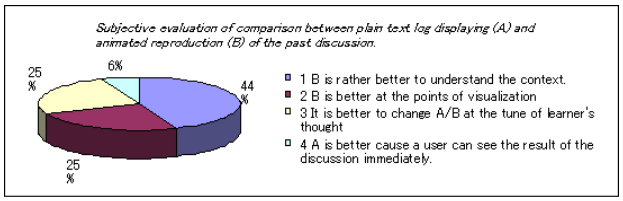

Figure. 5 Result of questionnaire about simulative reproduction of past dialogue

Figure.6 shows the organized dialogues and each numbers of statements through a lecture. At the first day, we have constrains the system only to use synchronous communication tools and let testees to participate in AVC at the same time. We have 4 dialogues that have total 124 statements in it. At the second day, learners are constrained to use asynchronous tools and to participate in it asynchronously. At last day of our experiment, we have provided all functions of AVC and no constrains.

The result indicates our proposals are available to increase asynchronous communication in a lecture. Compared to the first day, synchronous communications in the third day are decrease properly, because learners merely happen to meet each other in the AVC's virtual community space. However, there are asynchronous dialogues more than the second day.

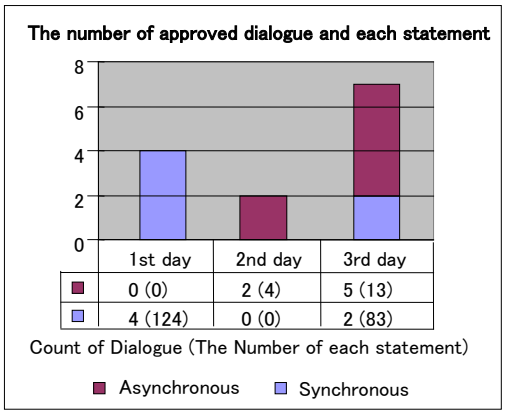

Figure. 6 The number of approved dialogue

5. Conclusion

This paper describes about AVC's framework. Especially, we propose the method of how to realize the animated reproduction of past discussion for an asynchronous virtual classroom and to organize the virtual classmates. The last topic of this paper is the evaluation of our proposals. It indicates our proposal AVC increases the opportunities to communicate with other users at anytime. But there weren't many members as testee in our latest experiment. So we did not have the manifest result for our classmates-organizing function, because a lot of testees must be necessary for the function.

The aim of this contribution was only to enhance

the chance to communicate with asynchronous participants and to propose convenient environment to a learner. But we have the plan to improve this study in which the system promote the suitable information to the learner's environment and to adopt more adaptive functions to the individual learners. For instances, engaging the knowledge-map in AVC will enhance learners' knowledge acquisition and visualizing the discussion structure will help learners to be aware of the intention of each statements.

We are convinced that the architecture of AVC is useful and accommodate to asynchronous participants. We believe it important that the system makes learners communicate each other in the virtual classroom. We will have continuous experience making a collection of public users on the internet. We have implemented the system with Java and XML.

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