

Internet Based Telemedicine & Distance education System

Seok-Soo Kim, Gil-Cheol Park
Dept. of Computer Engineering, Dong-yang University, 1 Kyochon-dong, Punggi-eup, Youngju-city,
Kyongsang North Province, South-Korea, 750-711
Email :sskim@phenix.dyu.ac.kr
school of Multimedia, Hannam University
Email: gcpark@eve.hannam.ac.kr

ABSTRACT

The telemedicine & distance education system that this paper suggests has been designed on the CTE(Collaborative Telemedicine & distance Education) framework, which is an integrated multimedia environment. This is a CBM-based collaborative telemedicine & distance education type, different from the conventional doctor based general practice, and is an integrated multimedia telemedicine & distance education system capable of many application developments using information super highway.

This paper presents the content regarding electronic medical examination chart and data treatment for efficient medical examination and prompt treatment by realizing mutual conversation type remote medical examination system among 3 parties(patient, doctor, pharmacist) on internet base.

And, The implementation of this new learning system should be designed with multimedia application development platform base which is interfaced with computer engineering, computer network technology, CSCW (Computer-Supported Cooperative Work) technology, and education engineering

1. Introduction

Recently increased Internet use, introduction and advertisement using home pages on Internet, extended utilization of Web (World Wide Web), multimedia based information services on high-speed networking environment open the new era of information society.

In accordance with the improvement of standard of living, demanding a support of comfortable life, support of safety, importance of health, increasing frequencies of entertainment and game, searching for convenient and effective business process, and searching for high quality of cultural life become real. These feature are natural chases toward to be advanced countries. In accordance with this trend, development of various state-of-the-art equipment made telemedicine feasible. Telemedicine system requires the communication technology and multimedia technology (audio/video) to support medical process which is located distantly between doctors and patients and fulfillment of content of telemedicine software development for effective medicine to the situation.

Also, The multimedia distance education is concentrated an interest about new education methods by join an education engineering and an information communication technology. Recently, rapidly increased PC communication and Internet use, education and introduction of educational institution or advertisement using home pages are extended and educational modes are pursued to open education through integrated multimedia distance education system in cyberspace which is not limited to traditional classroom oriented education. The implementation of this new learning system should be designed with multimedia application development platform base which is interfaced with computer engineering, computer network technology, CSCW (Computer-Supported Cooperative Work) technology, and education engineering, however, development of application takes time and costs. To resolve the problem of implementing the application development, distance education should be processed on CBM-based integrated multimedia environment[1-4].

2. Collaborative Telemedicine & distance Education system : CTE framework

CTE, which intends to be suggested by PC-based collaborative telemedicine & distance education system, is integrated multimedia framework to develop general applications of multimedia. This system an application system developed by SDK, was developed on Window 98/2000 and Window NT Server.

CTE system is a framework that extracts common characteristics of CSCW(Computer Supported Cooperative Work) and Groupware, objectifies them, and prepares a session management layer to organically control them,

in order to provide collaborative distributed multimedia environment, so that application developers can easily develop applications for collaborative distributed multimedia cooperation. The structure of CTE is divided into multimedia application layer, user connection layer, application program connection layer and core function layer. The agent of CTE, located between application program connection layer and operating system, is middleware that provides functions to help develop various multimedia applications. Besides, CTE system provides service processing on the demand of users, media, network resource management, voice control, integrated management of session, applications developed by CTE, and a monitoring function on used resources.

All services provided by CTE start on demand for applications, and the result of service handling is reported to the applications. From an application user's point of view, if necessary resources are requested through user application interface, regardless of the use and allocation of resources, service provider of each resource provides possible service for applications.

Also, applications of CTE-based Telemedicine & distance education system have all the functions, such as real time video conference and multisession, and the need of multiparticipant. They also provide various modes of medical general practice, such as independent general practice(a medical general practice by the expert system of provided database), telemedicine & distance education(direct general practice of a doctor), an individual general practice and a cooperative general practice(conference general practice). As another characteristic, the software structure of CTE has a completely distributed duplicate structure unlike a conventional client/server structure. Therefore, even though the number of participators in a general practice increases, response time has a constant characteristic. Besides, bidirectional, that is, a collaborative multiple function is possible; for example, dynamic change in the roles of a session manager like in when the doctor calls the patient, or the patient calls the doctor [5].

1). Multimedia Application Layer

This is a layer where various applications developed by using the CTE framework, and where choices are made on application services such as telemedicine & distance education, electronic approval, video conference, and evaluation [6].

2). Application Connection Layer

This layer is used for application development by means of the CTE agent and various functions which are included in the CTE agent are provided in the form of class library; therefore, it is used to realize the functions that users require.

3). Core Procedure Layer

Core procedure layer is where constituent functions necessary for multimedia application development are provided, and its functions includes session management, a service agent, and other additional application functions, which are necessary for implementing a collaborative environment.

Session management conducts its function to maintain and manage all information on sessions, including a medical general practice given on networks. To do this, a global session manager and a local session manager, a participant manager, and a message interpreter which is in charge of interpreting lots of message brought about in a session progressing process are all needed.

The service agent is intelligent modules that provide various functions carried out on a service request of applications, and it supports application sharing, including access control, and concurrency control. Application sharing technology of CTE is an important technology that not only makes usable the application program of an individual operation type, which is commercialized among multiusers on networks without modification, but also converts it into a collaborative application.

The function to use additional applications is provided in order to make use of commercialized applications, and makes it possible to add functions necessary for session operation, such as browser or DB connection for the Internet use.

3. Telemedicine & distance education on the CTE framework

3.1 Design of intelligence type cyber doctor base

Total configuration is made by using Windows NT, asp, html, photoshop, and access in web page type. General configuration of web page is made by using asp where web server programming of NT base is possible.

Image configuration is made by using photoshop, and D/B configuration is made by using access program easy to realize.

3.2 Telemedicine scenario

- 1) Required information is provided for the users who need consultation with regard to health through internet.
- 2) Patient can be examined at hospital more conveniently in case of wanting to receive medical examination at near hospital through medical consultation provided on cyber.
- 3) Medical examination data of patients who are suffering from large operation or long chronic disease are connected to this site, and the stored data can be used anywhere.
- 4) Medical examination data is checked and medicine is prescribed at any pharmacy through personal ID.

3.3. Cyber doctor data flow

Relation type database is realized by using WinNT 4.0 which is an operation system in order to operate opendoctor site, using IIS 4.0 which is web server program, using SQL and Access 97 for database of medical examination data with members during web operation, and using ASP language, VBScript, and JavaScript in order to handle DB.

Data treatment is different between general member and charge member and between doctor and pharmacist, and service access right is endowed according to this, so certification of each members must follow. Login and certification treatment diagram of each member of cyber doctor system is shown in figure 4. Common field part of such members is supposed to include member ID, password, member name, sex, resident number, grade, home phone number, cell phone number, mail number, home address, e-mail, recommended ID, class, member check question, answer, point, etc., and difference between members is determined by class.[7, 8]

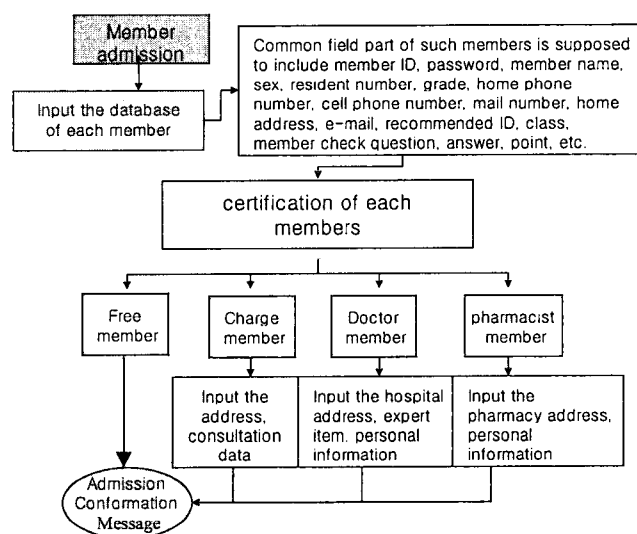


Figure 1. Login and certification treatment diagram

Charge member can request consultation to expert, and when requesting consultation, doctor is selected first and then the content of consultation is inputted to doctor. When doctor finishes consultation, charge member can see the content of consultation. Doctor receives the content of consultation first and then performs medical examination, and the medical examination data is opened to charge member. If this consultation data is presented to pharmacist for medicine, the pharmacist prepares medicine.

3.4. Distance education scenario

- 1) The teacher prepares a lesson plan using the editor provided by the distance learning system, and the lesson plan is kept in the database of the distance learning system.
- 2) The teacher dispatches an invitation message to the proper students who have joined the environments.

- 3) Each student participates in the distance learning system session using his or her name.
- 4) The teacher distributes the lesson context to the students, and a lesson starts.
After the lesson is activated, questions and answers are done interactively in the session, and examinations can be taken by either on-line or oral.

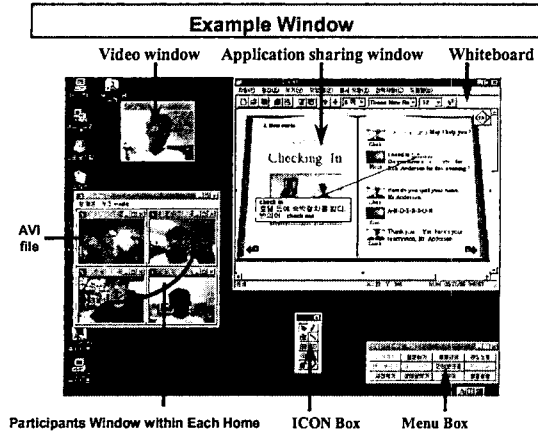


Figure 2. Example of Distance Education

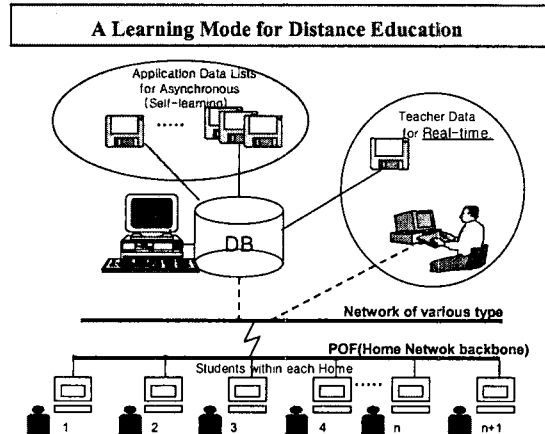


Figure 3. A learning mode of distance education

4. ESTIMATION AND COMPARISON

A growing number of hospitals worldwide are implementing hospital-wide Picture Archiving and Communications System(PACS). A great deal has been written on the advantages, disadvantages and cost benefits of PACS. A merit of PACS same as the following table which are a depository, maintenance expense, development costs, efficiency(storage, speed) and flexibility.

Table 1. Web service of CTE system

Item	off-line hospital	Various telemedicine	Other web service	Web for CTE system
Transcending of time and space	X		O	O
Free consultation	X	X	O	O
Medical treatment	O			O
Supporting for medical treatment	O	O		O
cost	high	high	low	low
member	X		O	O
On-line service	X			O
Object oriented DB	X	X	X	O
Web service	X	X	O	O
Interaction	X			O
Distance Education	X	X	X	O
Video conferencing	X	X	X	O

Table 1 shows performance comparison and analysis among existing hospital, existing remote medical examination system, other similar system, and this system(cyber doctor), and general matters show convenience and efficiency for user, and excellence in economic property. Especially, semi-eternal class between members according to efficient intelligence type data handling presented in this paper, management of differentiated

medical examination data, fast medical examination through disease history, prevention of mal-examination, and effect of cooperated medical examination between doctors are brought.

5. CONCLUSION

The telemedicine & distance education is requiring a change in an environment from the conventional hospital and doctor based general practice to cyberspace on networks. The telemedicine & education system that this paper suggests has been designed on the CTE framework, which is an integrated multimedia environment. This is a CBM-based collaborative telemedicine & distance education type, different from the conventional doctor based general practice, and is an integrated multimedia telemedicine & distance education system capable of many application developments using Information super highway.

Especially, the CTE is capable of both an interaction by means of video/audio, multiple session, multiple participants, application sharing, icon, tool box and whiteboard, and real time or non-real time support which have no restrictions in time and space. Most of all, it has a great significance in that it is a multimedia PC based integrated collaborative telemedicine & distance education system, which has made up for the high price of hardware equipment and incompatibility of the conventional system.

Also, this paper presents the content regarding electronic medical examination chart and data treatment for efficient medical examination and prompt treatment by realizing mutual conversation type remote medical examination system among 3 parties(patient, doctor, pharmacist) on internet base. This is an intelligence type remote medical examination system for both on-line and off-line mode to transcend time and space on the web being participated by anybody, which is cheap type to solve problems in existing remote medical examination system such as high price based on hardware, incompatibility, and so on.

And, The implementation of this new learning system should be designed with multimedia application development platform base which is interfaced with computer engineering, computer network technology, CSCW (Computer-Supported Cooperative Work) technology, and education engineering

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