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THE DESIGN OF AN INTELLIGENT WEB-BASED INTERACTIVE LANGUAGE LEARNING SYSTEM

CHIN-HWA KUO

DAVID WIBLE
Tamkang University

MENG-CHANG CHEN
Academia Sinica, Taiwan ROC

LI-CHUN SUNG

NAI-LUNG TSAO

CHIA-LIN CHIO
Tamkang University

ABSTRACT

The design of an Intelligent Web-based Interactive Language Learning (IWiLL) system to support English learning on the Internet is described. We designed two kinds of learning environments: 1) an interactive English writing environment; and 2) an authentic conversation learning environment. These are intended to improve learners' basic language skills in listening, reading, speaking, and writing. In addition, the system also offers authoring tools that facilitate teachers' content preparation. The system not only provides multimedia learning environments for users, but also builds a learner corpus, an archive of English texts written by learners for whom English is a second language. Further analysis of the learner corpus creates the potential to detect the users' persistent errors and then to provide adequate help to the users. An important aspect of the system is the careful integration of the multimedia environments in ways that systematically enrich the learners exposure to and grasp of specific aspects of the target language. For example, particular targeted vocabulary items can be encountered in text as well as video. The system also is designed to track a variety of facets of each learner's interaction with the environment. This tracked data in turn supports spiraling of English material that the learner has encountered.

INTRODUCTION

In this article, we describe the design of an intelligent Web-based interactive language learning system called IWiLL. In our design, we integrate results from the areas of language pedagogy, linguistics, computer, networks, and multimedia technologies to build a networked learning system. The system includes advanced features to assist learners in learning basic language skills such as listening, speaking, reading, and writing. It is worth mentioning that the system not only provides multimedia learning environments for users, but also builds a learner corpus, a machine-readable archive of essays written by learners for whom English is a second language. Further analysis of the learner corpus is supported and creates the potential to detect the users' persistent errors and then to provide adequate help to the users (Granger, 1998; James, 1998).

Many Computer Aided Language Learning (CALL) systems (Newwirth & Wojahn, 1996; Ogata, Yano, & Wakita, 1998) have been developed to support language learning. Most of them only make use of computing resources from local computers. The computing and knowledge resources are therefore limited by this restriction. Due to the popularity of the Internet, another opportunity has become available for further breaking down the temporal and spatial limitations imposed by traditional CALL. Existing approaches, however, do not fully exploit the strength of the integration of computers, networks, and linguistics in language learning. To illustrate the advantages of such integration, we describe in this article the design and implementation of two language-learning environments: 1) an interactive networked English writing environment; and 2) an authentic conversation learning environment.

The present article is organized as follows. First, the system requirements and design overview are presented. We illustrate the requirements of a networked language learning system and the design paradigm and philosophy of the proposed system. These two learning environments are then described and the functionality and features of each environment are presented. The system integration portion is provided in the next section and the corresponding video/voice transmission mechanisms are briefly introduced.

WEB-BASED LANGUAGE LEARNING

Common Computer Aided Language Learning (CALL) systems focus on the providing content or testing materials to the learners. Due to the popularity of the Internet, the field is moving toward Web-based approaches. However, the basic design philosophy is the same. These approaches do not fully explore the power of the integration of computer systems, computer networks, multimedia techniques, and language pedagogy. The following are three of the many limitations in current systems:

1. Flat content creation and learning flow: Most lecture content relies on the hard work of human content creation. This takes a large amount of time to deal with the whole content preparation process for teachers. Furthermore, the prepared content is usually just in one form and occupies just one fixed position in the learning flow. It does not take into account learners' individual interests or their responses to the system. This leads to flat rather than dynamic content preparation. In other words, the design assumes that one size fits all users. The individual learners' performance is largely ignored.
2. Teacher and learner outputs: The interaction between learners and teachers are ignored. For example, in traditional writing classes many useful comments from teachers are simply ignored by learners. On the other hand, teachers may fail to detect patterns in individual learners' performance and difficulties. Moreover, the experiences of both learners and teachers are not shared with others. The same errors may repeatedly occur without the teacher or student noticing the patterns of their occurrence.
3. Poor and inauthentic conversation learning: The traditional learning systems that try to provide conversation input typically suffer from one of two shortcomings: either the materials are highly authentic but beyond the abilities of the learners, or they are adjusted to the learners' level but correspondingly become unnatural and lose authenticity.

In the design of IWiLL, we take the above issues into consideration. We design a means for tabulating online error statistics to inform users. The collected data from learners are used to build a learner corpus. This learner corpus is extremely useful for detecting learners' persistent errors. In addition, we develop a novel English conversation learning environment. Learners can listen to natural conversation voice recordings which can be filtered to extract particular examples of authentic language in natural contexts. In addition, learners can practice authentically in our environment through talking with other learners or teachers on line.

Before presenting the design of our system, we consider the requirements of a computer aided-language learning system from the point of view of users, including learners, teachers, and researchers.

Learners' Needs

Language learners have distinctive needs that set them apart from learners in other academic fields. What they are attempting to acquire is not just a body of knowledge per se but rather a set of skills that depend on certain kinds of knowledge. To help learners acquire the set of skills that constitutes mastery of the target language, they have certain basic needs that should be addressed in a learning environment.

They need exposure to natural or authentic target language input at an appropriate level of difficulty. They need clear, comprehensible feedback on their production of the target language that makes clear to them their particular areas of difficulty. Ideally, the learners' production as well as the teachers' feedback should be cumulative, archived, and accessible to the learner to overcome the ephemeral nature of traditional pen and paper assignments and red-pen comments given by teachers. This can give students ways of searching their own target language output and the comprehensible teacher feedback that make insights, and generalizations, or gestalts possible. Finally, they need opportunity to use the language to communicate.

Teachers' Needs

Teachers basically need the means to meet the learners' needs. Concerning input to the learners, teachers need the resources to expose learners to appropriate authentic target language materials. As far as learners output, teachers need quick and convenient means of providing comprehensible and useful feedback to learners. This entails the elimination of repetitive tasks involved in commenting on student writing while still offering comprehensible feedback. They also should have some means of directing learners' attention to specific aspects of their own target language use and of detecting patterns of problems in the learners' production.

Researchers' Needs

Researchers require easy and flexible access to large amounts of learner output (target language data produced by learners) in order to analyze that output and gain insight into sources of learners' difficulties. An intermediate step in this process is annotation of this data. Hence, researchers need the means to conveniently annotate the learner data.

The basic design schema of IWiLL is illustrated in Figure 1. The center of the schema includes two kinds of learning environments: 1) an interactive networked English writing environment and 2) an authentic conversation learning environment. Learners, teachers, and researchers online can access these environments. Special interfaces have been developed such that learners can request the specific content they want or content assigned by the teacher. Note that learners and teachers also give input to the learning environments. Learners input their essays and teachers input teaching materials and mark learners' essays. The collection of this data can be used to generate learning performance indices to inform teachers and learners of the learning process of each individual learner. Further analysis of the learner corpus can be used to detect the learners' persistent problems. The results of these analyses put us in a position to provide online help for the learning environments to benefit to all users. In this manner, the expertise of teachers and

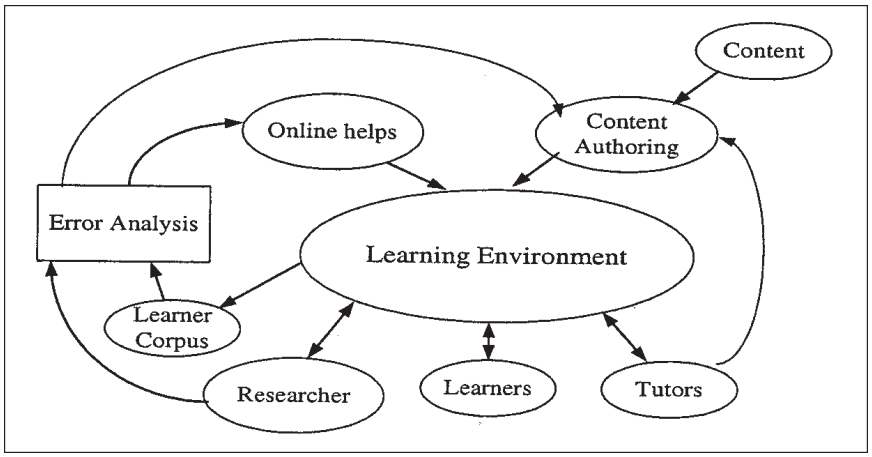

Figure 1. The design schema of IWiLL.

the learning experience of learners can be accumulated and can enrich the environment the more it is used.

For a multimedia Web-based system to effectively provide a language learning environment rather than merely a showcase for technology toys, the various media of the "multi" media environment must be carefully integrated to support language learning. One respect in which multimedia technology can actually enhance language learning is in exposing learners to the same linguistic expression through a variety of channels. Taking the example of vocabulary learning, a student who encounters a new word in text form through reading alone becomes familiar with one facet of that word, so to speak. If the same learner also uses that word in writing, he or she becomes familiar with another facet of that word. Further exposure to the same expression in auditory form, say, by hearing it in spoken discourse, further enriches the learners grasp of that word. Seeing it on film or video correspondingly deepens their understanding of the expression even further. The present multimedia system has been designed to provide precisely this sort of focused, mutually reinforcing exposure to the target language.

Within this overall architecture of the IWiLL system, we have embedded a special family of functions which we refer to as *tracking* and spiraling designed explicitly to exploit not only multimedia transmission but also information engineering for the benefit of users of a language learning environment. In what follows, we describe the details of these functions, their interrelations, and the advantages they bring to the system.

Tracking refers to the capacity of the system to record and trace a wide variety of data concerning individual users and their behavior as it accumulates over their history of using the system. The concept of tracking is applied to a variety of

modules in the system. For example, all of the comments that a teacher makes on a learner's essays are indexed to that learner's profile and each comment is further indexed to the exact string of text in the particular essay where the comment was given. With this indexing, it is a relatively simple matter then to specify specific responses the system should provide under particular conditions. Currently under this system, for example, in the event that a teacher has marked the same error type more than three times in the essays of an individual student (whether they occur within the same essay or cumulatively over more than one essay), the system triggers an appropriate message to that student. In the case of more than three sentence fragments, for example, the message says:

> Your teacher has marked more than three sentence fragments in your essays. For help with sentence fragments, click here.

Tracking is closely related to the second function of spiraling in that spiraling further exploits the data that has been tracked. Once a vocabulary item has been entered by the tracking function into the log of a particular learner, for example, the system is then enabled to spiral this vocabulary word for that learner. That is, the system can proactively seek further examples of this expression on Web pages or other reading materials on the system (filtered for the individual learner's level) and then present them to that learner in the future. For example, if a student looks up the expression *cautious* in the online dictionary and chooses to have it recorded in the learner log, then when that learner encounters the word *cautious* in the future, say on a Web page or reading lesson or even in the text of a video, the system highlights it and offers links to reminders about previous encounters with this word or to the record of the word in the learner's log.

The integration of tracking and spiraling is designed to enrich the student's learning experience. Rather than simply flooding the learner with English and dictionary definitions, the system brings order to this linguistic exposure and turns it into an integral part of the learner's language competence over time. If I, as a learner, look up a word that is unfamiliar to me, say the verb *ponder,* it may or may not become part of my repertoire of English vocabulary. If, however, the system ensures that I will see *ponder* in a meaningful context again tomorrow and the next day, highlighted and accompanied with optional help, the chances that it will become part of my English repertoire increase greatly.

The integration of various media in order to mutually reinforce a learner's exposure to the target language is further enhanced, then, by tracking and spiraling so that the multimedia aspects of the environment can enrich learners rather than overwhelm them.

IWiLL LEARNING ENVIRONMENTS

To assist learners in improving their language skills and to facilitate teachers in the preparation of course content and examples, we have developed two kinds of

learning environments: 1) an interactive networked English writing environment; and 2) an authentic conversation learning environment. The functionality and features of each environment are introduced in this section.

Interactive Networked English Writing Environment

Conventional computer-aided English writing software, e.g., MS Word, provides tools such as document formatting, spelling, and grammar checking functions. These functions only utilize the resources from the local computer. With the popularity of the Internet, however, more functions can be added to an on-line system to facilitate the learning process. In this article we report two kinds of writing environments in IWiLL, an asynchronous writing environment and an online essay discussion environment that is a synchronous writing environment. We describe the first one in this subsection and the synchronous one in "Online Essay Discussion Environment" subsection.

The asynchronous writing environment mainly allows both teachers and learners to work and interact without being online at the same time. The process of learner writing involved is represented in Figure 2. It includes writing, revising, and completion phases. Within these phases, the system includes functions for turning in essays via the Internet either to the teacher or to peers for peer commenting, for examining essays that have been turned in and/or returned from the teacher. Students can examine essays that the teacher has returned, with teacher comments appearing in pop-up form. A special feature is that learners can retrieve all the comments the teacher has made on all of his or her essays cumulatively, with each comment linked to the portion of the student essay that was the target of the comment. Hence, at a glance students can know their most persistent difficulties.

Teachers using the system can examine all of the essays that have been turned in and select specific essays to be corrected in an online interface. A comment bank for each teacher allows frequently used comments to be stored and then retrieved on demand. The learners' essays constitute a corpus that can be searched

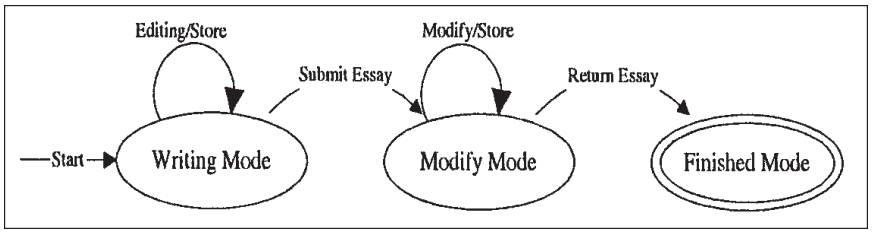

Figure 2. Common student writing phases.

for keywords to see how well students have mastered a particular expression. The interface where teachers mark student essays is shown in Figure 3. To mark a portion of the essay with a comment the teacher first marks off the area of text targeted for comment and then either types or selects the relevant comment. To see the content of the teacher's comment, the student places the cursor on the blue text and the comment appears (see Figure 4). Note that the comment bank is also a special design. Teacher's personal favorite comments can be easily added to the comment bank so that teachers need not type the same comment repeatedly. Different teachers control the content of their own comment bank.

The system provides the following functions for all users, including teachers, students, and researchers.

Statistics on Common Writing Errors

Learners are often unaware of their own misconceptions about English as their second language and therefore do not notice the errors which these misconceptions create in their own writing. A parallel obstacle for teachers is that with traditional pen-and-paper writing classes it is extremely difficult to track which students show which sorts of errors and for which students are these errors persistent over time.

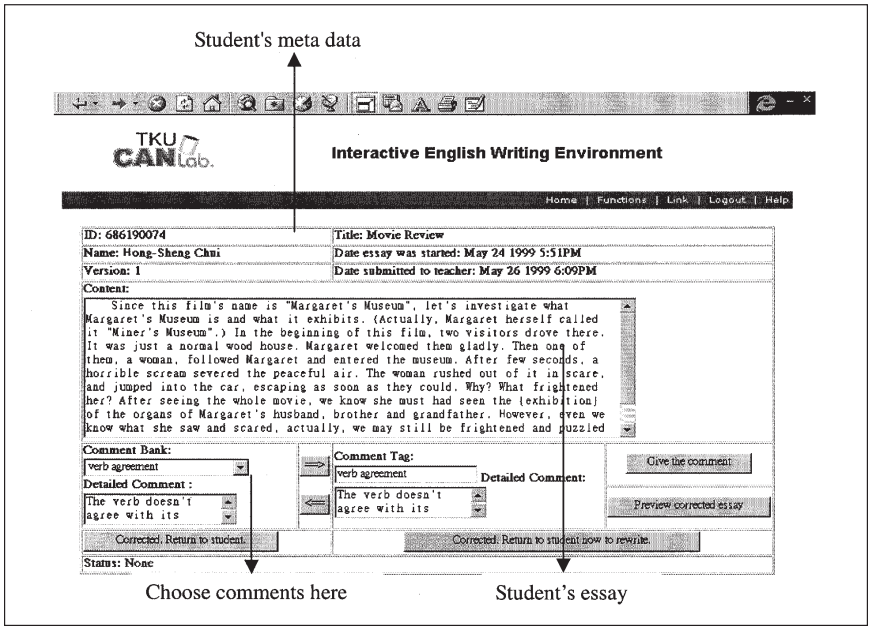

Figure 3. The commenting mode.

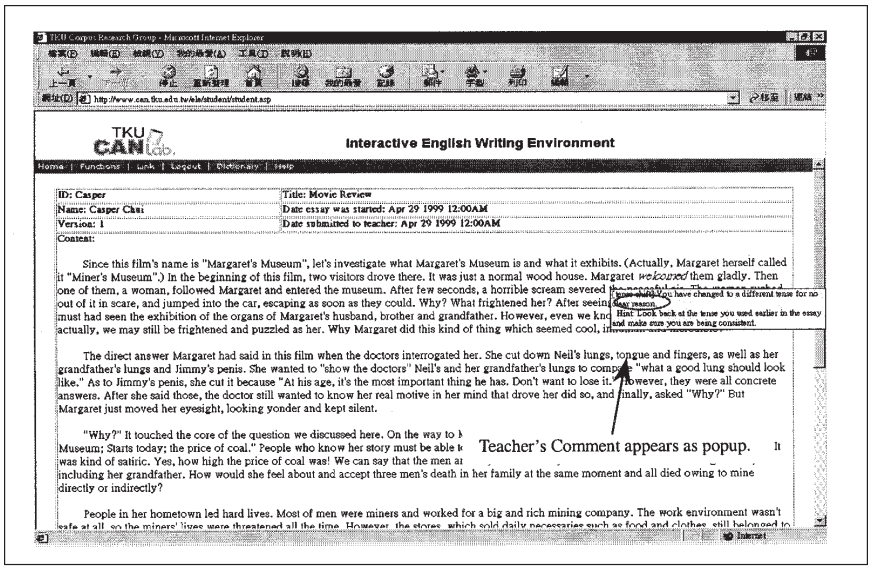

Figure 4. User interface to viewing teacher's comment.

To address these limitations, we have designed a special function for comment analysis, illustrated in Figure 5. The system records and tabulates the errors of each student essay and can these be displayed as search results. The error types that are listed in the search result are linked to all of the instances of that error which the teacher has marked in the essays (see Figure 5). After a period of time, individual students can easily examine what their persistent errors are. Alternatively, teachers can view these results as tabulated for an entire class (seeing the most common errors for that class) or for individual students. They can use this information to detect areas to focus on in their teaching and to individualize the help they offer to students. Researchers can view this statistical information as well, with the students remaining anonymous in the information made available to researchers.

Key Word Query

A key word query function is depicted in Figure 6. Certain expressions in the second language maybe difficult for learners to master. With the key word query function, teachers and researchers can investigate students' usage of particular expressions and identify which ones lead to errors in usage. By examining these search results they can formulate and test hypotheses about the source of the errors

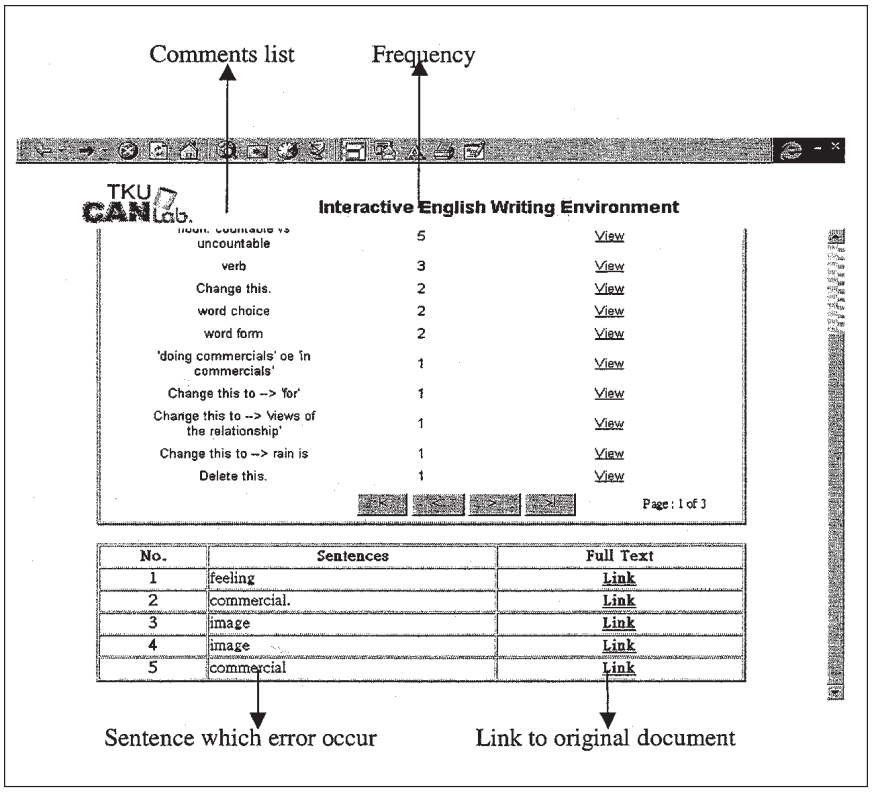

Figure 5. Classification of errors and link to original document.

and improve teaching materials accordingly to address these attested areas of difficulty. The extracted examples can play a role in these teaching materials to raise learners language awareness.

The Web-based English writing environment that we have described consists of an array of advanced features that distinguish it from conventional computer-aided English learning software. Among these features are: 1) a Web-based user interface for students and teachers in facilitating system access; 2) error analysis and statistics reporting to highlight learning difficulties, and 3) archiving of the essays into a learner corpus to provide a foundation for further analysis in detecting non-native speakers' persistent problems and support interlanguage research.

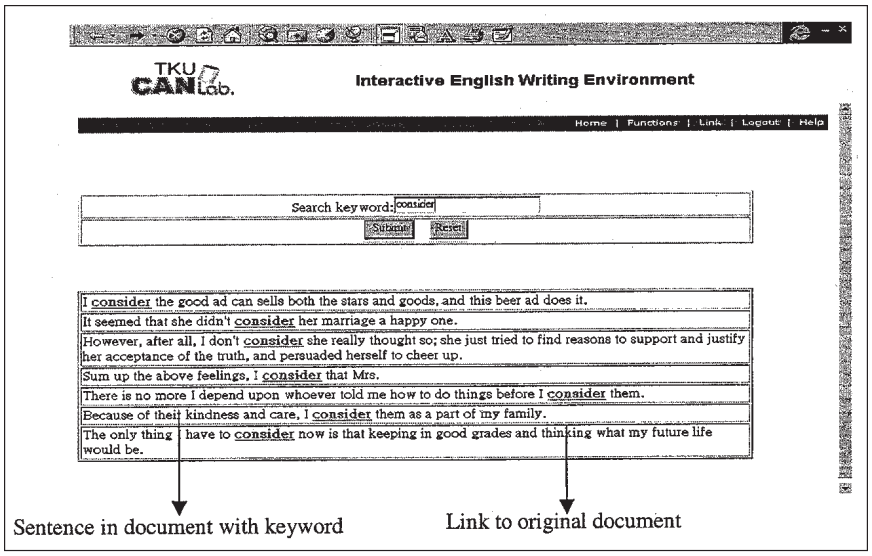

Figure 6. Key word search form.

Online Essay Discussion Environment

To imitate the on-site writing clinic on the Internet and to exploit the potential of integrating computer, communication networks, linguistics, and language pedagogy, a synchronous module called "WriteNow" is provided in the writing environment, offering the following special tools and functions.

1. *Co-editing:* This function provides an environment to attract that learner and tutor or two peers to the same focal point. Both learner and tutor are able to work on the same sentence and immediately identify the writing problem (Handley & Crowcroft, 1997). However, co-editing the same sentence may result in conflicting data if a suitable co-editing mechanism is not available. We therefore have developed a textual co-editing mechanism to meet this challenge (Kuo, Chio, Yu, & Hsia, 1998).
2. *Online discussion:* To achieve a better environment for discussion between the participants, we provide not only a textual discussion unit, but also a voice discussion facility developed for our authentic conversation learning environment, which will be described in section 3.3. In contrast to bothersome delays waiting for input from one's discussion partner, this feature in our system can accelerate the discussion speed and promote naturalistic conversation on line among peers or with the teacher.

The graphic user interface of "WriteNow" is shown in Figure 7. After the initiation of the main page, users can select the tutor from the online user list. Once the connection has been set up, learner and tutor make use of the co-editing area as editing ground. The markup area, as shown in Figure 7, will also appear at the remote site to attract the users at both ends to focus on the same portion of text. The comment bank and online help are also displayed in this interface. Currently, users can access a corpus of standard English and other sources of language help. Both learner and tutor may select the corresponding tool from the main page. A voice control panel and a text discussion board are provided. Thus, users may choose these communication channels for their convenience.

Authentic Conversation Learning Environment

To enable learners to practice authentic English conversation, we have designed a conversation learning environment. The environment consists of two portions: *Movie-Based Conversation Showroom* and *Voice Conversation Unit.* These two points are described in what follows.

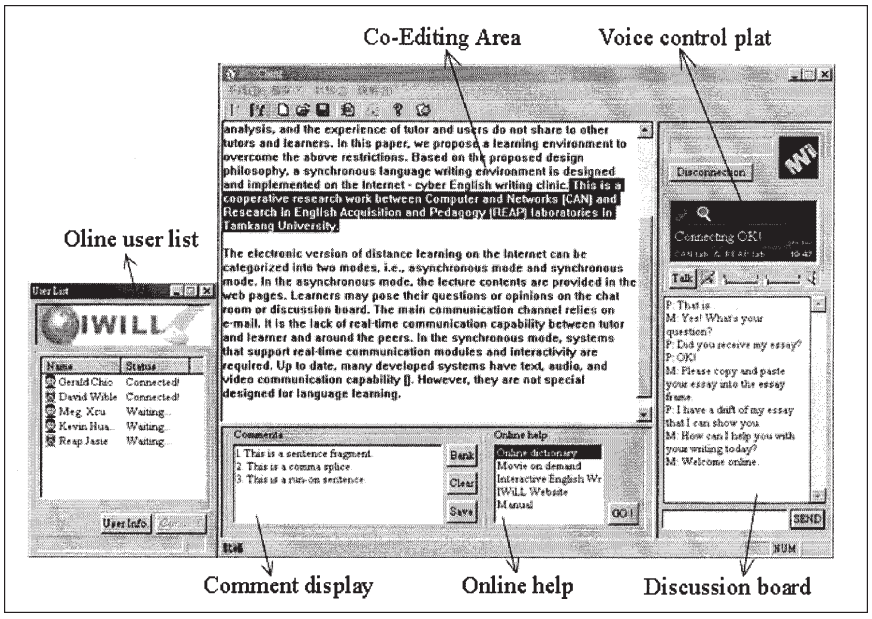

Figure 7. User interface for synchronous writing environment.

Movie-Based Conversation Showroom

To provide instances of natural English conversation that both match the interests of learners and allow self-guided learning, IWiLL makes use of VoD technology (Gemmell, Vin, Kandler, Rangen, & Rowe, 1995; Ghandeharizadeh, Kim, Shahabi, & Zimmermann, 1996) in the design of the environment for viewing English movies. The showroom provides features for: a) viewing movies; and b) mining movies for real English.

In the first portion, the system provides a user interface that allows users to view a movie designated by teachers or a movie of the student's own choice on the Internet. This user interface is shown in Figure 8. It enables users to: 1) select movies from the movie server; 2) control common playback functions, 3) jump to a specified portion of dialogue; and 4) select the display of subtitles.

In general, learners connect to the movie server and through the interface directly select a specified movie. The interface will pop up and playback the specified movie when learners click the movie title listed on the menu Web page. In addition, the showroom has an important function that is able to playback selectively particular segments of the specified movie. This function in turn supports the "Key word query" system designed in our asynchronous writing

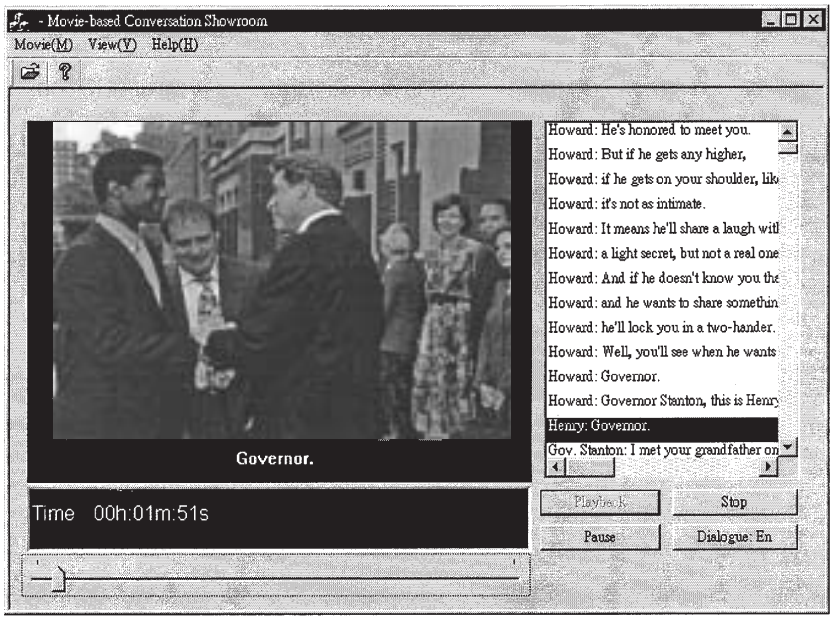

Figure 8. Learner interface for viewing English movies.

environment, allowing this query function to search not only pure text, but also examples of a vocabulary word appearing in movie dialogues. This enhances the integrated multimedia aspects of the system.

In the second portion, the system provides users with a tool for strengthening their command of English expressions. It consists of two user interfaces, one for content authoring and the other for learner access. For content authoring, the user interface, which is shown in Figure 9, is designed to facilitate system content authors, e.g., teachers, in their preparation of examples from movies. For example, users in Taiwan often have difficulties in using the word, *even.* Teachers who want to illustrate the examples can input the word, and the system will retrieve all sentences with the word *even* in the movies. Furthermore, the authoring interface also allows teacher to: 1) extend the amount of context given to the student preceding and following the target word; 2) exclude the unsuitable examples; and 3) arrange the presentation sequence of the examples. In addition, the tool allows learners to extract instances of specified English vocabulary from the movies in the database. The results can be played back, offering the students ample examples of a particular expression in context. This allows teachers and learners to locate multiple examples of specific English expressions as they appear in authentic contextualized use in the films. This tool is especially valuable for teachers who are not native speakers of English since it enables them to provide students with a vast array of specific, authentic English input at will. This is very useful to learners who do not live in an English speaking society. Moreover, this function allows the

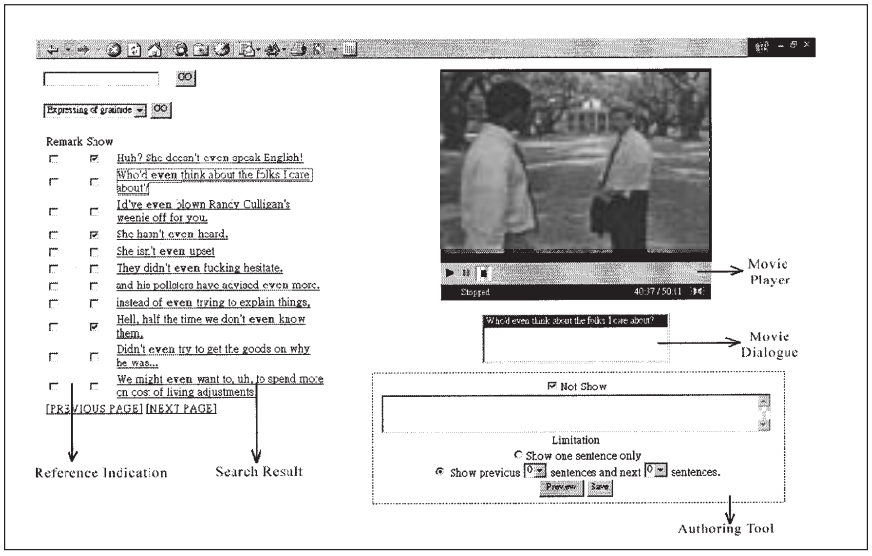

Figure 9. Teacher interface for mining English from movies.

advantages of using authentic materials from films while the search, filter, and edit features overcome the disadvantage that traditional uses of such materials overwhelm learners.

Voice Conversation Unit

After passing through some learning processes, learners can practice conversation with other learners or teacher through LANs and WANs by the voice conversation unit. During conversation, they cannot only practice sentence intonations, but also examine their English pronunciation.

SYSTEM ARCHITECTURE AND DESIGN

To facilitate global access, the system is deployed on the Internet. The design of the IWiLL system architecture is shown in Figure 10. It includes three

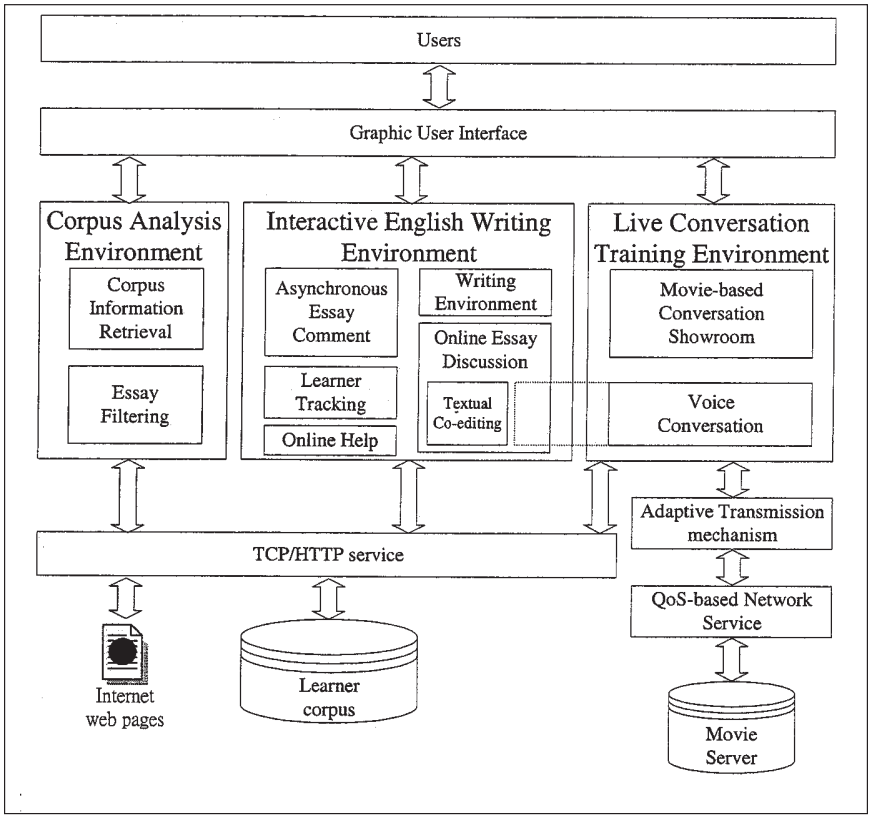

Figure 10. The system architecture of IWiLL.

environments: 1) an interactive English writing environment; 2) a live conversation training environment; and 3) a corpus analysis environment. The functions of the first two environments were briefly described above. The third environment aims to provide content in the form of text to users from the Internet Web servers. Under such an environment, we can easily avoid the flat content problem faced in the traditional content preparation case.

To ensure that these environments function together, specific tools and systems have been developed and integrated. The individualized learning environment integrates dynamic HTML and database techniques. In addition, we have designed a tracking scheme to trace learners' learning process described above. To deliver continuous multimedia on the Internet, voice and video transmission mechanisms have also been developed to overcome the network transmission difficulties. As a result, the quality of voice and video playback is further ensured. The content filtering mechanism works by cooperating with Internet data retrieval and filtering techniques. It consists of Web spider as data collector that gathers varied regular essays from Web pages on the Internet.

In the system implementation, we make use of MS VC++, MS SQL, and JAVA programming languages as system development tools. It includes two database servers, (i.e., learner corpus and movie servers) to store the corresponding data and information of the system. Based on the temporal characteristics of media transmission, the learning environment can be classified into two types: an asynchronous learning environment and a synchronous learning environment. In order to build the above learning environments, we also have designed video and voice transmission and content filtering mechanisms. As is well known, the present Internet may present network delay, jitter, and packet loss, which are hostile to continuous media transmission. We address these issues in our design to achieve high quality multimedia transmission. In this section, we briefly describe the realization of these mechanisms.

Individualized Learning Environment

General users can access the IWiLL system. However, as we mentioned, the system is not a flat content provider. It also takes each individual into account. In our system architecture, we have developed personalized learning environments for each learner which make full use of the tracking and spiraling features described above. After the user registration, the system creates an individualized access page based on user level. At the present time, we use vocabulary frequency lists as a tracking reference to track the students' learning trajectory. Based upon a set of vocabulary frequency lists, each individual is recommended a set of vocabulary to focus on for their current stage in learning before progressing to another level. In addition to using the frequency lists as a bases for setting student levels, the system can alternatively be set to accommodate specific vocabulary lists from particular text books that a school or class is using.

Voice Transmission

The Internet currently offers only a point-to-point *best-effort* service, which may present packet delay, delay variation, and packet loss (Bolot, Fosse-Parisis, & Towsley, 1999; Moon, Kurose, & Towsley, 1998). As a result, voice quality is degraded. Since inferior voice quality will seriously influence the effect of conversation learning, our purpose is to design an effective voice transmission mechanism to solve these problems. Accordingly, we have designed a policy-based adaptive voice transmission tool, which detects the usage of bandwidth and the network loss rate, making it possible thereby to overcome the problem of packet loss (Kuo, Chio, Hsu, & Chen, 1999). In addition, the on-line statistic playback mechanism provides an effective solution for network delay and jitter by gathering statistics of the current packet delay and estimating the best playback time (Kuo, Chio, Hsu, & Chen, 1999).

In order to overcome the delay jitter, the playout delay mechanism dynamically adjusts playback time. The algorithm predicts the playback time for the next talk-spurt by the distribution of the recently arriving packets' delay (Kuo, Hsu, & Hsi, 1998). Since the network delay varies with different network infrastructure, there must be an effective mechanism that can adapt to all of these situations, and our mechanism is indeed able to provide a better playback time in the various networks.

The desired mechanisms in the realization of the designed voice transmission tool also includes echo cancellation, silence detection, automatic gain control, and voice compression. The learning environments in the IWiLL system are thus equipped with voice channel support over LANs and WANs.

Video Transmission

The video used in IWiLL is stored in MPEG-1 format. Thus, video transmission requires a great amount of bandwidth in the case of movie transmission. We have designed a video storage placement mechanism to increase the number of simultaneous accesses possible. The system architecture is illustrated in Figure 11. Further details can be found in (Kuo, Sung, & Chen, 2000). In our proposed mechanism, the *idle round* scheme has been developed to reduce the variability of the data rate of the VBR MPEG-1 video effectively. Because the resulting data rate is near constant, the transmission of video is able to use the RSVP through the MS GQoS architecture to reserve effectively the required bandwidth to achieve good video playback quality (Braden, Zhang, Berson, Herzog, & Jamin, 1997).

In addition, for mining movies for real English, the movie dialogue is stored as text in the English corpus while the movie video is stored in the movie storage system. The process of mining movies for real English is shown in Figure 12. After entering the requested keyword, the system responds with a list of sentences containing that word. As a user clicks on any of the retrieved sentences, the system

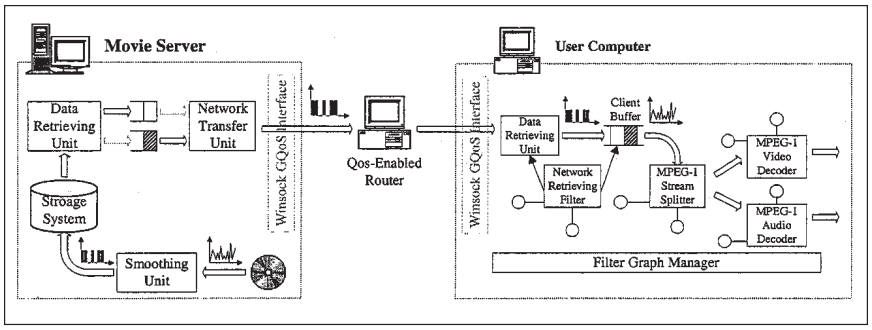

Figure 11. The movie playback architecture.

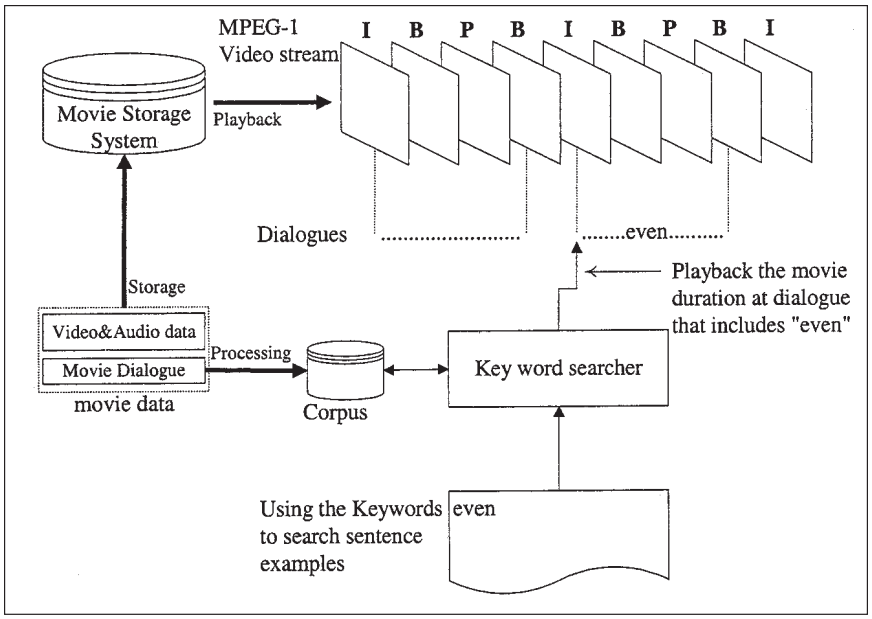

Figure 12. Movie processing for key word searching.

starts playing the corresponding video segment on the movie-based conversation showroom. This function is of value to learners in developing their language skill.

Content Filtering

The textual contents in IWiLL may come from different resources, e.g., teacher-provided lectures, and articles from journals, newspapers, magazines, and Web pages. These materials are classified and filtered based on content attributes and levels. Learners are able to access these materials based on their levels and interests. In other words, the system may provide different materials to different levels of people. To do the above efficiently, we use the *lexical difficulty filter* (LDF) that we designed for this purpose. Each article collected is passed into the LDF to obtain the corresponding difficulty level index. As teachers or learners specify their requests, the system responds with a list of essays in ranking order. In other words, IWiLL has the capability to deliver materials matched to needs or requests of individual learners. This provides the flexibility intended to stimulate the learners' interest in reading.

CONCLUSION

Many academic and commercial computer-aided language learning system or software packages have been developed recently. In this article we propose a novel design schema to develop two kinds of language environments: 1) an interactive networked English writing environment, and 2) an authentic conversation learning environment. These learning environments are able to stimulate learner interests and improve learner basic language skills. Furthermore, the collected learners' output constitutes a learner corpus. By analyzing the learner corpus, we are able to develop a process to detect persistent errors of learners and design online help accordingly. The suitability of the designed system for the intended users can be seen in the level of usage it has received in its recent deployment in high schools in Taiwan. Within a period of less than two months, these students have turned in essays exceeding a total of 1,200,000 word tokens. Readers can access our Web site at http://www.iwillnow.org to view the system. Although the present system is specially designed for English learning, the design concepts and system can be easily extended to other language learning.

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Direct reprint requests to:

Dr. Chin-Hwa Kuo
Department of Computer and Information Technology
Tamkang University
151, Ying-chuan Road
Tamsui, Taipei hsein 251
Taiwan, Republic of China
e-mail: chkuo@mail.tku.edu.tw