# An Interactive Language Learning System in the Web

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**Abstract:** Due to recent technology advances, an increasing number of applications are being ported to the Web at rapid pace. Such applications include Web Phone, Web Fax, Web BBCall, to name a few. Among others, network education has emerged as an important Internet application. It not only avoids the limitation of physical learning locations but also keeps the flexibility of teaching time. In this paper, we develop an interactive language learning system on the World Wide Web. By using this system, students are able to learn languages everywhere and anytime as long as a Web interface is provided. The language learning system we developed in the Computer and Network Center at National Taiwan University is in essence a two-tier client-server architecture, and is divided into two components, namely (1) the language learning player at the client-side and (2) the course content provider at the server side. Explicitly, the language-learning player runs at the client side and provides a user interface to access the course materials. Using an authentication mechanism, the player is able to verify the user identification via the Web and to provide different user interfaces for students and teachers, as one form of personalized service. On the other hand, the course content provider is a database manager in the Web. This database manager employs the PHP script language to access the MySQL database and to response the client's requests. The PHP script language is used after our evaluation due to its efficient access to many databases, and also its capability of processing the Web requests. In this system, we put not only the description of the course content but also the corresponding audio files in order to support a multimedia-teaching environment. By using this language learning package, we can automate the procedures for preparing audio course materials, conduct data mining on student behavior, and achieve the teaching quality that a network language learning system is expected to provide.

**Keywords:** Distance learning, two-tier client-server architecture, World Wide Web

## 1. Introduction

In the recent years, the Internet and its related techniques have become the most important research topics in computer science fields. Many companies, universities and research institutes are exploring new techniques, publishing materials and developing new products on this evolving platform. With its growing impact, Internet has been regarded as the forth-major mass medium after television, newspaper and radio. Moreover, Internet has some unique merits that other mass media do not have. Such merits include fast data transmission, high availability, low cost business model, easy data collection, to name a few. An increasing number of applications are being ported to the Web at rapid pace, including Web Phone, Web Fax, Web BBCall, and so forth. Among others, network education has emerged as an important Internet application since it not only avoids the limitation of physical learning locations but also keeps the flexibility of teaching time [1,2,3,5,6,7,8].

Traditionally, the students have to be present in the language-learning classrooms and use specific language learning mechanisms to improve their speaking ability. However, the major disadvantage of the traditional language learning is the limitation of time and space. For example, the students may have an English class in the Monday morning at the language-studio classroom and that class could be their sole opportunity to practice their language speaking, since the instructor is only present at that moment. Consequently, the effectiveness of the traditional language-learning systems is limited.

In this paper, we develop an interactive language learning system in the Web. The interactive language-learning system we developed in the Computer and Network Center at National Taiwan University is in essence a two-tier

client-server architecture. Through a Web interface, the students are able to not only learn the lessons anywhere at any time but also practice their speaking at leisure pace, thus overcoming the limitation imposed by time and space. In addition, using the interactive language learning system, students can communicate with the instructors interactively via the mechanisms provided, and the teachers can timely edit the course materials by writing the content of text and recording the audio files in response to the students' requests very easily. These are the very advantages of our system over some stand-alone commercial language-learning applications, which are usually lack of interactive features.

The paper is organized as follows. Section 2 depicts the whole system architecture. Section 3 presents the implementation and functionality of the language learning system. Section 4 concludes this paper.

## 2. The System Architecture of the Interactive Language Learning System

We use a two-tier client-server architecture for the language learning system. The system architecture is shown in Fig. 2.1. The reason of using the two-tier client-server architecture is that it can provide our two key components, i.e., the language-learning interfaces at the client side and the course content provider at the server-side. This architecture can be easily extended to a three-tier one if an additional gateway is required in this application.

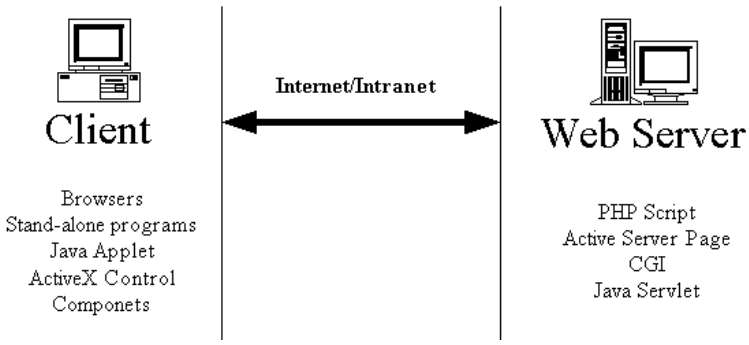


Fig. 2.1 The two-tier client-server architecture.

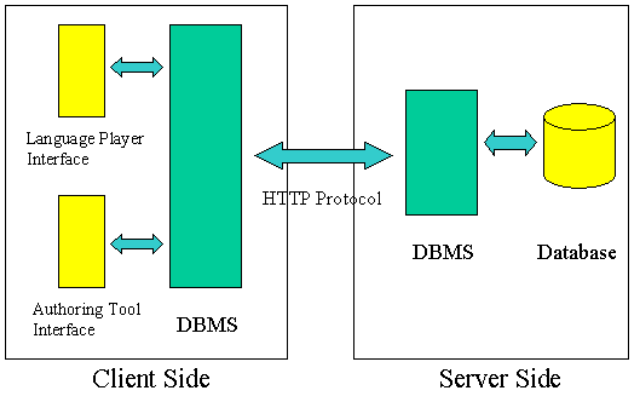


Fig. 2.2 The architecture of the language learning system.

Based on the two-tier client-server architecture, the language learning system is designed as the Fig. 2.2. At the client side, both the language player interface and the authoring tool interface use the DBMS (Database Manager System) to access the course materials in the server via the HTTP protocol in the Internet/Intranet. The program at

the server side then accepts the requests from the clients and returns the results of the requests to the clients. The DBMS at the server side saves not only the course materials but also the information of the users, including the students and the teachers. Using an authentication mechanism, the player is able to verify the user identification via the Web and to provide different user interfaces for students and teachers, as one form of personalized service. For instance, the students are only allowed to use the language player interface whereas the teachers can use both the language player interface and the authoring tool interface.

## 3. The Implementation and the Functionality of the Interactive Language Learning System

As mentioned earlier, the language learning system provides our two key components, i.e., the language-learning interfaces at the client side and the course content provider at the server-side. The following subsections will introduce the operations of the language learning system briefly.

### *3.1 The language learning player at the client side*

To assist the students in language leaning on listening and speaking, the user interface (UI) of the language learning system provides the functions of playing the audio files and those of recording the user's voice. Furthermore, the UI displays the wave shapes of the audio files and the user's voice for users to capture the differences and to improve their speaking. For example, once the user selects one topic of the course in upper-left area of the Fig. 3.1, i.e., "There are always two sides to everything." In Fig. 3.2, not only will the content be shown in the upper-right area but also the shape of this audio appears in the middle area. When the users are playing back the audio in the middle area, an indicator will run along the shape of the audio to indicate the exact timing of audio playing.

In addition to listening the audio and watching the shape of it, the users are also able to record their voice into the system, play it out, and compare its shape with the standard one in the course material. In order to prepare the course materials easily and automatically, the language learning system provides an interface to authorize the use of course materials and to upload and download the materials automatically from the course content provider. This is a very convenient feature for the teachers who are not familiar with the operations of the transmitting files in the Web. Furthermore, the teachers could edit the content of the course material and record the audio easily via this interface, such as adding a new topic of the course material or creating a new course in the upper-right area in the Fig. 3.2. They can also playback and record the audio file of the course materials in the bottom area. As such, the language-learning player, including the language learning interface and the course material authoring tools interface, runs at the client side and provides a user interface to access the course materials in the server. In addition, we use the algorithms isolating the utterances of the speech to display the speech waveform in order to facilitate the language learning of students.

The language-learning player displays the shapes in the screen and also indicates the timing when the waveform of the speech plays. Thus, this functionality of the language-learning player offers not only the playout of the audio but also the display of the waveform shapes at the same time. This is a very helpful feature for students to learn language speaking.

Note that the user needs to use the local resources, such as the I/O of the audio interfaces and the I/O of the storage interfaces at the client side. However, this I/O access is not allowable for the browsers, such as the Internet Explorer and the Netscape Navigator. Therefore, we implement a stand-alone language-learning program at the client side by using the Microsoft Visual Basic 6.0 programming tools.

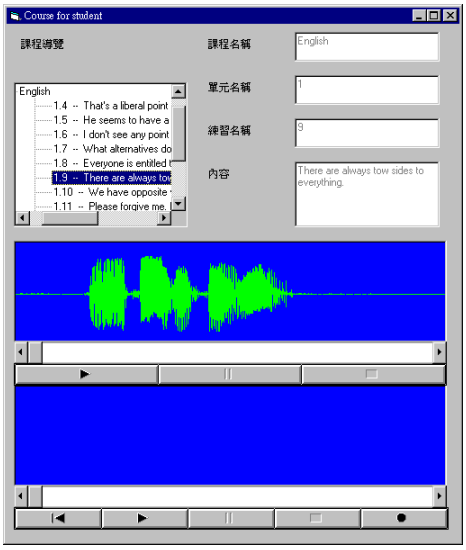


Fig. 3.1 The language-learning player for the students


Fig. 3.2 the authoring tools for the teachers

*3.2 The course content provider at the server- side*

The major tasks of the server are to save and update the teaching materials and to query the databases when necessary. These tasks are implemented by using the PHP script language and MySQL database at the server side. Since the PHP script language has been integrated with MySQL database, we use it to query the databases (MySQL). The client can then use the HTTP protocol to communicate with the server.

The course content provider is mainly a server combining the Web service and the database management. It employs the PHP script language to access the MySQL database and to response the client' s requests. As mentioned earlier, the server side of the language learning system saves not only the contents of the courses but also the corresponding audio files in order to support a multimedia-teaching environment. Once the server gets a request, the content provider fetches the requested materials by the user from the database, and then, if the corresponding authentication succeeds, returns the result to the client.

## 4. Conclusions

In this paper, we developed an interactive language learning system to improve the language learning and teaching for the students and the teachers respectively. By using the language learning system, the students are able to not only learn the lessons anywhere at any time but also practice their speaking at leisure pace, thus overcoming the limitation imposed by time and space in traditional teaching environments. The advantage of the language learning system over some stand-alone commercial language-learning applications lies in the full interactivity system provided. By using this language learning package, we can automate the procedures for preparing audio course materials, conduct data mining on student behavior, and achieve the teaching quality that a network language learning system is expected to provide.

It is worth to mention that the language learning system has been distributed to some language learning groups in our campus for experimental use and been well received so far. We believe that by exploiting the availability of Internet, the language learning system is very instrumental to the traditional in-class teaching and will improve the quality of teaching results significantly from both the perspectives of students and instructors.

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