CONCEPTUAL DESIGN OF AN INTELLIGENT HYPERMEDIA
LANGUAGE LEARNING ENVIRONMENT
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Abstract: A major concern in the area of foreign language instruction has been the enhancement of effective teaching strategies and pedagogical approaches. There has been an increasing attempt in recent years to apply the new technology as part of this endeavor. This paper will describe a current research effort to determine the nature of effective instructional methodology and multimedia courseware design in the area of Computer-Assisted Language Learning (CALL) through a reconstruction and reanalysis of an existing Korean interactive video courseware. By studying its design decisions and underlying pedagogical principles documented through the Instructional Design Environment or IDE, empirical research will be conducted on how learners respond to and make use of various HELP options in acquiring their language skills. The project's ultimate objective is to apply these research results to the design and development of intelligent authoring tools for language learning.

In the following sections I will describe the Korean Interactive video courseware, its content, design, and teaching objectives. I will discuss how IDE can facilitate
the tasks of instructional development, analysis, evaluation, and modification.

Keywords: interactive video, videodisc, multimedia, hypermedia, Artificial Intelligence (AI), Instructional Design Environment (IDE), courseware design, notecard, link, network structure, notefile, template, representation

INTRODUCTION

The Korean Interactive Video Courseware Overview

This courseware was developed under a cooperative agreement between the National Cryptologic School (NCS) and Brigham Young University (BYU) during the period from 1984 to 1988. The course design and development were conducted at the NCS, while the programming and implementation were completed at BYU. The courseware is essentially a multimedia computer-assisted instructional program that makes use of authentic video material obtained from the Korea Broadcasting Station (KBS) to teach intermediate and advanced colloquial Korean. It has been designed for students who have mastered their basic level or level 2 according to the Federal Interagency Language Roundtable's scale of proficiency assessment. A total of 51 lessons and 4 sets of listening comprehension tests have been developed, using 5 videodisc sides, each of which runs for about 30 minutes. Maximum advantage is taken of the rich source of authentic language and culture offered by the video in applying contextual methodology where appropriate. The details of this approach will be discussed in the following sections.

Course Objective

The major course objective is to improve the listening proficiency of adult learners while reinforcing the mastery of grammar, vocabulary, and idiomatic expressions in the context of natural discourse. A set of situation comedies expose the learners to a wide range of dialectal differences, a rich context of natural discourse, and cultural awareness through the interaction of native speakers in various situational contexts.
Course Video Content

Selections have been made from the following video contents:

Cultural Introduction to Korea (5 minutes)
A Family (25 minutes)
The Ordinary People (30 minutes)
In Pyongyang Now (1 hour and 30 minutes)

The Cultural Introduction to Korea and A Family are on one disc side; The Ordinary People is on another; and In Pyongyang Now has been pressed on 3 disc sides. The Ordinary People and A Family are situational comedies involving various character types from diverse levels of the social strata. In Pyongyang Now is a fictitious portrayal of the North Korean leaders, Kim Il-sung and his son, Kim Chung-il. Rumors and reports on their personal and political lives have been dramatized by the South Korean Broadcasting Station (KBS). For the most part, the video content focuses on circumstances surrounding day to day events and social interactions. Various styles of speech and levels of formality are easily observable through exchanges among characters of different age groups, social status, and relationship. Learners are exposed to segments of authentic language and culture.

The Cultural Introduction to Korea is subdivided into several topics as shown below. The learners have the option to watch the entire cultural video or to randomly access specific sections of interest. The Cultural Video Menu appears on the screen as follows:

Complete Cultural Video

Introduction
Geography and Weather
History of Korea
Seoul
Education
Technology and Agriculture
Quit to Lesson Level Menu

Courseware Design Overview

The entire courseware is menu-driven and has a multiple branching capability. The major tutorial strategy attempts to maximize learner control by offering various HELP options to accommodate different language learning strategies needed by learners of varying proficiency levels and background. The program controls when and where learner options are made available in the instructional
sequence, depending on pedagogical principles. The basic approach is to provide useful HELP options that are relevant and appropriate in the instructional sequence to allow the learners to select whatever help they feel is necessary. The underlying assumption is that a mature and motivated learner knows what kind of help to seek and will make optimum use of all that is offered. The validity of this basic approach and the benefit of each of the HELP options at particular points in the instructional sequence are subject to research and field study.

The program consists of multiple distinct paths of instruction. The main disc level offers the following options, which are accessible through function keys.

- **F1** See 30 minute video (one videodisc side)
- **F2** Select New Videodisc
- **F3** Take performance test
- **F4** Select a lesson
- **F5** See program HELPS
- **F6** Cultural Introduction
- **F7** Quit
- **F8** Quit with Resume

The learner may opt to watch the entire 30 minutes of the video before deciding to seek a performance evaluation administered in the form of a listening comprehension test or to study in the lesson mode. By selecting a lesson, the learner is able to study the content of a lesson's video. Each lesson branches into the Tutorial and the Exercise Paths explained below. The program HELPS refer to a graphic representation of the possible branching options. The QUIT option allows the learner to exit the program at any point, an important feature that extends the flexibility of the learner control. Within the lesson mode, one can choose to engage in learning through the tutorial mode or exercises.

**THE TUTORIAL MODE**

**Video/Audio Option**

The tutorial component allows the learners to navigate through the video contents while interrupting only to obtain HELP. It is characterized by video presentations that are accompanied by relevant HELP information at critical points in the instructional sequence. The interactive video and audio options, for example, reinforce the comprehension of the spoken language through the repetition of the video and audio segments of any length at any point any number of times.
times, depending on the learner’s choice. This initial exercise permits the learner to seek other HELP options such as the following:

**Keyword-Based Audio Retrieval**

Keywords written in Korean are displayed on the screen with the option to listen to the audio. The audio can be heard in either the normal speed or the more clearly enunciated form, simply referred to as the slow mode. The latter version was rerecorded in the second track of the laser disc by native speakers, who made a deliberate effort to enunciate the words more carefully while still maintaining natural speech.

**Transcript-Based Help Retrieval**

HELP options other than the video and audio repetition are accessible from the Korean transcript. When the transcript option is selected, sentences written in Korean are displayed with the option to listen to the slow or normal audio. The transcript option is available only after the learner has repeated the audio or video option, since the foremost course objective is to improve listening skill through repeated exposures to the spoken language. Highlighted segments are linked to hypermedia such as text, graphics, audio or video. Textual information provides notes on the grammar, vocabulary, dialect, or culture. After reviewing a particular piece of information that is linked to the utterance represented in the transcript, the learner can branch back to the original point of departure. The transcript with audio option exposes the learners to the discrepancy between the written form of the language and what is actually heard.

Figure 1 illustrates the multiple paths and review options offered in the tutorial mode described above. The graphic representation was made using the IDE software, the details of which will be discussed in the following sections. (See figure 1.)

**The Exercise Mode**

The exercises provide further opportunities for building listening skills and mastering the grammar and vocabulary. Each student input is evaluated and followed by immediate feedback on the accuracy of the response and recommended review options. Rather than provide the correct answer on the first try, the relevant contexts are first offered as hints in order that the learner may eventually arrive at the correct answer. The exercises are comprised of the following types:
Cloze (Fill-In-The-Blank)

This exercise involves completing a partial transcript of the video utterances displayed in the Korean orthography. The learner is given 3 tries before the option of obtaining the complete transcript shows up. An English translation of the complete Korean transcript is made available after the second try to assist the learner’s comprehension.

Scrambling

This phrase reordering presents Korean texts consisting of sentence fragments arranged in random order. The students are tasked to reorder them into well-formed grammatical sentences after they have listened to the normal or slow audio.

Gisting and Listening Comprehension

These multiple-choice type exercises question the students on their understanding of the lesson’s video content. If the learner fails to identify the correct summary or gist, the program advises the learner to review the relevant video. The comprehension exercise consists of a series of questions designed to measure the learner’s understanding of the lesson’s video. Help options similar to those offered in the tutorial are again made available in order to enable the learners to arrive at the correct answer themselves.

Vocabulary Building and Translation

Pats of the Korean sentences are highlighted for the students to translate by selecting the correct choice. The learner options include contextual clues and grammar notes in addition to the video and audio options.

Student Feedback

There has been an attempt to diversify the types of HELP options in order to accommodate different types of learners with varying degrees of competence, motivation, and preferred language learning strategies. Each type of exercise has its unique set of feedback options made available after a given student input. The students are usually given 3 or 4 tries before the correct answer shows up. The review options offered after each try show up as keys at the bottom of the screen. Feedback has been designed in such a way that the relevant contextual information is provided without revealing the correct answer right away. The audio and video review options are always accessible from anywhere in the program in order to maximize the advantages of
the multimedia system. The complete set of review options is accessible for the purpose of reinforcement even if the students have arrived at the correct answer.

**Recordkeeping**

A facility has been provided for the instructors to be able to add the students' records to the diskettes while they are working on their courseware, view the students' records, edit them, or drop them altogether by removing them. Each student record includes information such as the system time used, the number of logins and logouts, the average score for exercise type, the average score for each lesson, and the performance evaluation test scores for each disc side.

**Hardware and Software Requirements**

Most of the Korean courseware was originally programmed using the Courseware Design System (CDS). It currently runs on the IBM compatible Zenith 248. Other components of the hardware consist of the MIC-2000 interface board, the EGA board, 640K base memory (512K expansion), the SONY PVM-1271Q color monitor, and the SONY LDP 1500 laser disc player.

**IDE AND ITS ROLE IN FOREIGN LANGUAGE COURSEWARE DESIGN**

**Introduction**

Major components of the Korean interactive video courseware have been reprogrammed and the design details and their underlying principles have been represented in the Instructional Design Environment or IDE. Since this software is not a product, we have used it as our research vehicle in the capacity of a test site. The original version runs on the Xerox 1100 series Lisp Machine workstations. IDE 2.0, the latest version, runs on the Apple Macintosh II. This system serves both as a development and a delivery environment. As such, it can interact with the standard Apple software such as Hypercard and Course of Action. Compilers have been written to translate the Xerox notefile into a version that runs on the Macintosh and to take the IDE project file on the Macintosh and
Further research and development of IDE is now being conducted at the Institute for Research on Conducting (ILR). IDE is an AI-based hypermedia environment that sits on Notecards (Halasz, Moran, and Trigg, 1986) created at the Xerox Palo Alto Research Center (PARC) for structuring complex bodies of knowledge, especially those involved in designing and developing advanced tutoring systems. The complete IDE system provides tools for the design, development, and delivery of computer-based instruction in a wide variety of domains. (Russell, Moran, Jordan, 1988) IDE is a flexible and tailorable knowledge engineering tool for articulating, structuring, and documenting a course's domain knowledge. It facilitates the course designer's tasks of analyzing the instructional domain, organizing the course content, and sequencing the material. The environment can be tailored to organize knowledge within any knowledge domain, such as a foreign language, into representations that can be used to design complex delivery systems such as Computer-Assisted Language Learning (CALL). In this system knowledge elements are organized into iconic representation of 3x5 notecards, which appear as windows displayed on the screen. Each notecard can be linked to other notecards nonlinearly according to their relationship with each other. Each notecard has an active area or hot spot, which shows the destination of the link. Information can be presented in the form of a text, sound, video, or graphics. This kind of nonlinear interconnections of cards or nodes and links results in a network of knowledge structure that can be graphically displayed in a special card called a browser. Figure 1 is an example of this.

The Application of IDE to the Korean Interactive Video Program

A conceptual design model for foreign language instruction, based on the Korean interactive video courseware, has been developed in IDE. It serves as a research tool that links CALL design decisions to a set of explanations or rationales about language learning and pedagogical principles. Because the entire knowledge representation structures are linked together (representing interactions between decisions and components of the course), it is possible to trace decisions from their origin to some underlying principle or rationale based on instructional, cognitive, and foreign language theory. (Russell, 1987; Russell, Moran, and Jordan, 1988)

Templates or master cards were first
created and defined for representing different parts of the Korean interactive video courseware in order to organize different types of knowledge elements to be taught. For example, the video cards identify particular video segments by specifying their frame numbers. The audio card, on the other hand, specify audio segments. IDE’s videodisc tools have the capability to run these segments whose frame numbers have been specified. The advantage of tools such as this is that they enable us to inspect the effects of our design during the creation process.

Other templates include those needed throughout the course to provide some sort of HELP such as notes on the vocabulary, grammar, culture, transcript, and translation. The vocabulary notecard defines the Korean word in both English and Korean, and illustrates its usage in Korean sentences. At least two example sentences are provided for each expression. The cultural notecard provides an explanation on how the cultural aspects interact with the linguistic. The transcript notecard provides the actual Korean text given in Korean orthography. The transcript with the option to listen to the audio is a valuable training device, since students of listening comprehension are able to see the discrepancy between the written form of the language and what is actually uttered and heard.

The translation notecard is provided as a final HELP in resolving any kind of ambiguity and as a remedy for word for word translation. Both the transcript and the translation go beyond the sentence level in providing a rich context of discourse for the learner to work with.

The templates of these cards are stored in the IDE Definitions Notefile, which contains task specific representation and tools for a particular knowledge domain. Any number of cards can be duplicated from the templates or master cards for subsequent instances of certain card types. These different categories of support information are linked into networks that form the structure and sequence of the entire instructional design.

The links make explicit the kinds of relationships that exist among the different cards such as Activity, Help, Feedback, Mode, Done, and Evaluation links. The cards are linked together in terms of what they contribute to the lesson. The links also determine the branching paths.

The justification of explanation for design decisions is documented in the rational cards. A design rationale provides the principles or reason(s) for particular design decisions. The knowledge structure being taught can thus be constantly reviewed for design coherence and adherence to established
instructional objectives. A permanent record of particular pedagogical principles that have been applied is kept in these rationale cards for future review, evaluation, revision, or reconstruction. This facility encourages team work and facilitates the duplication of effective and successful courseware or modification of the inadequate.

**Future Direction**

The documentation of both the design process and the instructional structure and sequence will help us examine the effectiveness of this particular course presentation through a study on how learners access and make use of various forms of HELP. By inspecting the design rationales and their effects on instruction, we will determine whether the instructional objectives have been achieved. With new insight obtained from our research results, we will design a model of foreign language CALL that can be used to facilitate the task of courseware development and to teach the basic approaches to designing effective CALL. Our future goal is to develop a model of foreign language instructional environment that not only provides useful HELP to learners but can also intelligently guide and advise them on how they should approach their learning objectives and what specific HELP options or strategies they should seek. Such an effort would depend on the application of AI technology to obtain data from student evaluation and monitoring and also from assessing individual learner’s strengths, weaknesses, and learning styles. Before this can be achieved, more work needs to be done in the area of student modeling.

**REFERENCES**


**AUTHOR'S BIODATA**

Wha-Chun M. Kim is a member of the Linguistics and Courseware Design group at the National Cryptologic School. She received her Ph.D. in linguistics from the Massachusetts Institute of Technology, and her current research interest lies in the area of applying Hypermedia and AI technologies to courseware design. In addition to teaching Japanese and Korean at the University of Hawaii, the University of Maryland, and Johns Hopkins school of Advanced International Studies, she has developed a Korean interactive video program with Brigham Young University.

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