Using Interactive Multimedia for Foreign Language Acquisition

by

Rizwan Q. Virk and Mitchell C. H. Liu

Submitted to the Department of Electrical Engineering and Computer Science
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Abstract

This thesis presents the design, implementation, and evaluation of a language learning system using interactive video. The goals are to bridge the gap between the most efficient methods of learning a foreign language and in-classroom teaching by bringing "Cultural Immersion to the Desktop".

The system consists of a drill-based supplement to Japanese Language education at MIT, and a less structured adventure game set in the streets of Tokyo. In creating this system, we have developed a set of methodologies for integrating multiple media of interaction including video, graphics, text and voice-input, to produce effective language learning applications.

Thesis Supervisor: Glorianna Davenport
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Acknowledgments

From Mitch: My most sincere thanks to Riz, long-time friend, partner and soon-to-be business associate. Our relationship has spanned three continents and four years; it has yet to encompass many more worlds. This is only the beginning!

Next, I would like to thank Stuart Malone from the Athena Language Learning Project for guiding the project at every step, providing many valuable software development skills, and to Kevin Brooks for his invaluable help in the video production.

And of course, to all of our supervisors: Glorianna for flying with us to the limits of imagination, Janet for bringing us back to reality, and Shigeru for giving us great insights into the Japanese culture.

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Thanks to Glorianna for taking us under her wing, To Shigeru for giving us the motivation to create a revolution in language learning, and to Janet for keeping us honest through it all!

Thanks to the Engineers at NTT, who gave me my first opportunity to create Interactive Multi-Media applications. And a special thanks to Hiroko, who taught me *real* Japanese...

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Chapter 1

Introduction

This thesis summarizes the authors' work on an interactive multimedia computer software system for learning the Japanese language. This work is jointly supervised by Professors Glorianna Davenport, Janet Murray and Shigeru Miyagawa. The software system was implemented using the resources of the Athena Language Learning Project (ALLP) and the MIT Media Laboratory.

This introductory chapter gives an overview of the authors' personal backgrounds, the initial goals of this project, a brief description of how these goals changed along way. Lastly, an outline of the upcoming chapters is provided.

1.1 Author's Backgrounds

Rizwan Virk was born in Pakistan, raised bilingual in Punjabi (a language spoken in parts of Pakistan and India) and English. He studied Japanese for several years at MIT, diligently using the materials available in the language lab, but found them very inefficient for producing the level of fluency he desired. One summer working in Japan helped solve that problem. Rizwan's motivation for this thesis was to produce an application that would have allowed him to achieve the desired level of comfort

with the Japanese language before his trip there. Rizwan has experience creating educational software, including multi-media applications incorporating full motion video.

Mitchell C. H. Liu was born in Brazil, and raised bilingual in Portuguese and Chinese Mandarin. At age 12, he came to the U.S. and found himself in a foreign environment, and was once again forced to learn a new language. Mitchell is currently studying Japanese at MIT, and will also be spending a summer working in Japan, where he can test out the language fluency he has developed by using the system described in this thesis. Mitchell's experiences with both language learning and software engineering prompted him to pursue a thesis project that would incorporate those two interests.

1.2 Initial Goals

Initially, our goals were to design and implement a multimedia computer system which would bridge the gap between the most efficient form of foreign language acquisition and in-classroom teaching. The most efficient method of learning a foreign language is to visit the target country, and becomes completely immersed in its culture, language, and people. The next best method is to merge the learner's physical world into a simulated culturally authentic world. Through interactive video we sought to create an interactive system where boundaries between the computer's virtual world and the learner's real world become invisible.

The complete interactive multimedia system for teaching foreign languages, from the very beginning, was designed to have two parts: a drill-based portion, referred to as the Lesson portion, and a free-form portion that lets the user interact with a culturally-authentic environment in a less structured way, referred to as the Adventure Game portion.

The design was intended to be sufficiently general and broad to allow for teaching of any foreign language. For our prototype system, we focused on the Japanese language because of the authors' personal experiences with learning Japanese, and because of the inherent subtlety in the language.

At first, the Lesson and the Game were intertwined; in other words, the student could shift from the classroom setting to the "real" world or vice-versa at any time. The content base of the lesson portion could be mastered, and immediately put to use in the interactive Game. Each lesson in the Lesson portion, as envisioned, consisted of a set of conversations, dialogs and phrases about a particular aspect of life in Japan. The Game would provide a real-time environment where students could practice the material they have just learned.

The Lesson was designed to be a supplement and not a replacement for human teachers. Although the current state of multimedia technology is sufficiently advanced to create an interactive and highly efficient "model teacher", the human factors involved in learning a new language and culture could NEVER be replaced. At best, this multimedia system could be an efficient learning tool used in language laboratories.

Some specific objectives we hoped to achieve along the way were:

1. To explore techniques for using computers in foreign language learning.

2. To create a practical and useful Lesson program for MIT Japanese students.

3. To design a game which extends the use of interactive video.

4. To integrate various media of interaction (including full-motion video, graphics/text, and mouse/voice input) for desktop cultural immersion.

5. To create a system which is applicable to the research of three different groups within MIT.

6. To pursue other opportunities (academic as well as commercial) in the field of multimedia applications for foreign language teaching.

1.3 Obstacles and Unexpected Changes in Design

As design and development of the lesson progressed rapidly during the Fall term 1991, we were confronted by several obstacles. First, we did not have either the budget or expertise to create professional quality video which was crucial to our system. We settled on the idea of using "home-made" video for our prototype system.

Some time later, we realized that many foreign language courseware publishers produce video material which accompany their textbooks. We approached Professor S. Miyagawa in the Japanese Language Program to find out more about the most widely used Japanese courseware in American universities: "Japanese the Spoken Language" (JSL) by Eleanor Jorden and Mari Noda. We proceeded to obtain permission from Professor Jorden and Noda to use their commercially available video as part of our prototype system. This provided the added benefit of being able to test the effectiveness of our system, since this textbook is used in first year Japanese language teaching here at MIT. We invited Japanese students at MIT to use our system, and then observed its effectiveness on their language studies.

The next obstacle to our design process came as a result of the decision to use the JSL video. This meant that the content of the Lesson program would have to be that of the textbook, and implied that the Game would have to be designed to accommodate this material or be decoupled from the Lesson portion. Since the material presented in each of the chapters of the JSL textbook does not revolve about specific themes (for instance, how to send mail in Japanese post offices), which we required for the interface between the Lesson and the Game, we did not have a choice but to decouple the Game from the Lesson.

1.4 Goals Reached and Preview

The results of our work include:

- Complete design documents for the Lesson and the Game,
- Stand-alone implementation of the Lesson software including video,
- Prototype demo of the Game,
- Evaluation of the software with current first year Japanese students, and
- Survey of current Japanese language laboratory usage.

We have structured our thesis as follows:

Chapter two provides an overview of the three research groups we worked with, and a detailed description of the design philosophies and methodologies we have used as the basis for the Lesson and Game design.

Chapter three provides a detailed description of the design and control flow of the Game including its various forms of interaction.

Chapter four shifts its focus to the Lesson portion, and likewise, gives a detailed design and description.

Chapter five describes the limits of our prototypes, both the implemented Lesson program and the 'structural prototype' of the Game. It specifically outlines the software we have written.

Chapter six gives a summary of the evaluations we conducted with current students of first Japanese at MIT for our Lesson portion.

Chapter 2

Framework for Construction of Language Acquisition Systems

2.1 Overview

In order to define a framework for constructing language acquisition systems, it is necessary to gain a basic understanding of the underlying forces which affect all facets of language learning. The focus of our thesis work was not a literature search of all current and past theories of language learning ever written; therefore, we recognize the possibility that many other works have already cited similar foreign language learning frameworks.

The framework provided here is the result of the authors' personal experiences with learning foreign languages, as well as the authors' interaction with many foreign language instructors not only at MIT but also in various other institutions. It is of importance to note that the philosophies for constructing language acquisition systems cited in the next few sections came from the authors experience in designing the Lesson and the Game, and from feedback obtained from researchers in the field

of Computer Aided Language Learning (CALL). [1]

2.2 Integration of Three Fields of Research

One of the project's primary goals at the outset was to draw on the strengths of three separate groups within MIT: the Athena Language Learning Project, the Interactive Cinema group at the Media Laboratory, and the Japanese Language Program. Input from all three groups significantly helped define the scope and nature of the project, and is reflected in this thesis document as well as in the software implementation of the Lesson and the prototype of the Game.

Professor Janet Murray at the Athena Language Learning Project has significant experience with creating interactive foreign language teaching systems (such as "A la Rencontre de Philippe"). She has firm grounding in the theoretical aspects of using interactive media to teach foreign languages. Her expertise helped us integrate the two unrelated fields of second-language acquisition and interactive multimedia. She also provided us with the tools [2] and experience derived from the French Philippe project.

Professor Shigeru Miyagawa at the Japanese Language Program helped us define the content base and the methods for record/playback/compare of the students verbal responses in the Lesson portion. More importantly, Professor Miyagawa provided us with the necessary cultural and language expertise to produce an integrated language learning system. The theme of gift-giving in Japan implemented in the Game is the result of our discussions with both Professors Miyagawa and Murray.

Professor Glorianna Davenport at the Media Laboratory provided us with valuable

[1] Janet Murray and Shigeru Miyagawa have been of immense help in guiding us to the right direction.

[2] We will remain indebted to her for full-use of her lab 24 hours a day for the implementation of our project.

guidelines for creating interactive multimedia systems, and was the primary supervisor supporting our goal to integrate voice-recognition into the project. Professor Davenport pointed us in the right direction right direction to create an "interactive" system which would be truly *interactive*. In addition, she provided us with all the resources for the filming, production, and post-production of video required for the producing the lasersdic.[3] She also helped us immensely by filming specific scenes for the project while she was in Japan in the fall of 1991. The gift-giving idea could not been conceived without the video she brought back from Japan.

One of our major challenges throughout this project has been to produce work that satisfies the research interests of all three groups.

2.3 High Level Design Philosophies in Language Acquisition Systems

We believe that interactive systems for foreign language learning support two basic design philosophies:

Duplicating Cultural Immersion. The first design philosophy relies on duplicating, in as much detail as possible, the experience of visiting or living in a foreign culture. At its crux is the ability to create a real-time environment that induces stress, anxiety and even a bit of frustration for the beginning language student.

Providing "Fallback" Help. The second philosophy attempts to reduce the frustration, vagueness, and confusion that can result from cultural immersion. At its crux is the ability to keep the student confident about his/her understanding at every

[3] We will remain indebted to her for letting us use her video-production lab and also the financing for the production of our laserdisc.

step. Key elements in this type of design include complete readings, translations, and explanations available at any point. The student should also be able to repeat words, phrases, and even entire conversations as many times as necessary to ensure understanding.

These philosophies are somewhat conflicting in nature, and can be seen as marking two ends of a spectrum. One of the major design obstacles confronting the designer of an interactive language application is to find the proper balance (or imbalance) in order to meet the functional goals of the application.

Incorporating too much of one and not enough of the other pulls an application to one end of the spectrum. While we believe that effective language learning incorporates elements of both design philosophies, we do not necessarily believe that a learner should be subjected to both *simultaneously*. In fact, providing full cultural immersion while providing full fallback help may not be consistent with the original reasons fro providing the cultural immersion.

Our two applications, the Lesson and the Game, generally fall to opposing ends of the spectrum. In the Lesson, the student can invoke the complete Japanese script or English translation at any time, has control of the video clips (through a VCR-like control panel), can repeat sentences and video clips as many times as necessary, and progresses in level of difficulty from simple to difficult, guided by the program.

The Game portion of our thesis falls as far to the other end of the spectrum as possible. The Game is our attempt to produce full cultural immersion at the desktop. One of the main difficulties cited by foreign language instructors in guiding students to full fluency is the "cultural barrier" inherent in all classroom instruction.

This barrier can be broken by surrounding the students with as many authentic aspects of the culture as possible. Systems which use full-motion video to attempt to reproduce cultural immersion fall into three general categories:

- Ordinary video tapes, or *Passive Video* as we shall refer to it, with prepared

scenarios and dialogs tailored to language levels of the students, were a useful first step in providing students with a live and culturally authentic environment where events occur at natural speeds. Though these scenarios are often seen as awkward or even hilarious to native speakers, many teachers have successfully integrated them into their teaching methods. However, these video clips could not be fully exploited because they place students into a "passive" learning mode. The main benefit of being in a culturally authentic environment, however, is to interact with it, often randomly unexpectly, participating in an "active" mode.

- *Static Interactive Video applications*, such as our Lesson portion, provide a more directed set of tools to attack a foreign language. Though still relying on pre-planned dialogs and conversations, they give the user full interactive control of the dialog video; students can instantly cross-reference translations and scripts, easily replay phrases, and perfect pronunciation. Understanding and practice of the language in prepared situations provide firm grounding in the basics of speaking and understanding the language at natural speeds. However, breaking through the "cultural barrier" requires a level of interaction that is more spontaneous, more unstructured, more stressful, and more authentic than that provided in these somewhat-static applications.

  In a foreign country, the visitor does not learn the language by repeating prepared dialogs with a tutor until they are perfected. Rather, the visitor interacts with the environment in a much less structured way, often as a means of pursuing larger goals (e.g.. buying groceries, visiting a friend, asking directions, conveying information over the telephone, eating an exotic meal, etc.).

- Creating *Active Interactive Video applications* introduces a new set of questions about the most effective ways to arrange the levels of interaction currently avail-

able to the student into a cohesive package. The Game was created specifically to address and define methodologies for using and integrating multiple forms of interaction (video, audio, graphics, keyboard, mouse, speech) to produce an effective desktop application

Some of the tasks it hopes to accomplish is the integration of speech with full-motion video (using currently available voice-recognition technology), and the user of a conversational model to produce the quick, fluid response/feedback and multi-level probing of natural conversation. The Game falls into the general category of Active Interactive Video Applications which attempt to make students respond in real time to the environment.

2.4 Methodologies for Design of O-Miyage

2.4.1 Overview

As described in the previous section, one of the main goals of our work is to devise new tools to break the cultural barrier that ubiquitously stands in front of students of a foreign language. Students can memorize grammar, vocabulary, and even pronunciation, but speaking practice in the classroom consistently falls short of *real* practice with native speakers. Until recently, the most effective cultural immersion could be achieved by only two methods: one, visiting the foreign country, or two, interacting with an "authentic" group of friends from the foreign country who retain their cultural and linguistic heritage.

In order to bring this level of learning to the desktop, we must create an application that can duplicate not only the mechanics of a visitor's interactions, but also the *reasons* for that interaction. A visitor doesn't just ask directions randomly, he generally has a goal in mind and asking and understanding directions are sub-tasks to

achieving that larger goal. We have chosen to create an adventure game, **O-Miyage** (which means "gift" or "souvenir" in Japanese), as an appropriate method of duplicating these forms of interaction, as well as the reasons for interacting: a series of goals/subgoals, coupled with unexpected factors in the environment. O-Miyage's ultimate goal cannot be reached without first solving many of the same sub-tasks that visitors to Japan would have to master.

2.4.2 Interaction Format

The player of the Game wanders from location to location by issuing commands using the mouse to select buttons and menu items labeled in Japanese, and by speaking Japanese into the computer. These buttons and voice commands, in addition to other forms of interaction are described in detail in Chapter 3.

The methods of interaction in the Game were designed to be as culturally authentic as current technology allows. For example, when an individual in Japan pays cash for an item (credit cards are rarely used), he does not write out the amount he is giving; instead, he reaches in his wallet and pulls out the bills and the coins to make up the total amount. He sees the Japanese bills and coins, each denomination with its own peculiarities and colors, and must combine them to form the total. This is also true in O-Miyage.

The visitor interacts with his Japanese friends as much as possible by speaking to them, and by pointing if necessary. The pointing is easily accomplished by using the mouse; we have attempted to integrate as much speech input as possible into O-Miyage. We believe there is significant value in having the player continuously speaking in Japanese, even if the voice-recognition technology can accommodate only words and not complete sentences. Everyday conversation with native speakers does not always consist of complete sentences, but rather of a series of phrases, words, and other snippets. By having the player of O-Miyage speak in Japanese throughout the

game, we have provided one of the most important first steps to getting the player to *think in Japanese.*

One of the main difficulties in bringing cultural immersion to the desktop has been introducing real-time effects. In a foreign country, the visitor must respond to the environment immediately or lose opportunities. At the desktop, the player can usually get up, have a cup of coffee, come back to the desktop, and find the environment unchanged from when he had left. In O-Miyage, we have added elements of timing, both in responding to the characters in the story, and to the opportunities available on screen. For example, at the train station, the player is placed in front of a ticket machine (assuming he has stood in line and one is available). If the player stands in front of the machine and studies it for a long time without buying a ticket and the station is busy, there will be many upset individuals behind him. In this instance, we provide a video clip that shows angry individuals in line behind him; if the player repeats his mistake, he is kicked out of line. We have made provisions in the game design for adding this "delay-and-get-penalized" methodology for every location in the game where it is appropriate.

2.4.3 Methodology for Interaction

Introduction

Throughout the design stages of O-Miyage we have reflected on different possibilities *of integrating full-motion video, computer screen graphical interface,* and *multi-modal* user input into a complete package. Based on our experiences with O-Miyage, we have developed a methodology for the continual switching from one medium of interaction to another; in other words, no one medium holds "control" of the state of the game for extended periods of time. In typical game programs, most of the idle state happens at the student input level, thus breaking the flow of the game, and interrupting the

immersion.

We feel that current interactive language systems which allow students to take their time to learn the system and the environment fall short of being truly interactive. In real-life situations, students do not have the option to check their comprehension, and get English translations of each phrase said. In O-Miyage as in real-life, a student can get help through other characters in the environment.

There exist tradeoffs between systems which force students to interact in real-time (O-Miyage for example) and systems which allow students to explore their comprehension and understanding of the situation at their own pace. As described in the previous section, we have adopted the extreme philosophy that a little pressure on the student is good. At the same time, it is unreasonable to put the foreign language student at awkward positions (as happens often in real-life situations in foreign countries) without any help at all. It is precisely this reason why our original design tightly coupled the Lesson and the Game portions. As a student progresses from a step-by-step method of learning the specifics of a language, s/he is forced to use these new language skills in the Game.

Description

One of the key weaknesses of current systems is the over emphasized use of video resulting in long clips presented to the students (often more than 10 to 15 seconds at a time). From a language learning perspective, this leads to excessive language constructs and patterns presented to the students. From a learner's perspective, the system becomes a medium which provides information in a static manner, as opposed to a medium which seeks interaction through dynamic responses from the learner. Such systems are only slight improvements to existing video tape based language systems, and the end result is inefficient integration of the different mediums resulting in sub-optimal language learning and decreased student motivation.

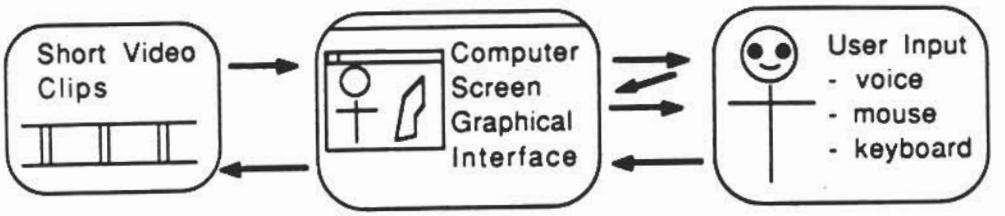

Figure 2-1: Three media of interaction

The diagram in Figure 2-1 presents three media for interaction: the video clips, the computer screen graphical interface, and the learner input. The focus of our methodology is on active and continual switch among these three media.

The learner provides input by speaking into the microphone, by using the mouse and by typing using the keyboard. An idealized system would have the student speak both short phrases and complete sentences in the target language; however, current technology limits the amount of voice recognition that can be incorporated into a computer-based learning system. As mentioned before, in every day conversation, communication is often accomplished by quick exchanges of words and short phrases, interspersed with more grammatical sentences, rather than through a collection of complete sentences.

The act of saying individual words and short phrases in the target language is a crucial first step to achieving the spontanaeity that everyday exchanges offer. This may be, for example, saying the word "map" in the foreign language when the student wishes to view a map of the city, in contrast to the traditional use of the mouse to click on a map icon. Incorporating these into a game like O-Miyage is consistent with our methodology of continual shifting of focus between media of interaction.

The video clips are short sequences of video, usually less than five seconds, that

serve the purpose of communicating visual-language and audio-language information to the learner. The learner participates in this medium through interaction with the characters of the story, brought alive through the short video clips. For example, after a character asks a question which requires the student to make a choice or decision, the student is given a short "response time" within which to provide input. If the response from the student is not provided within the allocated response time then an "annoyance" video clip will be played to tell the student to hurry up.

The computer screen graphical interface is the medium through which the learner navigates through the environment. The graphical interface provides voice-activated icons, specific simulations (the subway ticket machine, for example, in O-Miyage), and text in the foreign language. In addition, it contains traditional objects such as menus, help, multiple choice selections, etc, as describe in the next chapter.

Important Note

Within every medium described above, the student is completely immersed in the foreign language and its culture. We have designed the "help" aspect of the program to fit into, not break, the integrity of this immersion. For instance, after a brief conversation exchange between two characters in the story, one of the characters may turn to the learner and ask (in the foreign language) whether the student has understood the conversation. The learner then needs to read (in the foreign language) the multiple comprehension check options and decide on the content of the conversation. There will always be a "I don't understand" option which prompts the character in the story to provide more clues to the learner (for example, he may rephrase the question and the answer itself so the learner understands the contents and can continue). As a last resort, the player's Japanese buddy could translate a sentence into English, simulating the process of having a bilingual friend.

Learner Skills in Practice

In our game, the learner practices a comprehensive set of skills in the foreign language: the learner input requires the student to SPEAK to the system, the computer graphical interface forces the student to READ, and the video clips enforce both AUDITORY and VISUAL comprehension.

2.4.4 Specific Principles Used in the Game

Some of the principles we have used to guide our development of the game follow. It is important to note here that many of these principles may be seen as "common-sense" for individuals who have studied several languages, or are knowledgeable in the field of foreign language acquisition. However, we found that these were very crucial principles which underly our work in the field of interactive multimedia. [4]

- *The acquisition of a language is not independent from learning about the culture that produced that language.* Although vocabulary, translations, explanations, and grammar are needed to develop the basics of a language, we believe the only way to achieve full fluency in a language is to emphasize communication in cultural context. We have incorporated this principle into O-Miyage by providing the player with as many cultural elements as possible.

- *Students of a language should attempt to understand the language without help: a little bit of stress is good for the language learner.* Carried to an extreme, this can lead to unnecessary frustration that a short five-minute explanation could have avoided. Yet, this is the primary reason why cultural immersion works as well as it does. We have incorporated this principle into O-Miyage by providing a limited help.

[4] Readers who do not have background in foreign languages would benefit most from this section.

- *Help should be provided in-context.* When a person is in Japan, he cannot instantly leave Japan to be given guidance and understanding. One thing the visitor can do is find an English speaker and ask him to translate what was not understood. In O-Miyage, the idea of having a Japanese buddy incorporates this principle.

- *Interacting with native speakers who speak at full speed is necessary.* This principle is present throughout the game.

- *Interactivity is a measure of effectiveness in language learning tools.* We believe that the more interactive we can make an application, the better it will be as a language learning tool. This is true not only because students learn better if they are more involved, but also because of motivation. Students are more likely to make an effort to use interesting interactive applications, and thus spend more time learning.

2.5 Methodologies for Design of the Lesson

2.5.1 Overview

As referred to earlier, the design goals of the Lesson were to create a step-by-step computer-aided supplement to current in-classroom teaching. It would provide culturally authentic video clips of conversations, provided in an interactive way to give students the ability to master given dialogs, phrases, and sentence patterns quickly. The suggested step-by-step methods of learning are given as a guide to first time users of the system. It is by no means the only way to use the system, in fact, the Lesson was designed to allow students to freely select any path they want to take. It was the result of our testing and evaluation of the Lesson with current students of Japanese which led us to integrate a more detailed step-by-step guide to using the

Lesson. These beginner students felt at a loss with the unstructured format of the Lesson. As students become more experienced with the system and the language, they can better utilize the Lesson program as a personal tool based on their own learning habits.

The next section provides a list of key principles which underly our beliefs of some of the most effective ways to learn foreign languages in a structured, step-by-step approach, such as that taken by the Lesson. All these principles have been incorporated into our Lesson implementation.

2.5.2 Specific Principles Used in the Lesson

- *Children learn languages quickly by modeling native speakers (namely, their family and elders).* We believe that the most efficient methods for learning to speak a foreign language are to provide native speakers to model. In the Lesson, this includes not only native speech, but also close ups of the facial expressions, gestures, and movements that accompany normal speech. Ideally, these methods would incorporate as much as possible, the natural spontanaeity that occurs when interacting with native speakers.

- *Repetition is important to develop basics.* This is true in both speaking and understanding a language. A word may not be pronounced correctly the first time, a phrase may not be used appropriately the first time, and a sentence may not be understood the first time. Repetition is crucial in learning any language, and is the primary reason why individuals who have lived in a culture for several years generally speak the language better than those who have stayed for a few months. Through the use of phrase-by-phrase indexing in the Lesson, the student can easily repeat particular phrases as often as s/he wishes. The Lesson also indexes each core conversation, so students can easily forward and

rewind to specific trouble points within the conversation.

- *An instant feedback loop that allows the student to converge on an understanding and perfection of the language is an extremely effective tool.* After the student has attempted to understand and produce the language without help, then it is beneficial for the student to receive guidance and feedback. A student's language learning odyssey can be shortened many-fold by analyzing his errors, and allowing him to correct these errors instantly. The record/playback/compare method used in the practice portion of the Lesson provides students with this level of feedback by comparing the students verbal response to a professor's as well as to professionally filmed video from Japan.

- *Learning vocabulary in context.* Rather than memorize words in the foreign language per se, it is better for students to concentrate on the meaning of what is being said, and let their natural memory help in the memorization of words and phrases. We found that students who concentrated on the meaning of a conversation learned it faster and could reproduce it much more effectively than students who concentrated on memorizing the words and phrases in the foreign language. The Lesson helps students with memorizing core conversations which the students have to reproduce in the classroom. Many students spend hours memorizing conversations because they tend to focus on specific words; the lesson program guides students to learn whole phrases and dialogs step-by-step.

Chapter 3

Detailed Design of O-Miyage

3.1 O-Miyage Introduction

3.1.1 Overview

O-Miyage is an interactive multi-media application for learners of Japanese. It combines multiple forms of output (full motion video, audio, graphics) with multiple forms of input (mouse, keyboard, speech input) to produce "cultural immersion" from the desktop.

The Situation and Problem: You (the player) are a foreigner visiting Japan. This evening at 6 pm, you will have dinner at the house of Fukuhara-san, a business associate. It is now 9 am. You are new to Japan and understand that it is appropriate to take a gift with you to his house. However, you do not know Fukuhara-san well, and are unsure what to buy for him.

Resources: You have a map of the Tokyo train system, three meishi (business cards) of associates of Fukuhara-san who know him well, a notebook, and a set amount of money. You have a Japanese buddy, who is going to accompany you in

Tokyo. You have access to the trains, can visit multiple shops (each specializing in a different kind of gift), and can visit each of the associates. You are constrained by both time and money.

The Goal: By talking to his associates (with the help of your Japanese buddy), you are to discover an appropriate gift to take to Fukuhara-san's house. You are to buy the gift with your money, and arrive at his house by the appointed time.

Each time O-Miyage is played, the identities of the target (Fukuhara-san) and of each of the associates are chosen randomly from a database of Japanese individuals that are contained in the Game. At the end of the Game, the present will either please or displease Fukuhara-san. The ending states can be enumerated as: *very appropriate, appropriate, acceptable, not acceptable, and no gift* in cases when the player does not reach the party at all.

3.1.2 Gift Giving in Japan

In Japan, giving gifts is a very common custom, and the first time visitor may be surprised at the number of times gifts are required or expected. Certain occasions call for certain types of gifts, and other occasions require no special gift at all. Though in general, finding a gift for someone need not require the depth of research the player of O-Miyage is expected to do, some competence on the general appropriateness of a *gift is a highly-valued set of knowledge that all foreigners in Japan must eventually* master.

In the scenario of O-Miyage, Fukuhara-san is a *very important* person for the player to know and interact with in the future, so it would be *very beneficial* to find a gift that would please him.

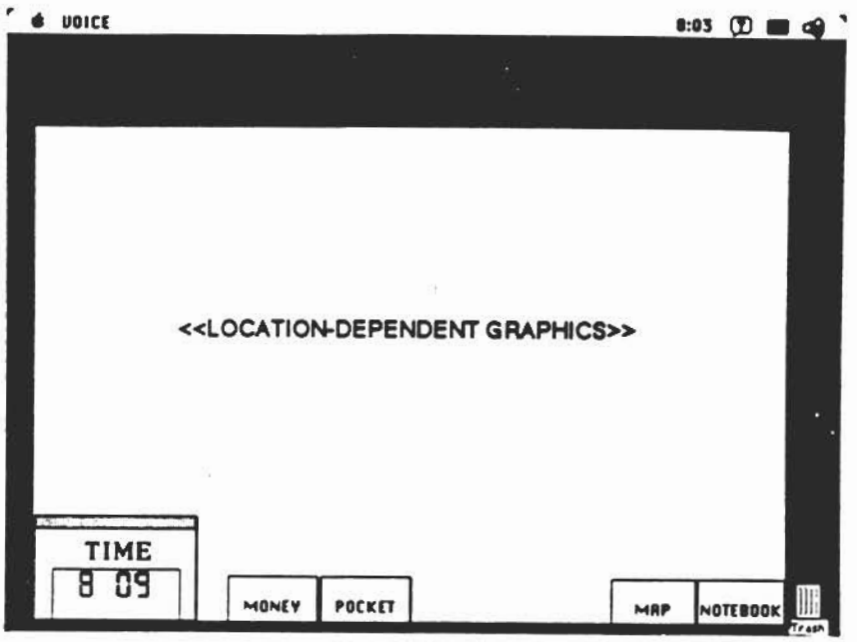

Figure 3-1: The O-Miyage Screen

3.2 O-Miyage Detailed Design of Environment

The player always sees the screen outline featured in Figure 3-1. Across the bottom of the screen are the buttons and information that make up the player's RESOURCE CONTROL PANEL. To the bottom left, there is a clock that tells the current time. To the right of the clock are a series of buttons that open the corresponding resource windows. Immediately to the right of the clock is a button that pops open the money window, which must be open for the player to spend any money. Next is a button that opens the pocket window, which displays the player's current inventory (train tickets, business cards, gifts, etc.) Further to the right is a button that opens up the map window, which displays a map of the subset of the Tokyo trains system we have chosen for O-Miyage. Finally, at the bottom right there is a notebook button, that pops open a notebook that the player can use to take notes during the Game (either in English or in Japanese).

Each of the four resource windows (money, pocket, map, notebook) can be opened

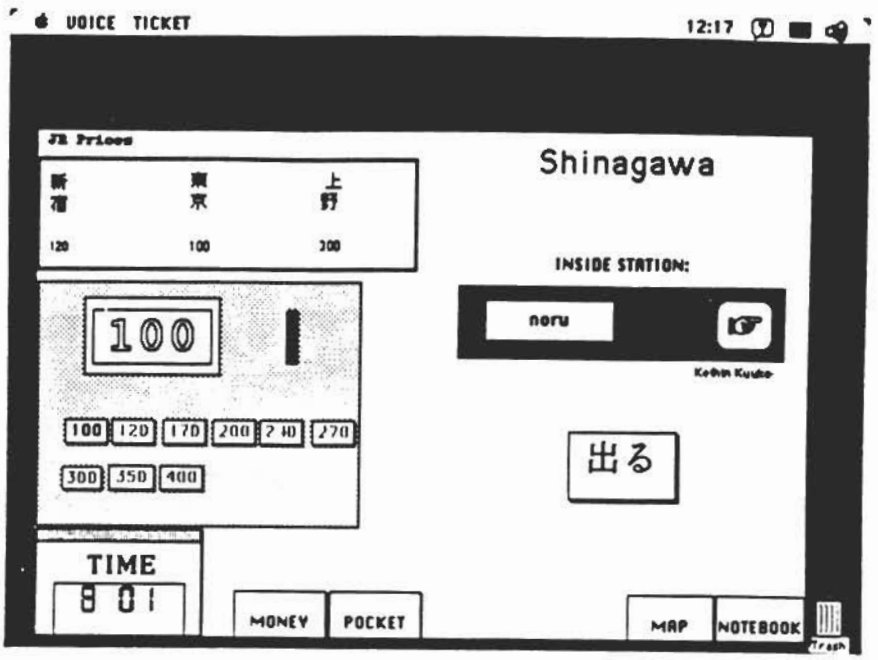

Figure 3-2: Train Station - Ticket Machine

by either pushing their buttons in the control panel at the bottom of the screen, or by speaking the appropriate word in Japanese to open the windows. These are: "okane" for money, "pokk-eto" for pocket, "chizu" for map, and "notto" for notebook. This is the preferred method for opening the resource windows; repeatedly speaking words in a foreign language provides the necessary practice to begin thinking about the underlying objects in Japanese.

Above this 'control panel', on the left-hand side, is where location-independent graphics, digitized images, and control buttons appear. These vary for each location. Figure 3-2 shows the graphics for the entrance to the train station; Figure 3-3 shows the arrangement of the screen while visiting an associate's house; Figure 3-4 shows the layout for a gift shop; and Figure 3-5 shows the graphics of a train platform where the player stands.

Next to the location-independent graphics is the major tool of O-Miyage for producing cultural immersion: a full-motion video window. Characters in the story appear in the this window and talk to the player. Trains zoom by and the land-

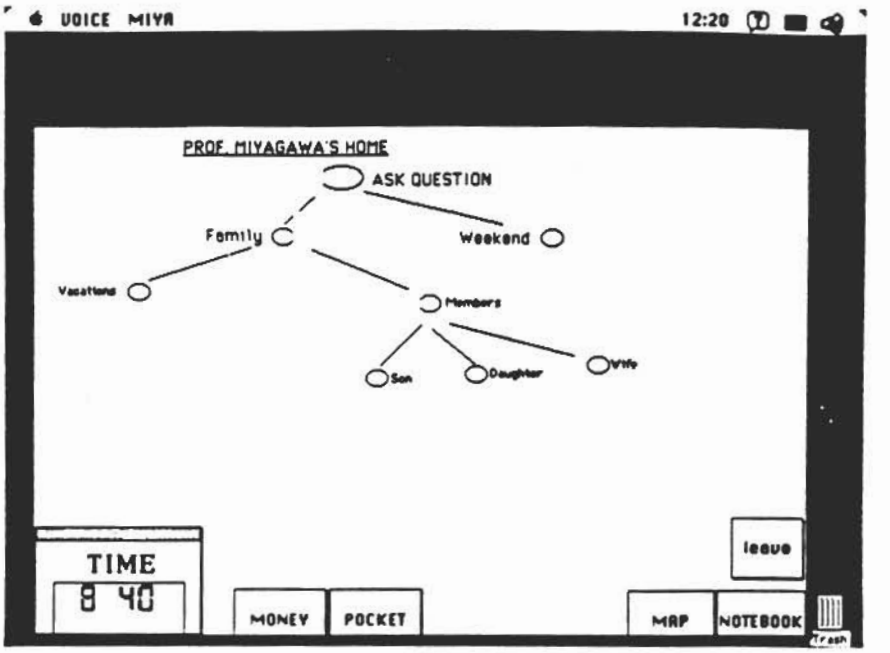

Figure 3-3: House of Associate Screen

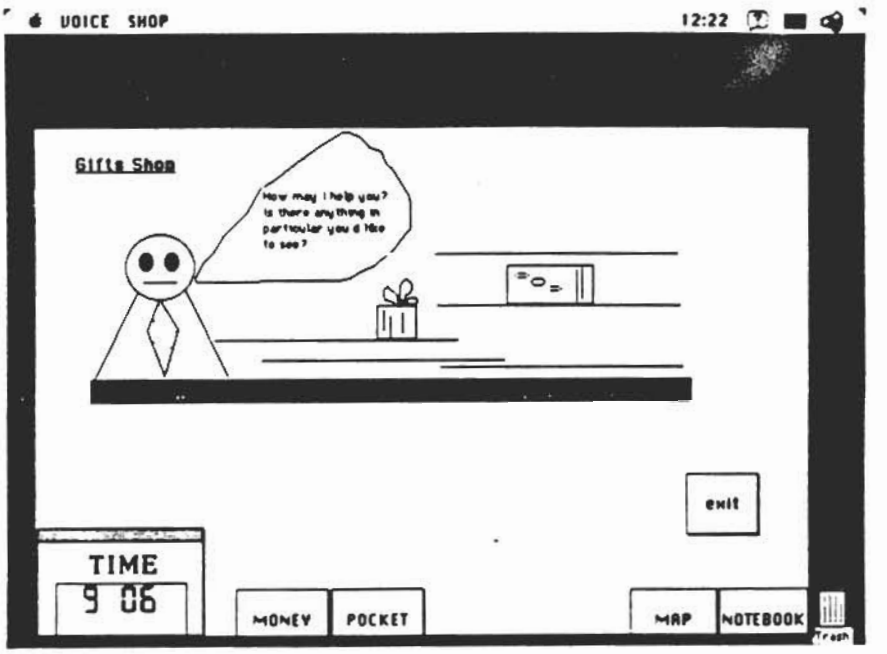

Figure 3-4: Gift Shop Screen

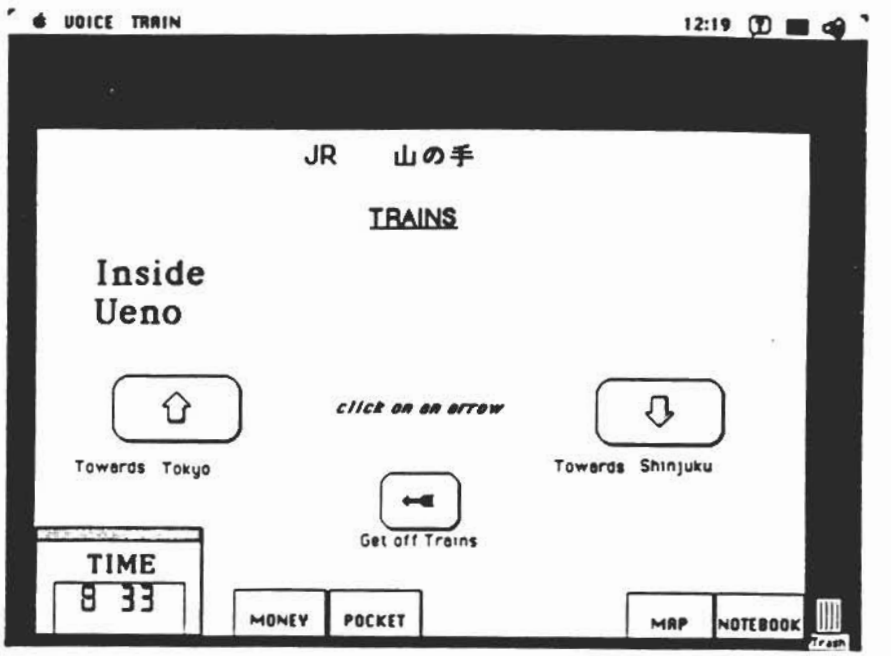

Figure 3-5: Train Station - on Platform

scape unfolds. The video is full color, full motion at 30 frames/second, and filmed on location in Tokyo.

At the top of the screen is the normal Macintosh menu bar. In this menu bar, a VOICE_COMMANDS menu indicates which commands can be spoken at any time by the user. In any adventure game where words/phrases are entered as commands, there is always an ambiguity as to what commands are commonly available (traditionally these commands are entered by typing, but in our game also through speaking). This menu, intended to reduce time and anguish for the player, can be viewed as a backup help option. This option can be removed to have an added element of realism: in Japan, guides to translate are not available at every turn.

1. On every idle round of SuperCard: one O-Miyage minute passes
2. Travel Times between stations: see table 6-2
3. Every video clip: two O-Miyage minutes
4. Between every screen: one O-Miyage minutes

Table 3.1: Clock Updates

3.2.1 Resources

The Clock

We have chosen to speed up the clock so that one O-Miyage minute takes less than a conventional minute. This clock is updated appropriately for the actions the player takes. Events take up an appropriate time relative to each other; i.e. traveling from one train station to another takes more time than traveling within one station. Table 3.1 shows all of the actions a user might take, and how many minutes each requires. Table 3.2 shows the travel times between all contiguous train stations in the Game; these numbers should be updated to reflect realistic travel times within Tokyo. In a more realistic game, times would vary depending on the time of the day; for example, longer during rush hour, taking into account the number of available trains at the time. This level of realism would require more detailed research than we believe is necessary for this kind of game. However, if the research were available, it could easily be incorporated into O-Miyage.

The Money Window

The money window, shown in Figure 3-6, must be open for the user to spend any money. In real life, a visitor to Japan would spend Yen not by typing an amount, but

Times Between Stations in O-Miyage

	Shinjuku	Shinagawa	Tokyo	Ueno	Chofu	Yokohama	Yokosuka
Shinjuku	—	10	20	15	15		
Shinagawa	10	—	10	28		25	55
Tokyo	20	10	—	18			
Ueno	15	25	18	—			
Chofu	15				—		
Yokohama		25				—	30
Yokosuka		55				30	—

Table 3.2: Travel Times between Stations

by pulling out coins and bills to make up the total amount. O-Miyage mirrors this reality as much as possible. In the money window, each denomination of currency (from 1 Yen up to 10,000 Yen including bills and coins) has its own line. For each coin or bill the player possesses, a graphic image appears in the appropriate line. The graphic images are taken from digitized images of the coins, and are as authentic as possible.

To use a coin or bill, the player need only click on that object, and the coin or bill at the end of that line disappears, leaving one less than before. Thus, the money is spent in the proper way in O-Miyage. If the player is standing in front of a ticket machine at a train station, the money plops into the machine, or if the player is in a gift shop, the money goes directly to the shopkeeper. If the player is in a location where spending the money doesn't make sense, a random event occurs: either a message telling the player that there is nowhere to spend the money nearby appears, or the money is somehow lost (in the crowd, by pickpockets, etc.)

The task of assembling a given amount of money out of coins and bills of smaller

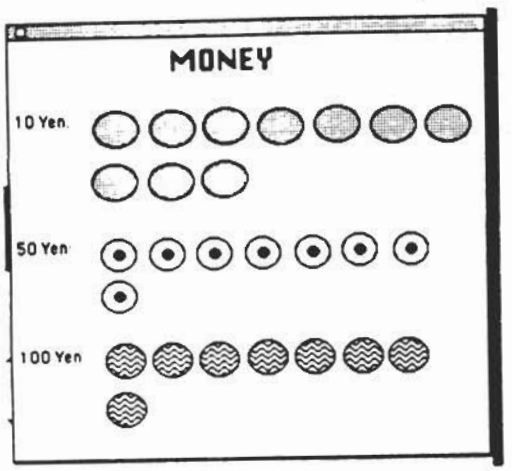

Figure 3-6: Money Window

denominations, though seemingly trivial and easily overlooked, is an integral part of spending money in any culture, and O-Miyage gives the player the experience in the most authentic way.

The Map Window

The playing ground of O-Miyage consists of three rail lines taken from the sprawling mess that is the Tokyo train and subway system, with selected stops along each line. The player can open the map window to see a map (shown in Figure 3-7) of all these stops and how they are connected.

Generally, the player will have two tasks once the window is opened: identifying a particular station, and/or finding a route from one station to the next. Since the names are all written in Kanji (one character representing one word), the first task may not be as easy as it seems. O-Miyage provides a map interface that lets the student speak the name of a station (which the player may have heard from one of the other characters in the story), and the station will be immediately highlighted

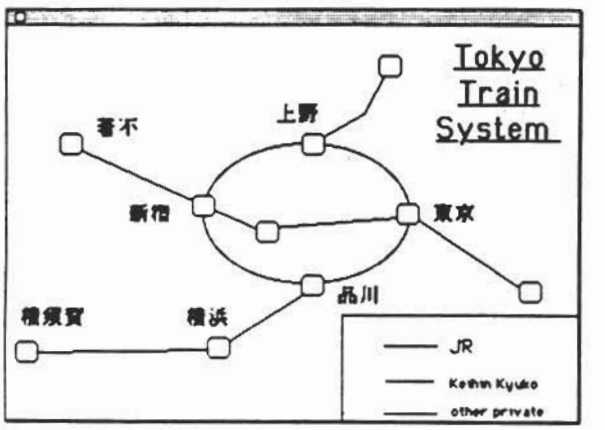

Figure 3-7: Subway Map

on the map. This help function would be the equivalent of asking someone to find a station for you on the map.

If the student clicks the mouse on a station, then a pre-recorded voice will say the station name so that the student can associate Kanji with their pronunciation.

The Pocket Window

The Pocket window simply shows what objects (other than the map, money and notebook) the player is carrying. These might include train tickets, business cards or gifts. Clicking on an object in the pocket window will present detailed information about the object. In the case of a business card, it provides a zoom window so that the card can be read. In the case of a rail ticket, it tells the price and station purchased at. Figure 3-8 shows an example of the pocket window.

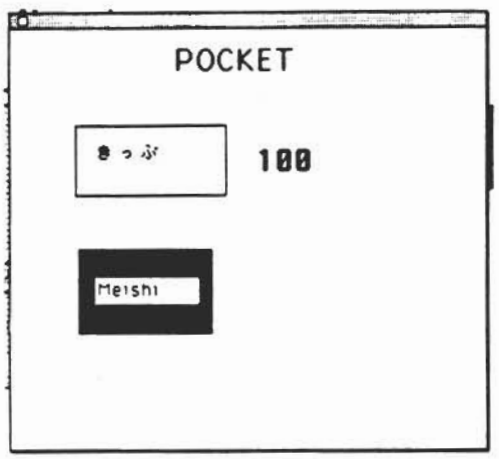

Figure 3-8: Pocket Window

The Notebook Window

The Notebook (shown in Figure 3-9) allows the user to take notes about any aspect of the Game. It is his own sanctuary, and he can write notes in Hiragana, Katakana (the two Japanese alphabets), or Kanji, as well as Romaji (romanized Japanese) and English. These notes can range from names of stations to pronunciations of words to notes about gift ideas or people. The notebook consists of a finite number of blank pages, which the user can manipulate at will.

In an ideal implementation of O-Miyage, a pen-based input accessory would be appropriate for interface to this window, to bring in the realism of writing notes as opposed to the traditional desktop method of typing in the notes. Freehand sketching would be particularly important for writing Japanese characters.

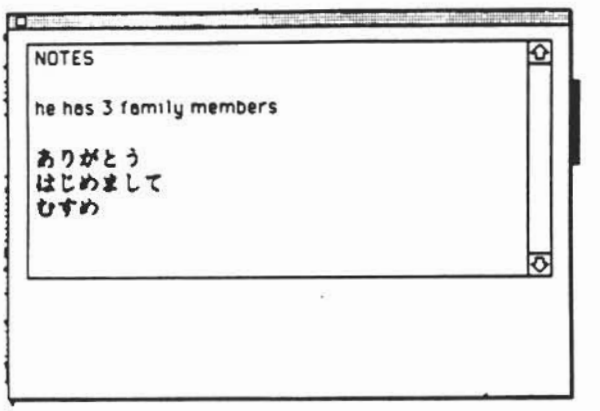

Figure 3-9: Notebook Window

3.2.2 The Arena of O-Miyage

The Transportation System

The player wanders around Tokyo by riding the trains from station to station. The foreign visitor to Tokyo will find himself overwhelmed not only by the number of stations, but also by the sheer number of different train lines that appear on a train map. There are both public lines (referred to as JR) and private lines. For the sake of simplicity, O-Miyage includes only three train lines from the intricate web that runs through Tokyo:

1. **Yamanote line** (one of the main JR lines) - it includes many of the major stations in Tokyo: Shinjuku, Tokyo, Shibuya, Shinagawa, etc.

2. **Keihin Kyuko line** (private line) - this line goes out of the Tokyo prefecture and stops in Yokohama.

3. **Keio line** - another private line.

1. Yamanote Line:

Shinagawa
Shinjuku
Tokyo
Ueno

2. Keio Line (other private line):

Chofu
Shinjuku

3. Keihin Kyuko Line:

Shinagawa
Yokohama
Yokosuka

Table 3.3: List of Stations Used

Figure 3-7 on page 40 details the stops chosen on these lines in the subway map. We chose a limited number of stations from each of these lines; these stations are listed in Table 3.3.

The player of O-Miyage travels from station to station by buying tickets and boarding trains, much as an actual visitor to Tokyo would do. The player must be able to determine how much each trip will cost, and purchase the appropriately priced tickets. A matrix of prices for the stations used in O-Miyage is tabulated in Table 3.4. This table should be updated to reflect current prices during the time of program implementation.

Figure 3-10 shows a high-level map of the user environment. The player's game revolves around the train stations. He travels from station to station by riding the trains, and then walks outside the stations to visit associates and gift shops. The houses of associates are spread out across the map of possible stations, as are the shops for gifts. Some stations contain both the house of an associate and a gift shop. The locations of the houses and shops, as well as the types of the shops, are chosen

Prices Between Stations in O-Miyage

	Shinjuku	Shinagawa	Tokyo	Ueno	Chofu	Yokohama	Yokosuka
Shinjuku	—	120	300	150	210		
Shinagawa	120	—	100	300		350	410
Tokyo	300	100	—	200			
Ueno	150	300	200	—			
Chofu	210				—		
Yokohama		350				—	100
Yokosuka		410				100	—

Table 3.4: Ticket Prices between Stations

randomly at the beginning of each new game.

The Train Station

The O-Miyage train station consists of three separate screens, as shown in Figure 3-11. The first is the OUTSIDE-STATION screen, which represents the surrounding neighborhood. The second is the TICKET-MACHINE screen, which is where the player finds prices and buys tickets to enter into the station. The third is the TRAIN-PLATFORM screen, where the player actually boards the trains. Since some stations are on the intersection of more than one line (for example, Shinagawa is on both the JR Yamanote line, and the private Keihin Kyuko line, see subway map, Figure 3-7 on Page 40), these stations have more than one ticket machine and more than one train platform though the surrounding neighborhood is the same. A diagram describing these duplex stations is shown in Figure 3-12.

The OUTSIDE-STATION screen, shown in Figure 3-13, contains buttons to represent each of the places in the neighborhood that might be of interest to the player.

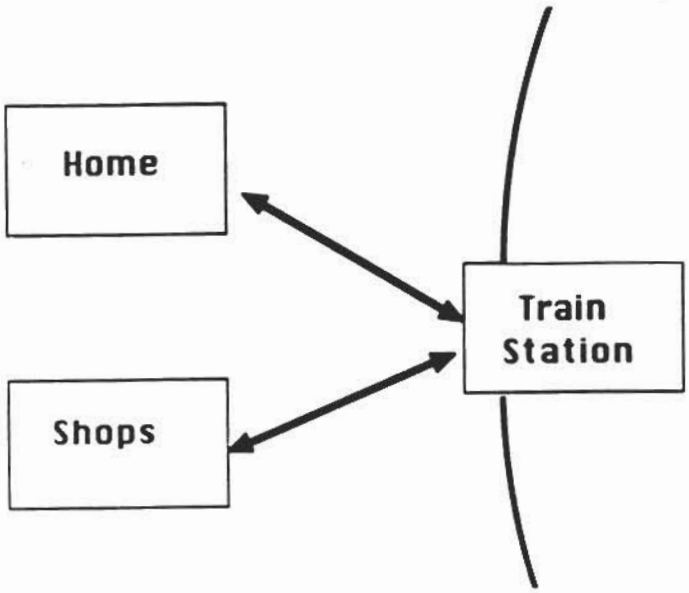

Figure 3-10: The O-Miyage Environment

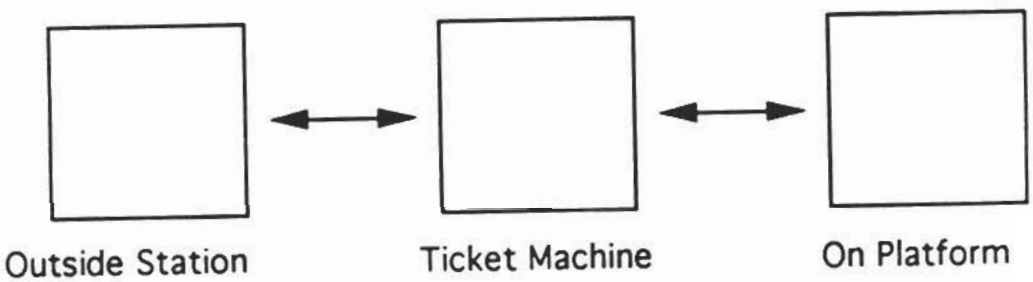

Figure 3-11: The Train Station

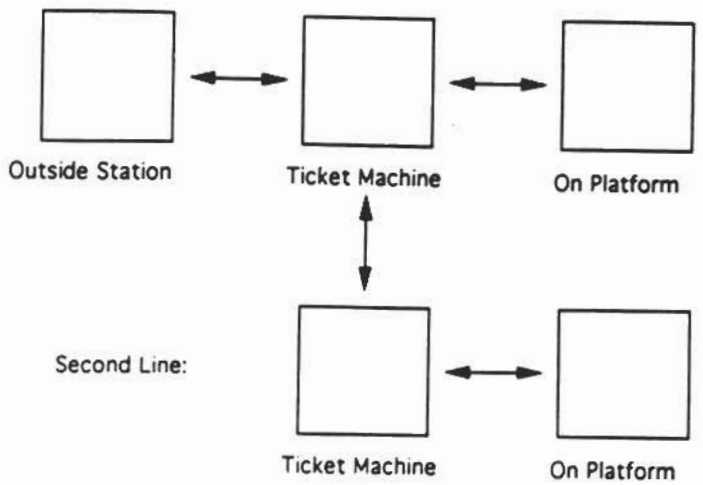

Figure 3-12: Station with Two Lines

At present, there are only two types of locations of interest: houses or workplaces of associates, and gift shops. In the video window, a circular video clip shows the entrance to the station. There is also a button, below and to the right of the other buttons, for approaching the ticket machines. By pressing any of these buttons, the user is transported to the appropriate ASSOCIATE screen, SHOP screen, or TICKET-MACHINE screen. A quick glance at the VOICE-COMMANDS menu will show that in addition to the ordinary four voice commands (map, pocket, money, notebook), the player can also say the names of the respective associates who live in the neighborhood, the names of the shops, or "hairimashoo" ("let's enter") for entering into the station and going to the ticket machine. These voice commands are the preferred methods of interaction, and mouse clicking is provided as a backup.

If the player lingers at the OUTSIDE-STATION screen for a period of time, a curious person (chosen randomly from a database of characters ranging from junior high school students to senior citizens) will approach the player to ask a question, such as: "Are you an American?". The player will be given a choice of responses

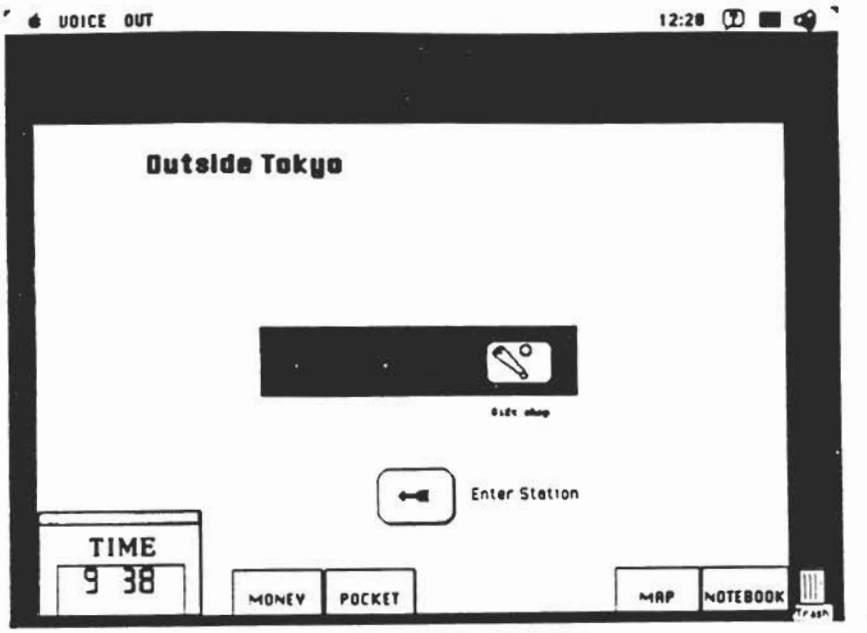

Figure 3-13: Train Station - Outside

leading into a conversation (as per the interview model, described in detail in the next chapter), and the curious person will go away either satisfied or unsatisfied, depending on the player's chosen conversation path, and fluency in speaking the language. The main use of video in O-Miyage is to provide face-to-face conversation with characters in the story, and this curious person will appear in the video window.

The TICKET-MACHINE screen, shown in Figure 3-2 on Page 34, is the entry point to the inside of the station. A video still of the station (filmed at that station in Japan) will appear in the video window. The graphics consist of a digitized image of an actual ticket machine, a list of stations in Kanji, their respective prices, buttons to go outside the station (VOICE-COMMAND "deru": "to leave"), to go to the train platforms (VOICE-COMMAND "norimashoo": "let's ride"), or to go to a different line (in stations that have more than one train line running through them).

The player deposits money into the ticket machine, and the tickets that can be purchased for the amount of money deposited appear on buttons across the bottom of the machine. This is culturally authentic; this is exactly how ticket machines work

in Japan.

If the player attempts to enter on to the train platforms without buying a ticket, a video clip of a "ticket watcher" appears and stops the player. If the player lingers in front of the ticket machine for too long without buying anything, angry individuals in line behind him appear in the video window and say a few choice words to the player (he has the option of initiating a conversation with them - though this would annoy people behind them even more).

It is expected that first and second year Japanese students (whom this game is targeted to) will *not* be able to read the Kanji in the price list, and will have to go to the map, speak the name of the station they are heading to, and then compare Kanji from the map to the price list above the ticket machine to finally arrive at the right amount. Soon, much like visitors traveling around Japan, they will begin to associate the Kanji with the station.

In the TRAIN-PLATFORM screen (Figure 3-5 on Page 36), the player is standing on a platform with train tracks on either side. Live video (a circular clip of trains arriving and leaving on both sides of the platform) provides the realistic noise and atmosphere of Japanese train platforms. The player must select which train to board since they are going in opposite directions though on the same line. Two digitized images of trains (one on either side of the location-independent graphics window) serve as the buttons to board the trains.

Travel is done one station at a time (a short video clip shows the inside of a moving train), and the player is given the option of leaving the platform at the new station, or continuing on to the next station. If the ticket that the player has purchased is only valid up until the current station, then the player can only get off the platform, or go back the other way. This simulation is a little unrealistic because in Japan, there are fare adjustment offices at each station. However, the added complexity does not justify the benefits to the learner. Future versions of O-Miyage will incorporate them

into the design.

The Associate

Information is gathered in O-Miyage through conversational exchanges at the homes of the target's associates. For a more detailed description of how the conversation with associates work, see the interview model described in the next chapter. The general screen for the home is given in Figure 3-3 on Page 35.

Upon entering the house, the player sees a very short greeting clip showing the associate and his Japanese buddy exchanging greetings. The associate then turns to the player and says "How may I help you?" This phrase is said slightly differently by each associate, as are the greetings; and the player's listening comprehension is being tested. A help option in the menu initiates a private conversation with the player's Japanese buddy to help the player understand the content of the conversational exchange. This option is available at any time throughout the conversation, though the more often this is used, the more annoyed the associate will be. The player's goal is to talk to the associate at his house and not to the buddy. This would be extremely rude.

The question is selected by choosing (through VOICE COMMANDS) one of several topics to question the associate about. The topics represent the top level of choices available to the player. At any time in the conversation, the user has the option of pursuing a particular line of questioning or thought, or backing out a level or two or three. Questions that the player can ask are arranged in a hierarchy; the higher the level, the more specific the question is. For example, the topic "Family" may be chosen. At level 1, a question about this topic might be: "How many family members are there?" Once this question is answered, new opportunities branch out in the next higher level; the player can then ask about a particular person who was mentioned in the answer to the Level 1 question. A level 2 question might be about

the age and/or school of one of the family members mentioned in the answer to the previous question.

The player chooses a topic using VOICE-COMMANDs, and then his Japanese buddy randomly asks a level 1 question to the associate. The first video clip shows the buddy asking the question, while the second is a close-up of the associate's face as he/she answers the question. At that point, the user is presented with choices of Level 2 subtopics. Since current voice-recognition technology does not allow the student to ask the complete question, O-Miyage has the student select topics and subtopics by speaking "key-words". Then the player's listening comprehension is tested as he watches his buddy ask the question in flawless Japanese.

After the answer, the player has the option of asking his buddy for help, taking notes, etc., before continuing. If a long time passes without involving the associate in any way, he/she may get bored, and may have other things to do; no further questioning of that associate will be allowed. Also, there are inappropriate questions which may be asked. The associate will not answer these questions, and will become annoyed. An exit button (VOICE-COMMAND "deru": "to leave") leaves the house. If the player leaves the associate on good terms (meaning that the associate was not annoyed or offended by any of the questions or by the player), then the player may return later to ask more questions after questioning other associates.

After leaving a house, the player may ask the buddy about where to head to next. Although, the buddy may not necessarily know or help. Time is always a consideration for the student since there are many associates who he can visit, and in addition, he must choose a gift, buy it, and arrive at the target's home before 6 pm.

The Shops

The SHOP screen, shown in Figure 3-4 on Page 35, shows a counter with an assortment of buttons representing items for sale in the shop. There is a button (VOICE-

COMMAND "deru") to leave the gift shop and go back to the station.

The user can use voice commands to identify gift items, as well as click on specific objects. Selecting an object shows a still video image of it in the video window. Conversation with the clerk is limited to asking about items, prices, and appropriateness for a particular situation. The user will be presented with three top level choices about an object: features, cost, and appropriateness as a gift for a particular situation.

The features path will show the user a video clip with the clerk describing the features of the object, which can then be pursued in more detail as per the interview model. The cost path will explore how much the object costs in relation to other brands of the same object, as well as prices at different stores, etc. The appropriateness of the gift for a particular situation will rely on having previously learned about the target from conversations with associates. Exploration of this path can only proceed based on what was learned from associates. If the player went directly to the shop and tried to explore this path, he would reach a dead end with no level 1 scenarios to present the clerk with.

Many possible gift items will be inappropriate because of price and cultural significance. Also, the player has a limited amount of money; therefore, he may want to or have to find the cheapest price for a given gift item.

3.3 Control Flow of O-Miyage

As shown in Figure 3-14, the Game begins by the player seeing a video clip of a plane landing at Narita international airport in Tokyo. Then, the player sees a video of his Japanese buddy explaining the mission to him (in Japanese), and hands the player four business cards, three of associates, and one of the target. From the very beginning, everything is presented to the student in Japanese.

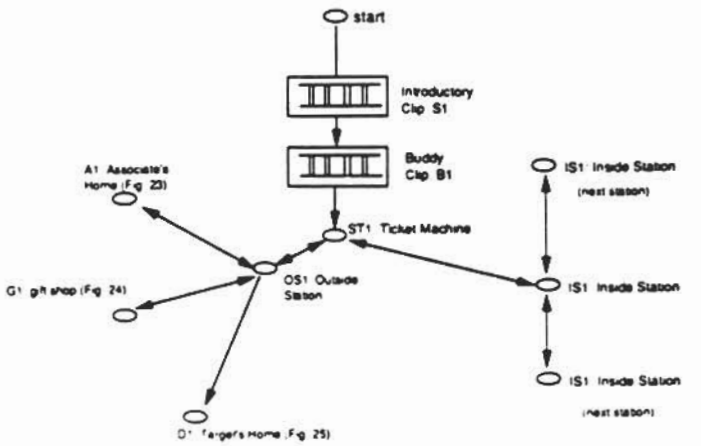

Figure 3-14: Top Level View of Game Environment

the Game randomly chooses a train station to place the student in, and the Game begins. The student is placed at point ST1 from Figure 3-14.

The flow of the Game from this point depends on the player. From a high level perspective, the student can either go into the station (point IS1, same Figure), or go outside the station (point OS1, same Figure).

More detailed control flow diagrams from point ST1 show three possible paths for the student to take (See Figure 3-15): He can choose to buy a ticket (refer to Figure 3-17), enter onto the train platforms (refer to Figure 3-18), or leave the station (following the path in Figure 3-16).

If the player does not buy a ticket, and stays in front of the ticket machine for an extended period of time, other people at the station (particularly those in line to buy tickets after the player) will get annoyed, and an annoyance video clip is shown (refer to Figure 3-17). If the player does this repeatedly, he will be kicked out of the station and end up at point OS1 (see the top level diagram, Figure 3-14).

If the player enters the station, he will be put on a train platform with trains

on either side, each heading in opposite directions (point IS1 in Figure 3-19). The player can choose to get off the platform (going back to Figure 3-15), or hop aboard either train, putting him at point IS1 again, only at the next station on the line.

If the player leaves the station, he will be put outside the train station at point OS1 (flow continues following Figure 3-20). From this point, depending on which station the player is at, he may visit either the home of an associate, the target, or a gift shop.

At the home of an associate, point A1 in the the top level diagram, the Game flows as in Figure 3-21. The player has two options: 1) ask the associate a question of the associate, or 2) leave the house.

To ask a question, the player must choose a topic or a question. Once the student chooses a topic the Game will randomly choose a general question relating to that topic (from an internal database of questions), and present a video clip of the players' Japanese buddy asking that question in formal Japanese. The student must rely on listening comprehension to get the precise meaning of the question. The associate then gives a short answer to that question (via a video clip).

Based on the associate's answer, the student's next question can continue probing about that same topic, or can switch to a different topic. If the student switches to another topic, the process is repeated all over.

After the associate answers a question, the player has the option of consulting his Japanese buddy for help (See Figure 3-24). Such a consultation will help the student understand the meanings of both the question and the answer. However, the player must be aware that this help function is akin to real life asking for help; it takes time. If the player takes too long, the associate will become annoyed, may have other matters to attend to, and will abruptly end the interview.

After asking the buddy for help, the player returns to the top of Figure 3-21, and can either ask another question, or choose to leave the shop.

At a gift shop, the student is presented with several icons representing the gifts available at this store (See Figure 3-22). From that point, the student can click on one of the icons, and see a short video clip of the clerk explaining the features of the product. After seeing the product, the player can ask several questions, such as "How much is it?", "How has it been selling?", and "Would it be an appropriate gift for such and such a situation". At any point immediately after the student sees a video clip, he can consult his buddy to help clear up misunderstandings (once again, Figure 3-24).

Once again, this "buddy consulting" is also in real time. If it takes an excessive amount of time, the clerk will go off to help someone else, and won't be back for a few minutes, meaning he can't explain anything about the products or their prices. The penalty will be having to wait an even longer period of time for the clerk to come back.

the Game ends upon entering the Target's house (see Figure 3-23). If time runs out on the player before he reaches the target's home, then the Game ends unfavorably (ending state E5: no gift). Upon arriving at the target's home, the player presents the target with the gift, and the Game ends in one of the following states: very appropriate (state E1), appropriate (ending state E2), acceptable (ending state E3), or not acceptable (ending state E4).

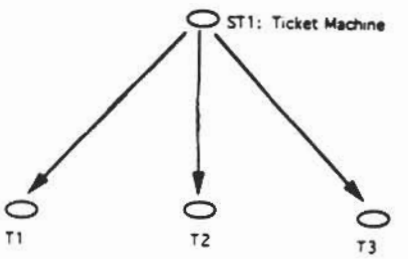

Figure 3-15: Train Station - Ticket Machine

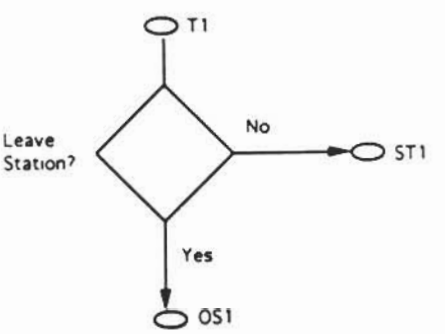

Figure 3-16: Ticket Machine - Leave Station?

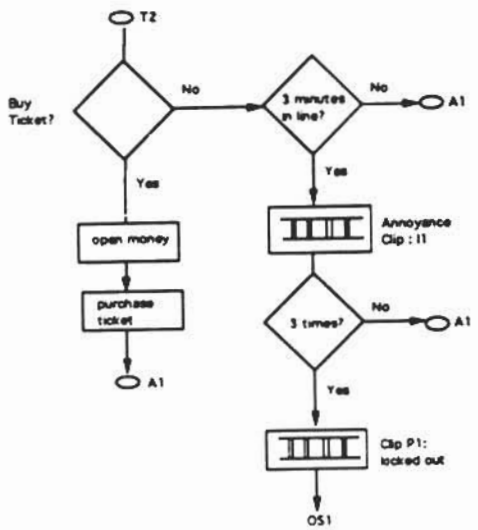

Figure 3-17: Ticket Machine - Buy Ticket?

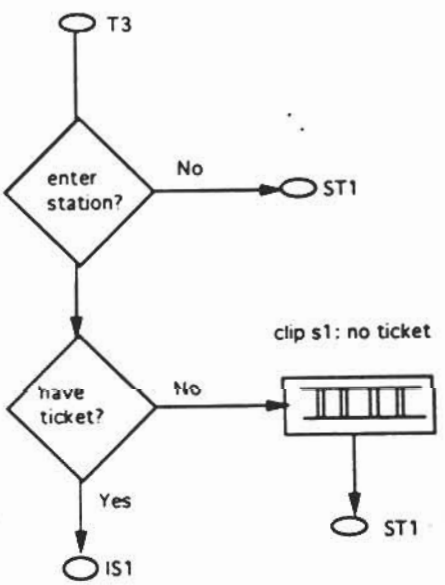

Figure 3-18: Ticket Machine - Enter Station?

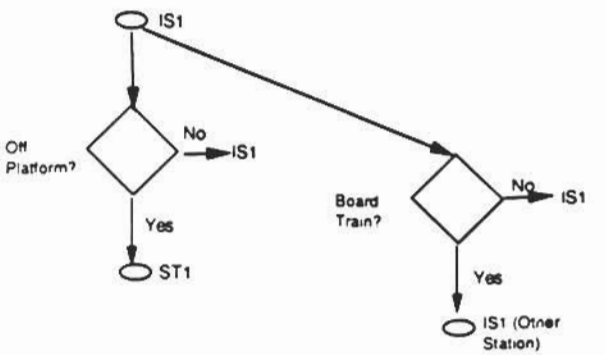

Figure 3-19: Train Station - On Platform

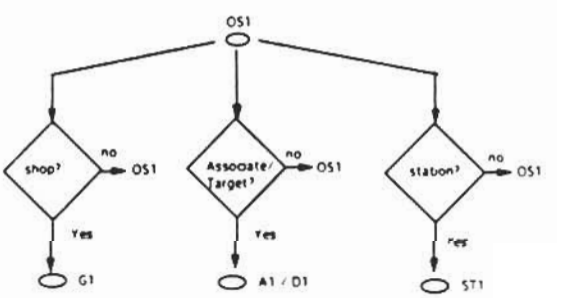

Figure 3-20: Train Station - Outside

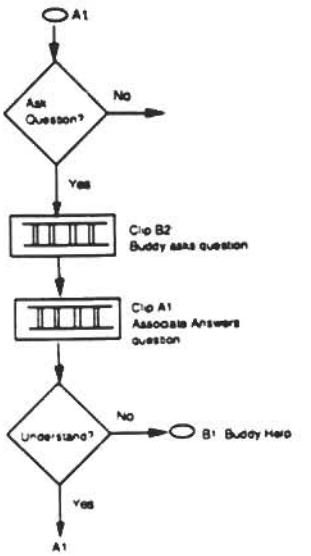

Figure 3-21: Home of Associate

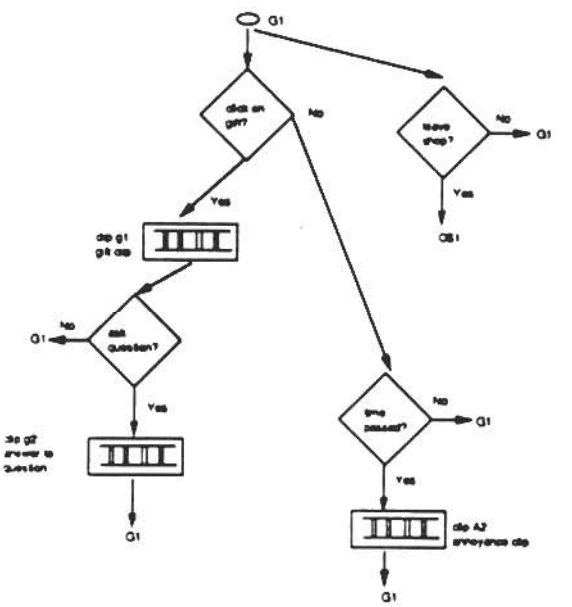

Figure 3-22: Gift Shop

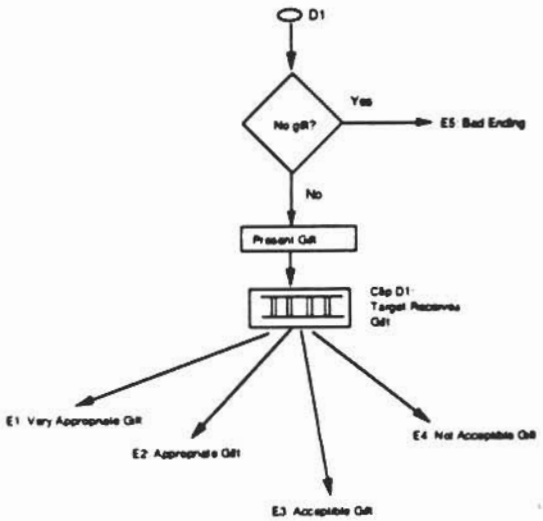

Figure 3-23: Target's Home: Game Endings

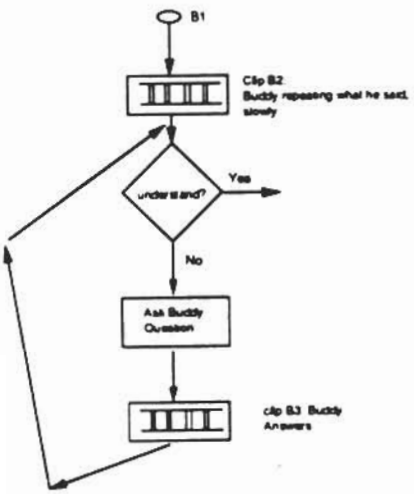

Figure 3-24: Consulting the Buddy

Chapter 4

Detailed Design of the Lesson

4.1 Terminology

A *lesson* consists of several different dialogs for the student to master (referred to as core conversations, or cc's). Typically, a Japanese language class is divided into a large number of units, each of which is referred to as a *lesson*. It may take several classroom sessions to complete each lesson. Our system is designed to fit well into this structure; thus we dubbed this half of our thesis the 'Lesson' portion.

The student practices and masters *dialogs* or *conversations* (the two terms are used interchangeably). Each conversation usually contains five to ten conversation lines between two people, and is in the range of half a minute to a minute long.

The conversation lines are referred to as *sentences* (sentence-indexed control) or *phrases* (phrase-by-phrase control). *Sentence-indexed control* and *Phrase-by-Phrase control* both refer to the ability of the student to learn the dialog by focusing on one line of one speaker, and then proceeding either forward or backward to the other speaker's lines.[1]

[1] This is like Philippe and other applications...

4.2 Control Flow

After startup, the student is prompted to select one of the available lessons. He or she is then immediately channeled into core conversation (abbrv: cc) number 1 of the chosen lesson. The student can switch to one of the other cc's at any time during the program.

We recommend the student to study a conversation in the following step by step manner:

Step 1: Watch Full Dialog The student views the entire conversation and attempts to understand as much as possible with minimum help from scripts.

Step 2: Study Dialog Phrase-by-Phrase The student studies each sentence individually referencing both English and Japanese scripts to understand the meaning. Each sentence is viewed individually to get a feel for the pronunciation, intonation, pitch and speed of the word in this particular context.

Step 3: Practice Dialog The student 'enters' the dialog by becoming one of the two characters, and learns the dialog at several levels of difficulty.

- (Level 1) - Both the Japanese text and the English translation are provided
- (Level 2) - Only the English translation is provided
- (Level 3) - No text is provided (but the student want invoke them)
- (Level 4) - Real-time interaction

After the student has mastered the core conversation, he or she may choose to go to another conversation, or begin doing drills that supplement the dialog.

Step 4: Related Drills

- *Pattern-matching replacement drills.* The student is given a crucial line from the dialog as the pattern. Then he or she is told to produce a similar sentence by replacing subjects, objects and verbs.
- *Real time question-and-answer.* The student is asked a question about the dialog by his professor, and is given a certain amount of time to respond.
- *Construction drills.* The student is asked to phrase a request, question or answer in Japanese given the English descriptions of a particular situation.

4.2.1 Step 1: Free Viewing of Core Conversations

While watching the full dialog, the student has complete control of the video from an on-screen control panel: he or she can pause, rewind or forward at any point. A reset conversation button easily searches to the beginning of the conversation.

These core conversation videos are professionally filmed in Japan, and contain numerous hints, clues and suggestions to the surrounding environment. It is often necessary and crucial to view the core conversations more than once to observe many subtle details and Japanese customs (for example, in a business meeting, after the initial exchange of business cards, it is very important to put the other person's business card on the table in front of you for later reference). Initially, a student may not have noticed this small detail, but the instruction bar would point out this custom.

The advantages of being able to view entire conversations over and over again are numerous. In the classroom, the teacher has very limited time to show the next day's video conversations (twice at most). Although the video tape is available in the language lab, students never bother to use the video because they have to view

the video on a TV, scramble with their two books to find the Japanese and English scripts, and then walk to the other side of the room to use the audio tapes to practice their lines. The majority of students do not use the language lab efficiently.

4.2.2 Step 2: Sentence Indexed Viewing

From the free viewing state, the student can click on a button (on the same control panel) to switch to sentence indexed viewing. Each of the character's sentences are indexed, so the student can replay particular sentences again and again. In a class of students studying a foreign language, different students find different sentences especially difficult. This viewing mode is flexible enough that students can repeatedly hone in on *whichever sentences* he or she finds difficult, and quickly pass over those that the student finds easier.

The instruction bar will display messages to the student explaining how he or she should go about viewing the conversation. First, the student should listen closely to a particular phrase, at least twice, and try to understand the meaning. Next, he or she should bring up the English script and understand what the phrase means (if he or she doesn't already).

Then, having understood its precise meaning, he or she should replay that sentence again and repeat it aloud. The student is encouraged to form his own sentences (of similar meaning) based on the vocabulary and sentence structural background he or she has. *It is absolutely important that the student is actively viewing the* conversations, thinking in what other ways the same sentence could be rephrased. A dictionary at hand could be extremely valuable. Practice doing this is provided in step 4: Related Drills.

Upon finishing steps 1 and 2 (repeatedly if necessary), the student should have a very good understanding of the content of the conversation, and the interaction patterns between the characters on screen (i.e. why they do what they do). These

aspects are deeply rooted in the cultural settings of the video and in the characters' manners and peculiarities.

4.2.3 Step 3: Practice and Interaction with Core Conversations

Perhaps the most crucial aspect of the students' learning process occurs in this practice and interaction mode. It is assumed that the student has already viewed the core conversations (as described in the previous two sections), and is now ready to test his fluency, comprehension and memory skills by practicing the dialog.

During the practice session, the student enters into the dialog, and becomes one of the two characters. In the video window, the student sees a close-up view of the *other* character, as if the two were actually having a conversation with each other. Close-up shots of the face and mouth movements are very important to the students, both in getting the feeling of a real conversation and in comparing their own recording to that of a pre-recorded correct response.

There are four levels of difficulty in the practice mode:

- **Level 1: Practice recording/compare with both the Japanese Reading and English translation provided.** As the student is recording and evaluating his response, the first instinct is to read the sentence in Japanese. This level allows the student to do so.

- **Level 2: Practice with only the English translation provided.** This gets the student to focus on the meaning of the dialog, and not just rote memorization. Students were often forgetting entire parts of sentences; this turned out to be because they didn't have a strong grasp of what the speaker in the dialog was trying to say. Once they knew what to say, students found it much easier to actually repeat it.

- **Level 3: Practice without Text.** Once the student has perfected pronunciation and knows the dialog, he or she is ready for real time fluency practice.

- **Level 4: Real time fluency practice.** At this difficulty level, the professor in the video window and the student perform the dialog in real time (given a limited response time), without any recording, buttons or mouse clicks. This provides the feel of having a real conversation with your own personal Japanese tutor.

Eventually, the goal of this drill-based lesson program is to have the student THINK in Japanese. In learning to speak Japanese fluently, one of the keys is to know what you want to communicate, and then produce the language to convey that idea. These levels of practice begin to develop that ability.

4.2.4 Step 4: Related Drills

The drills give the student an opportunity to apply the skills he or she has just mastered from the dialog to other situations. The design of the Lesson portion contains three types of drills. Upon entering drill mode, the student is asked to choose the type of drill, or choose Mixed-Mode.

A drill consists of a question presented by the computer, *the prompt*, and an answer presented by the student *the response*. The prompts are chosen randomly from a database of drills that comes along with every conversation. Each prompt also has one or more *correct responses* associated with it (also contained in the database). The computer prompts the student, the student responds, and then checks his response with the list of possible correct responses.

The reader will recognize this methodology as the same used during levels one, two, and three of interactive practice for the Lesson's core conversations.

The student is given a choice of how many drills he wants to do, or he can choose to

exhaust the the database of prompts for a particular type of question. The database should be sufficiently large so that exhausting it will take a long time, encouraging the student to split up the drilling into several sections.

The drill-types are:

Pattern-matching replacement drills The student is presented with an important line from the dialog. An example might be a line that translates to: "Next winter, I'll go to Hokkaido to go skiing". The student is then presented with English translations of sentences that are similar in structure to the original sentence from the dialog — the only difference being the substitution of keywords. Examples for the sentence given are:

- Next winter, I'll go to Colorado to go skiing (one-word substitution).
- Next summer, I'll go to Canada to go skiing (two-word substitution).
- Next spring, I'll go to California to go rock-climbing (three-word substitution).
- Next week, I'll go to the beach in Florida to go swimming.

After giving the computer a response, the student can view a professor speaking the correct response, and then try to improve his own response. The student can get a new prompt for the same pattern sentence (prompts are presented in increasing levels of difficulty) or can select a new one (chosen at random from the core conversation).

This drill gives students the confidence that they know not only how to say "next winter I'm going to Hokkaido", but also how to express similar thoughts (for example, whenever they want to go somewhere in some time frame).

Construction drills The student is given the English description of a particular situation (which should be similar in some way to the situation presented in the core

conversation). For example, in a dialog where an introduction is involved, the student may be asked to do an introduction.

These drills are more sophisticated than the pattern-matching drills; there are generally more than one correct response. It is up to the implementor of the system to anticipate as many responses as is feasible, and to include a correct response video clip for each of them.

Real-time question and answer drills In these drills, a professor appears in the video window and asks the student a question about the core conversation. The student is given a very short period of time to reply. Reading the translation of the core conversation is not enough; the student must understand the question the professor is asking, and then recall the situation and meaning of the dialog.

These drills begin to acclimate the student to the full speed of ordinary conversation. There is normally no question-response/ record-feedback loop. The answers are generally very short (a word or a few words), and the correct response clip is played *immediately* at the end of the time period. The student's response is not recorded — pronunciation is not being perfected here, only comprehension and fluency. Immediately after the correct response is played, the professor asks another question and the cycle begins again.

There is a pause button for students who get swamped or confused. When paused, the student can replay the question, pull up a translation if needed, or go back into full-speed mode.

Mixed Mode drills In mixed mode, the three drill types presented above are interspersed. Different drill types are randomly chosen each and subsequent times.

Chapter 5

Implementation and Limits of the Prototypes

5.1 Overview

This chapter details the implementation of the prototypes for both the Lesson and the Game portions of our Thesis. The reader is directed to Chapter 3 and 4 for the complete designs.

We begin with a discussion of the search that we conducted for an appropriate hardware/software platform to implement our prototypes, followed by a progress report that indicates all of the features of the designs that we implemented.

The Lesson portion has been implemented almost fully, and has been used successfully by Japanese students for perfecting dialogs and conversations from their classes. We have implemented a 'structural prototype' of the Game; it demonstrates each of the significant elements of our design.

5.2 Hardware Configuration for the Lesson and Game

5.2.1 Background and Research

Starting from the initial phases of thesis design, we researched several different hardware configurations that could best provide the level of support for our software requirements. This included support for basic voice input/navigation, intuitive user interface, device drivers for external laserdisc players, and extensive libraries for software implementation. The software design evolved simultaneously with the search for a most appropriate hardware configuration, and therefore, we were forced to design our software hardware-platform independent. The software design provided for extensions and reductions in levels of functionality depending on the final choice of hardware. As an example of this software extensibility, we designed the user input modules to accept mouse/keyboard input as default and allowed extended modules for voice input.

The following is a list of hardware configurations we researched at the beginning of our thesis project:

1. NeXTcube computer with its built in digital signal processing capabilities for voice input/processing, and the NeXTstep Interface Builder for an object oriented approach to software implementation.

2. IBM Ultimedia multimedia system (Model M57SLC) with IBM's Action Media II boards supporting the Intel DVI B series processors. DVI technology supports real-time compression and decompression of video data. Software implementation would be through OS/2 2.0 Multimedia Environment, or possibly in Microsoft Windows with Multimedia Extensions Environment.

3. Apple Macintosh with Apple's Quicktime technology for software based decompression of video data stored on CD-ROM or on non-volatile storage. Software implementation could be on Apple's C++ object-oriented environment, or on the Hypercard.

5.2.2 Hardware Decisions and Reasons

Among the three systems presented in the previous section, we decided to use a Macintosh computer interfaced with a videodisc player, and software development to be done on Supercard. There were several reasons for this decision:

1. **Time limitations:** Developing a prototype language system from scratch (using NeXTStep Interface Builder or Apples' C++ toolkit) would have required us to assemble a team of software engineers to complete the job in time.

2. **Monetary limitations:** All the systems presented above are in the order of $10,000, and no laboratory here at MIT had the exact configuration we required. There was little time to raise funding for buy the systems.

3. **Practical limitations:** We sought to develop a prototype system which could eventually gain visibility in foreign language teaching systems (such as Philippe); therefore, we chose a hardware platform which most language departments of universities in the US already have.

Since we were working in conjunction with the Athena Language Learning Project, the principal programmers at ALLP already had significant programming experience on the Mac/Laserdisc/Supercard platform; we didn't want to "reinvent the wheel". The Supercard programming environment proved to be more adequate for our software implementation than Hypercard. Supercard provides much better message pass-

ing interface between different windows; whereas, Hypercard does not support multiple windows.

5.2.3 Final Requirements

Following is a list of the components for the system. First, the hardware requirements:

- Apple Macintosh computer,
- Built-in or external microphone for voice recording (Lesson portion only),
- The Voice Navigator voice recognition system for the Macintosh (Game portion only), and
- Laserdisc player with RS-232 cable interface with the Mac (For Lesson prototype, is not used by the Game prototype, though a full implementation of O-Miyage would need this player).

Then, the software requirements:

- Silicon Beach's SuperCard development environment,
- Laserdisc device drivers (XCMDS, XFCTNS for Supercard interface, provided by the Voyager Company), and
- Prototype software for the Lesson and the Game.

5.3 The Lesson Prototype

The Lesson prototype provides all the main functionalities the final program would contain. These include fully-functional student-controlled video viewing, record playback/ compare and free-form interactive dialog practice sessions. Students in

second term Japanese courses using the JSL curriculum can benefit from using the Lesson program in conjunction with classroom teaching, and as a replacement for the audio language lab.

The prototype system is composed of the Lesson software program we wrote running on a color Macintosh II equipped with a MacRecorder and Pioneer Laserdisc player. Students can use this system to record their own voices, playback these recordings and compare them with pre-recorded sequences from both a Professor and actual characters of the video. Furthermore, the student can select various levels of practice and eventually reach the free-form interactive dialog practice where the student is given a limited amount of response time to "communicate" with the person in the video. (as described in detail in Chapter 4)

This prototype is the second main version of the software. Software modifications were made based on feedback received from Japanese faculty members, and as a result of in-lab testing with a small group of second term Japanese students. The main changes were made to the user interface for a more friendly interface, the addition of a "guidance" bar at the bottom of the screen, and the addition of a full free-form interaction practice dialog level.[1] The user interface changes involved replacing several windows on the screen by menu options, and simplifying the user video control panels.

5.4 The O-Miyage Prototype

O-Miyage, in its final form is a 'structural prototype'. We have implemented sufficiently to demonstrate all of the main elements of our design. This includes most of the graphical interface, an example of the interview model, the real-time interaction, and the voice-controlled user input. Functionally, the student is able to use each of

[1] Credit is given to Professor Takako Aikawa for this suggestion.

his resources (money, map, time, business cards), wander around Tokyo from subway station to station, visit one associate and ask questions about the target, and go to a gift shop and buy a gift.

The complete set of video needed to make O-Miyage a finished application was beyond our reach due to time constraints. The structural prototype contains a simulated video window, containing text, graphics, and sound. Rather than seeing a particular clip in full motion video, the student sees a text description of the clip occasionally accompanied by graphics in the video window and sound. In instances where a character speaks to the player, this method works well; in other instances (moving train, sounds of station, etc.), it proves less than adequate (though it is quite amusing). The production, filming and post-production of the necessary video for O-Miyage could constitute a separate bachelor's thesis in itself.

Following is a list of the design elements of O-Miyage (taken from Chapter 3) and a brief explanation of how each is implemented in the prototype:

5.4.1 Resources:

- **The Time Element:** The time element of the Game is fully implemented. The user starts at 8 am and has until 6 pm to buy the gift. Time moves at a faster-than-real-time rate, to allow the user to complete the simulated 10 hours in much less time.

- **Money:** The money window is fully implemented. It can be invoked by clicking on the 'money' button in the RESOURCE CONTROL PANEL at the bottom of the screen, or by saying 'o-kane' (money in Japanese). Instead of using digitized images of Japanese coins, we implemented graphical mock-ups of the coins. The money is used just as envisioned in the design; the player clicks on a coin with the mouse, and it is spent in the appropriate way.

- **Pocket:** The player's pocket window is fully implemented. It comes up by clicking on the 'pocket' button or by saying 'poketto'. The only objects that appear in the pocket window are train tickets (when they are bought), and 'meishi' (business cards). The player can examine the 'meishi' more closely by either clicking on them when the pocket window is open, or by saying 'meishi' at any time. A separate window pops up that lets the student read and shuffle through the cards.

- **Notebook:** The notebook window is fully implemented, and can be used to take notes in both English and Japanese. Similarly, it is activated by saying 'nooto' or by clicking on the 'notebook' button.

- **Map:** The map window is one of the more interesting aspects of our prototype. It can be opened by saying 'chizu' or by clicking on the map button. In the map, all relevant stations are labelled in Japanese. When the map is open, the student can find a train station by saying the station name; the appropriate station is highlighted on the map. If the student clicks on one of the stations on the map, O-Miyage will say the the name of the station.

5.4.2 The Environment

The Transportation System

Of the three train lines presented in the design of O-Miyage, we implemented all of the stations of the Yamanote line. The student begins the Game at one of the stations, and can travel to each of the other stations by buying tickets and riding the trains.

The Train Station

A working simulation of a Japanese ticket machine is implemented. The player deposits money as described above in the Money window section. After buying a

ticket, the player can enter onto the platform, where he sees a video clip (simulated) of the train platform, and must choose which train (left or right) he wants to take. The player decides which train by saying 'left' or 'right' (in Japanese, 'hidari' or 'migii'). The player then sees a short video clip of the train moving along the track, and subsequently finds himself at the next station, where he must make a decision about whether to stay on the train or get off to the platform.

The real-time effect of having people in line behind you waiting to use the ticket machine has been incorporated into our prototype. If the player repeatedly remains in the same position, he will make the people behind him angry, and he is automatically thrown out of the station. He can always choose to reenter.

The Associate

In our prototype, the student can visit one associate to ask questions about the target. In order to demonstrate our interview model, we've implemented a series of questions and answers relating to the target's Family. The user selects one of several available paths (by speaking the appropriate topic in Japanese), then sees a video clip of the Japanese buddy asking a full question about the topic to the associate, after which the associate responds. After the response, the student can turn to his Japanese buddy and ask for help (by saying the word 'help'), and the buddy will translate into English the exchange that just took place. After each answer from the associate, several new topics relating to what was said in the answer appear as options for the next question.

The Gift Shop

The gift shop is implemented minimally in our prototype. The player can go to a single gift shop, ask about a single gift (by saying the name of the gift, in this case, a pen), and is immediately presented with information about the gift. Neither the purchase of the gift nor the presentation to Fukuhara-san at the end of the day are implemented.

5.5 Implementation Issues

During the initial phases of learning the Macintosh/Supercard programming environment, we realized several limitations of the system. First, the Supercard scripting language is not a true programming language like C or Pascal; therefore, our design was modified to cater for the programming environment. Although Supercard is an semi-object-oriented language, the scripting language for each object was closer to Basic than to C (for example, the use of global variables to share data).

Next, the breakdown and division of labor during implementation stages was difficult to establish, since a modular breakdown is impossible in the Supercard programming environment. The easiest way to breakdown the work among several people was by different windows and specific cards within these windows. At the end, one person had to compile all the pieces and ensure that the same global variables, project and window level functions and procedures were used. There was much overhead work involved.

On a positive note, the run-time debugging environment offered by Supercard was superb, and it was straight-forward to correct simple programming errors; while, this same process would have taken much longer in a compiled or interpreted programming language.

Chapter 6

Evaluation of the Lesson

6.1 Introduction

The most important factors in measuring the success of a language learning tool are: 1) is it effective? (assuming that students use the tool), 2) will the students use the system of their own accord?

6.1.1 Evaluation Criteria

The evaluation criteria for the Lesson portion of our Thesis were fairly simple. It was designed and implemented as a supplement to the Japanese language classes offered at MIT, and was intended to replace the combinations of video and audio tapes that the professors recommend (even require) *students use in the MIT Language Laboratory.*

The Japanese classes at MIT use JSL as their textbooks, and every week students are required to memorize dialogs (called core conversations) from the current lesson in that text. The students then practice the conversations with each other live in class; they are expected to have the basics of the conversation (meaning, pronunciation, etc) memorized before coming to class. How prepared a student is on these days becomes

apparent very quickly, as the students begin to act out the dialogs with each other and with their professors.

The video footage we used in the first laserdisc for our interactive system was intended to help students to 1) understand the dialogs better, 2) get a cultural perspective of the dialogs, 3) memorize the dialogs faster, 4) easily perfect the pronunciation, 5) get real time fluency in their speech, all before going to class.

The primary criteria for the students motivation to use a language learning system is generally a question of time: if learning time to use the system is negligible, and learning time of the dialogs is reduced (with equal or better understanding), then students will use the system.

6.1.2 User Friendliness and Effectiveness

We asked students from MIT Japanese classes to come in and evaluate both the user-friendliness and the effectiveness of the system.

User-friendliness was evaluated primarily with first time users of the system. Our primary conclusion was that our initial user-interface design for the control panels was too confusing, and we had to modify our design. We decided to make the system easier to use by reducing the options the first-time user considered, and adding more guidance.

The effectiveness was evaluated based on feedback from the student users while they were using the system, immediately afterward, and from their own observation and the observation of classmates on the days the practiced dialogs were to be presented.

6.1.3 Survey of Current Language Laboratory Use

We also surveyed and interviewed students to get an idea of the type of practice they had actually been doing before our application was developed. Of particular interest was the existing language laboratory: how often were students using it, to what extent (did they only use videos, or only audio tapes, etc.), and most importantly, how effective it had been for them.

Our personal experiences in learning Japanese at MIT indicated that the language laboratory was not used very effectively - students often found it tedious, the technology was awkward, and connecting the different parts into one system was sorely needed. Despite these inefficiencies, we both knew that when the language lab *was actually used* to its full capacity, the results could be very powerful. The investment in terms of time needed to produce these results, however, was very costly in the life of an MIT student. The Lesson portion was designed and implemented under the philosophy that an easier and more interesting language learning tool, if available, would be more effective and efficient for students, and they would be more likely to use it.

The survey we distributed to members of the Japanese classes in the Spring Term of 1992 is presented in exhibit 1. Appendix 1 gives the raw data summarized by different forms of material usage (audio tapes and video tapes) and what they are used for. With the cooperation of MIT's Japanese teachers, we were able to survey the majority of the student body studying second term Japanese. As a result of our survey and interviews, we have compiled lists of what we believe to be the most effective ways for students to learn a foreign language.

As part of that list, we have discovered a sequential procedure for studying conversations and dialogs of the type used by MIT in JSL. We incorporated this new methodology into the Lesson portion of our thesis software; new users are guided step by step through the process of learning the dialog, perfecting it, and achieving

real-time fluency.

6.2 Results of Student Evaluations of Lesson Portion

Results are broken down into suggestions for improvements in the user-interface, and comments on the effectiveness of the system for language practice.

6.2.1 User-Interface

Our original system was designed to give as much control to the user as possible, in the form of control panels, buttons, and menus. However, we found that the primary concern for first time users of the system was exactly how to make most effective use of the system. There was little guidance, and the users seemed confused as to what to do next.

To correct this complication, we moved the extra control that we wanted the students to have into the menus at the top of the screen so that the first-time user would not be confused by them. We plan to do a detailed analysis of how students who are familiar with the system take advantage of the added control. Do they follow the methodology we prescribed? Or does each student develop his/her own step by step procedure? This kind of evaluation can only be done when video for more JSL lessons is incorporated into our software.

Specific suggestions made during the student evaluations for improving the user-interface were:

- The Level of Difficulty for practicing the dialog, as described above.
- During Practice Dialog, have a CURRENT-SENTENCE window for the English translation (in addition to the one we have for Japanese), because the translation

windows which contain the entire script of the dialogs were difficult to follow while the video was playing.

- We added an instruction bar at the bottom of the screen to provide guidance to the student at every stage of the Lesson.

- After recording the students' feedback during Practice Dialog, the two buttons for replaying the students response and the correct response were cumbersome. We replace them with compare buttons to play back both the correct pre-recorded response and the student's recorded response.

- The comparison was originally done only with the recorded video of the MIT professor rather than with the original footage of the dialog provided with JSL. We added a second comparison for comparing with the original video footage of JSL.

- We originally had a little control panel at the bottom right of the screen to go from one core conversation to the next. Each Lesson in JSL has several core conversations (each of which is one dialog in our software). The control panel was very confusing, not used very often, and generally unnecessary at the outset. We moved it into a menu at the top of the screen.

- In Practice Dialog before recording, the students wanted to be able to hear the correct responses. Originally, we had only let them hear the correct responses *after* they had recorded their response the first time. We changed the format to allow the students to hear the correct response before recording (the first time). This was important because students felt more *secure* after hearing the correct response before recording their own.

6.2.2 Effectiveness

The response from the students who used the system was very enthusiastic. They *all* felt that the system could reduce their study time and give them a increased control of the language, and they would like to use it. Some results:

- As a group, those who already used the language lab extensively found it easier to use the system than those who hadn't. Those who had used the lab appreciated the ease of integrating video, audio, and textual practice into one sit-down session. Most students did not like watching a video tape, trying to follow along in the book, then switching to audio tapes and practicing by recording in blank spaces (a very awkward technology that exists in the MIT language lab).

- One student used the system the night before they were to have a dialog memorized in class. Several students in the class the next day remarked on how much this student had improved his pronunciation and command of the day's dialog. Later, they learned that the improvement was the result of a 15-minutes session of our Lesson portion, and they immediately wanted to try it.

- One student remarked: "If you had the video available, I'd like to use this for as many lessons as possible."

- One student spent over half an hour copying and recording audio tapes of the conversations to practice and compare against, and more time listening and practicing. An integrated system such as ours, he remarked, would reduce his study time drastically.

- A student who rarely went to the Language Lab said: "If this was set up and easy to use, I could sit down 15-20 minutes before lecture, without any previous exposure to the day's lesson, and end up being one of the most prepared students in class... Yeah, I'd be willing to use it more often than I use the lab now."

6.3 Future Extensions

The following several items are possible extensions of the current implementation of the Lesson, and are all very valuable. Given the limited time we had for completion of our thesis, we did not implement these elements. A detailed time outline of future developments in the next year and a half is provided in Appendix 4, which describes the minimum system requirements needed in order to integrate our system into the Japanese language curriculum here at MIT.

1. One specific extension which would potentially be of extreme value to the student is automatic recording of the student's response in the the interactive free-response practice mode. Currently, there exists a timer which tells the student how many seconds he has left to respond and say his sentence; recording is not implemented. This would require writing two new XCMDS; one for sound_record to the resource fork of the program and one for sound_play from the saved file in the resource fork.

2. Create a large database of short phrases and question/responses for timed response drills. Much like in the interactive free-response mode, the student is posed with a random question, and expected to respond given a limited amount of time. This format could also be easily extended to provide vocabulary checks, in the same manner as flash cards are used.

3. Create hypertext links between the textual contents of the core conversations and grammar/vocabulary database. In this way, students can click on particular words or set of words, and its corresponding vocabulary and grammar patterns breakdown will be shown.

4. Integrate a quick Kanji and vocabulary test as supplementary tools to the Lesson program. All new vocabulary and Kanji words presented in the new chapter

can be tested, in addition to old material presented in previous lessons.

5. Instead of recording the student's voice alone, the system can be expanded to video record both the student's voice and the visual of the face. This way, during playback/compare time, the student can see his image side-by-side with the professor's and watch the differences in addition to hearing the differences. One drawback might be that some students would shy away from a system like this; however, this could be implemented as an option.

6. The current hardware configuration includes a separate TV monitor for the video. It would be nicer, and less distractive if the video were displayed on the computer monitor. The effectiveness of the program would increase because of the close proximity between the text script, video and control panel. This would require an add-on video board which costs between $1000 and $1500.

7. Give a demonstration of the current system to Professor Mari Noda and Eleanor Jorden. Later, obtain permission and sign an agreement with Professor Jorden and Noda to use all the video for part I of "Japanese the Spoken Language" and complete the Lesson program by including all 12 chapters. Each part of the three-part series is equivalent to a one-year, two semester course at University level. There may be possibilities of including our lesson program as part of the entire courseware series.

8. Master a few more videodiscs and setup systems in the MIT Foreign Language Lab for student use. Keep a log of student feedback of any software bugs and suggestions.

Appendix A

Student Surveys and Results

A.1 Overview

As described earlier, the results of our surveys confirmed our initial hypothesis: "The Japanese language laboratory at MIT was not used often, and when students used the lab, they were inefficient". The reason lied not so much on the students inability to learn efficiently, but on the students' lack of motivation to use the rather dry, and dispersed lab materials (audio tapes, video tapes, book, etc).

Out of 75 students currently taking second term Japanese, 57 students returned their surveys. Forty-seven percent are sophomores, 18 percent juniors and another 28 percent are graduate students. Freshmen and Seniors totalled 4 students (mainly due to enrollment restrictions at the beginning of the year). Of these, 71 percent are seeking a Bachelor's of Science degree, 12 percent are working towards a Masters degree and another 16 percent are working towards a PhD.

The results of the survey we distributed in the Spring of 1992 are as follows (please refer to survey attached):

Japanese Language Laboratory Usage Two-thirds of the students answered either "I rarely go to the language lab" or "I don't go consistently (some weeks I go, and some I don't)". Of the total time students spent using supplementary audio and visual materials, on average 30 percent of that time was spent in the language lab. This means that a significant number of students were recording the tapes and using them elsewhere.

General Audio Tape Usage 20 of the 57 students spent more than two hours per week using the audio tapes either in or out of the lab, and another 10 spent more than one hour. More than half of the students recorded the tapes from the language lab and used them elsewhere (this also means that they may have used the language in addition to recording the tapes).

Audio Tapes for Core Conversations 18 of the 57 students (32 percent) used the audio tapes to memorize the core conversations before **every** class session with a CC check. Another 23 (41 percent) used them before **some** class sessions. 62 percent of the students who replied to this question **did not** use the record and playback options of the audio tapes. We believe that this is a result of the awkward audio tape system in the lab.

Audio Tapes to Practice Drills 43 of the 57 students (77 percent) used the audio tapes to do the practice drills included in each lesson either in or out of the lab. 60 percent of the students who replied to this question **did not** use the record option while during practice drills.

Audio Tapes for Eavesdropping Close to 70 percent of the respondents used the audio tapes to prepare eavesdropping before every lesson quiz. Almost all of the students (97 percent) used the tapes to prepare eavesdropping before some of the

Lesson quizzes.

Using the Book/Scripts with the Audio Tapes 93 percent of the students found it awkward to follow along the book while listening to the audio tapes therefore, did not use the book at all (although 57 percent found it useful to have the Japanese script handy, and 64 percent found it useful to have the English script handy). An integrated system like ours would greatly improve the efficiency of learning.

Quality of Contents of Audio Tapes 90 percent of the respondents found the quality of the contents of the audio tapes to be "excellent" or "good".

Quality of Recording of Audio Tapes However, 69 percent of the respondents rated the quality of the recordings of the audio tapes as "fair" or "poor". This indicates a need to provide better supplementary tools based on similar content base for students use.

General Video Tape Usage 86 percent of the students have never or rarely used the video tapes while in the language laboratory. The most common reasons cited were: either they did not need to see the conversations and only needed to hear them (already seen them in the classroom), or did not know that video tapes existed in the lab.

Student Distribution 1 of the 57 respondents is a freshman, 27 (47 percent) are sophomores, 10 (18 percent) are juniors, and 3 (5 percent) are seniors. In addition, 16 (28 percent) are graduate students. 40 of the 57 respondents (71 percent) are seeking a bachelors of science degree, 7 (12 percent) are working towards a masters degree, and another 9 (16 percent) are working towards a PhD.

Appendix B

Proposed Software Implementation of Game

B.1 Software Design of O-Miyage

At the highest level, the software module composition of O-Miyage is shown in Figure B-1.

There are four main modules:

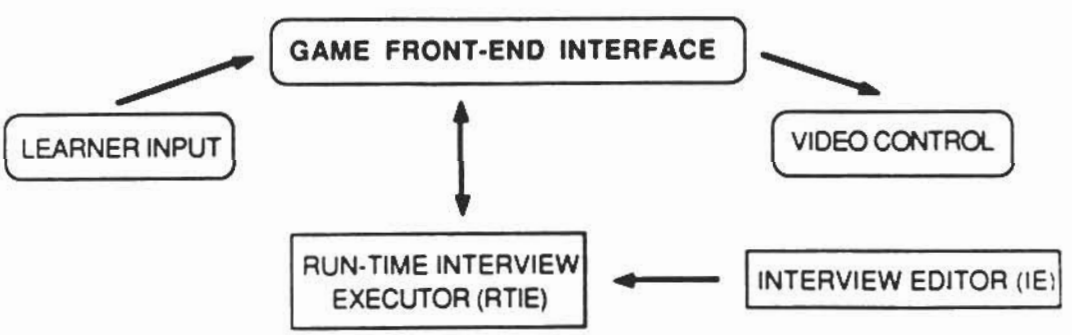

Figure B-1: O-Miyage software module composition

1. O-Miyage Front-End Interface
2. Learner input
3. Video output
4. Run-time Interview Executor (RTIE)

The Front-End Interface module is the "spine" of O-Miyage, and contains the main program code to route the input from the students and coordinate the output video sequences. The spine interacts directly with the RTIE to access the underlying database of questions and answers. Each of the simulations is also implemented in the spine. The Run-time Interview Executor was described in detail in the previous chapter.

B.1.1 Front-End Interface Module

The Front-End Interface module contains the bulk of the program code which implements each of the screen objects and simulations. The dynamic dependencies among these underlying modules is shown in Figure B-2

The Front-End Interface is composed of one main window subdivided into location-dependent and location-independent sections. As described in Chapter 6, the location-independent section includes the following objects: Tokyo subway map, clock, money, pocket, and notebook. Each of these objects has a corresponding window which opens up when the object is invoked (except for the clock, which is a window in itself on the main window). The location-dependent section changes according to the state of the Game and is one of the following simulations: the subway ticket machine, inside the subway station, outside the subway station, inside an individual's home, and inside a gift shop.

At the lowest level, each simulation and screen object is implemented as one or more of the following basic objects: graphics, text, voice-activated icons, and moving

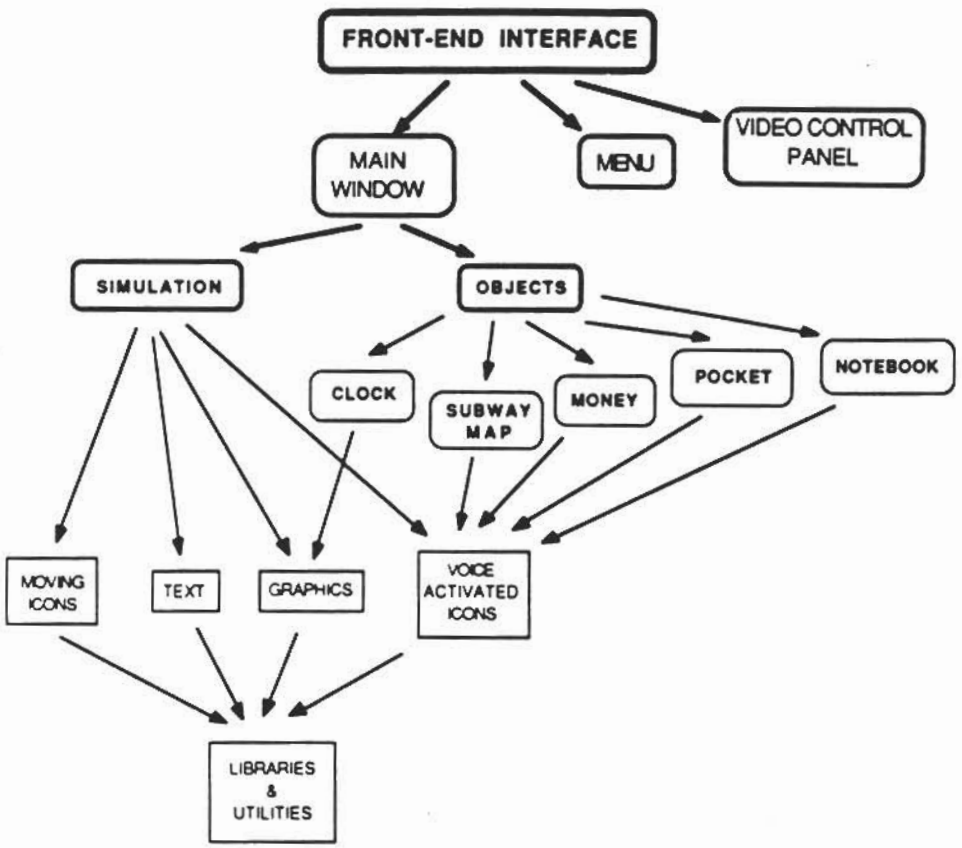

Figure B-2: Front-End Interface Module Dependency Diagram

icons[1]. These basic objects in turn access still lower programming environment-dependent input/output libraries and utilities.

The Front-End Interface module is the main "spine" of O-Miyage as described above, and thus keeps track of the *state* of each of the underlying screen objects, simulations, and user input and video output sequences. For example, the spine keeps an updated internal 'state' data structure containing the following fields:

```
GAME_STATE: structure[
                        objec_state: ostate,
                        simul_state: sstate,
                        video_state: vstate,
                        input_state: istate]

OSTATE: structure[
                    map_active: boolean,
                    clock_update: boolean,
                    money_update: boolean,
                    notebook_update: boolean,
                    pocket_open: boolean]

SSTATE: structure[
                    cur_simulation: name,
                    simul_step: step,
                    simul_active: boolean,
                    require_input: boolean,
                    require_output: boolean]

VSTATE: structure[
                    cur_video_sequence: name,
                    v_start_frame: integer,
                    v_end_frame: integer,
                    v_active: boolean,
                    v_request_function: function]

ISTATE: structure[
                    input_value: ivalue,
                    mouse_input: boolean,
```

[1] In reference to Prof. Davenport's Elastic tools

```
keyboard_input: boolean,
menu_selection: boolean,
voice_input: boolean]
```

Using an object-oriented approach to designing this software system, as each of the underlying or dependent objects changes state, it sends a message to GAME_STATE to update its current state. On startup, of course, the spine would run an INIT_STATE procedure which initializes each of the entries in GAME_STATE (similarly, the corresponding cleanup is done upon exit).

The spine contains a main program loop with the following three functions:

- Move the state of the Game forward in time. For example, calling functions provided by the simulations, updating the screen objects including the clock ticks, routing user input and controlling the video output.

- Check for program exit points. For instance, if the user wants to quit before the end of the Game.

- Check other boundary conditions which require special "care". For example, when approaching the meeting time of 6 pm, it alerts the user to hurry on because the subway may be much slower during rush hour.

B.1.2 Learner Input Module

This module is quite straight-forward, as shown in Figure B-3.

It "fetches" input from any of the three sources: voice, mouse or keyboard and places the input in a buffer. Then, the module sends a message to the spine indicating that there exists new data in the buffer to be read. The spine reads the data from the buffer, updates its state, and dispatches the appropriate actions in response to the input.

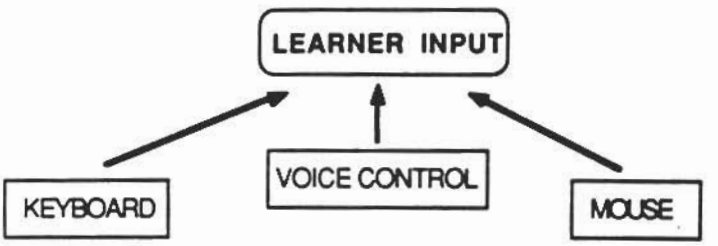

Figure B-3: Learner Input Module Diagram

B.1.3 Video Output Module

The Video Output Module is simply an added level of abstraction above the lower level device driver calls. This module provides some functions for "composite" actions which utilize more than one device driver call. For example, VIDEOSINIT function may call vvideo(open_device, port_number, optional args), vvideo(search, port_number, frame_number), and then vvideo(get_state, port_number).

Appendix C

Example Implementation of Interview Model

C.1 Introduction

The implementation of the interview model in O-Miyage is a very important example of the unique potentials of our methodology. The user participation and interaction with the characters in O-Miyage would not be effective if any of the mediums of interaction held extended "control" of the state of the Game.[1]

C.2 Description

The interview model is encountered in O-Miyage in several situations; however, of particular interest is when the student visits the different homes during the day, and attempts to gather clues and hints from the conversations with the acquaintances to

[1] Credit must be given to Sue Felshin at the Athena Language Learning Project for sharing with us her design of a similar interview editor. We took the liberty to capitalize on the strengths of our methodology and created a slightly more extended editor.

choose the best type of gift.

The interface to the characters in the story, in this case, is through another character in the story. This buddy of yours formulates complete sentences in Japanese and presents them to the interviewee based on the "topic" selections the student chooses. The student, in fact, has no idea whatsoever what the specific questions or answers will be before hand. This level of spontanaeity is achieved through a random selection out of a possible set of questions and answers, and the student is expected to be attentive and comprehend the short conversation exchanges. Figure C-1 provides an example of the various topics and subtopics seen at the graphic interface.

An example interaction among the three mediums presented in our methodology could be as follows:

Student picks a high level topic: 1. At level 1, the student selects one main topic of discussion from the computer screen by using voice input (for example, he or she would say "Family" in Japanese to "activate" that topic).

Formulation of a question: 2. A database contains a set of possible questions corresponding to this broad topic. The buddy will randomly pick one of these specific questions and "present" it to the interviewee. A short video clip will show the buddy asking the question.

Formulation of an answer: 3. The computer randomly selects a reply to that particular question posed by the buddy, and enables a possible set of questions for the next level of more specific subtopics (ie. level 2). A short video clip will show the interviewee replying to the question.

Short conversation check: 4. The buddy then turns and speaks directly to the student, asking whether the student understood the contents of the conversation. A

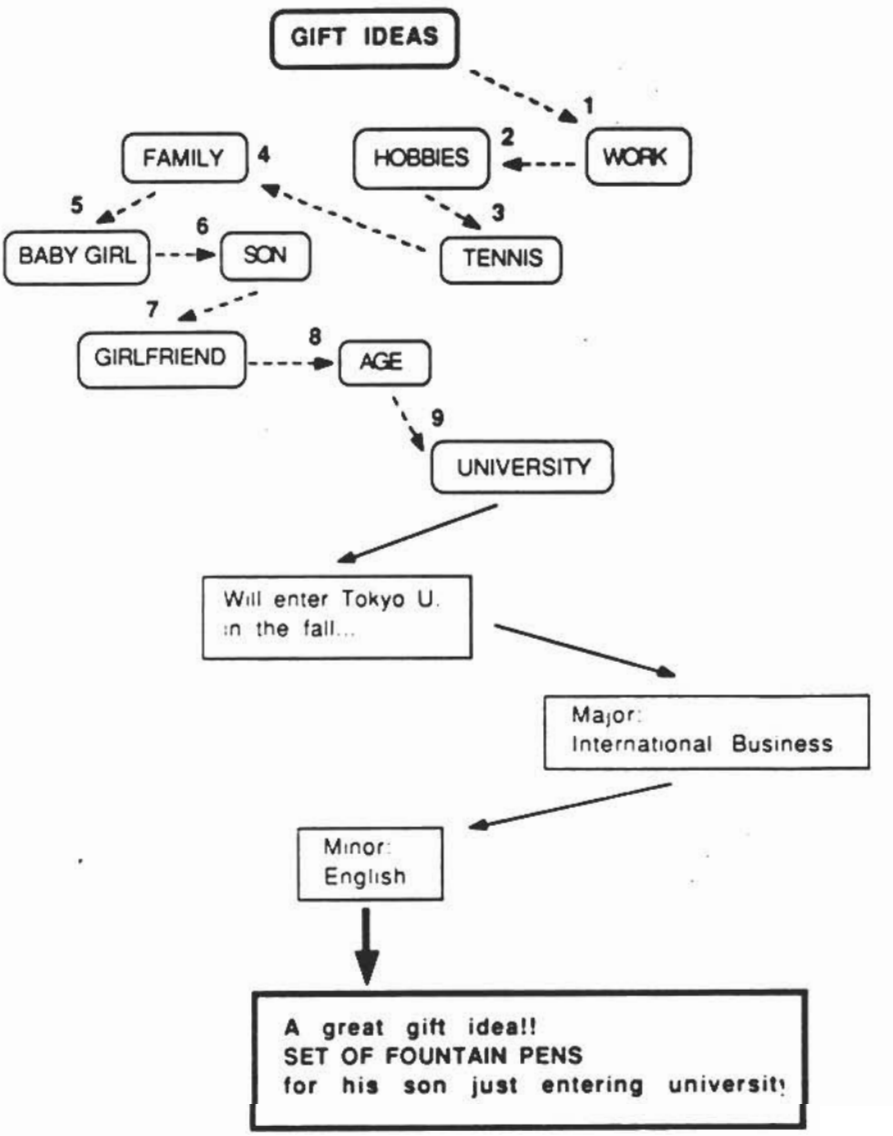

Figure C-1: Conversation topics hierarchy

set of multiple choice comprehension checks are presented to the student, and he/she is expected to reply in a given "response time", otherwise, the buddy regains control with an "annoyance" video clip. This conversation check is used in specific situations, for example, during complex conversation exchanges with a lot of information. Most times, the student has the option to ask the buddy for help through a menu VOICE-COMMAND.

And etc: 5. The student can then proceed with another broad topic, or can explore more in detail the more specific level of subtopics.

The key aspect here is that the student must listen attentively to the short question/answer exchange, and the exchange is completed, it cannot be replayed (as in real life). The student at this point can only receive help through the conversation check with the buddy. This design enforces complete immersion in the language, exactly as if the student were in Japan.

C.3 Software Design of Interview Model

The entire interview model is composed of two software pieces: the Run-Time Interview Executor (RTIE) and the Interview Editor (IE). The "front-end" game software accesses the RTIE during run-time, and its database of possible questions and answers. The actual interview conversation data including the set of questions at each "topical" level and its corresponding answers are entered through the IE during software implementation.

Both the RTIE and IE access and modify an underlying database data structure called DATABASE. DATABASE is a data object which is built above other objects such as TOPIC_DEPTH, QUESTION_TABLE, and ANSWER_TABLE. The DATABASE eventually contains all the specific questions and answers for every con-

versation exchange in O-Miyage, One motivation for this approach is that future extensions could take advantage of this indexed, centralized database of questions and answers for cross-referencing (such as those found in hypertext links).

C.3.1 The DATABASE object

An actual DATABASE object could be implemented as follows:

```
DATABASE: array[HIGH_LVL_TOPIC];

HIGH_LVL_TOPIC: array[SUB_LEVEL];
                            %% ie. a TOPIC_DEPTH

SUB_LEVEL: array[QUESTION];
                            %% this is equivalent to
                            %% a QUESTION_TABLE

QUESTION: structure[
                        used_flag:boolean,
                        enabled_flag:boolean,
                        question_txt:string,
                        start_frame:integer,
                        end_frame:integer,
                        question_token:id,
                        possible_answers:array[ANSWER],
                                %% this is equivalent to
                                %% an ANSWER_TABLE
                        txt_links:link]
                                %% the txt_links are provided
                                %% for future extensions

ANSWER: structure[
                        used_flag:boolean,
                        answer_txt:string,
                        start_frame:integer,
                        end_frame:integer,
                        answer_token:id,
                        enabled_nxt_level_questions:array[id],
```

```
                                possible_check_questions:array[CQUESTION],
                                txt_links:link]

CQUESTION: structure[
                                used_flag:boolean,
                                question_txt:string,
                                translation:string,
                                start_frame:integer,
                                end_frame:integer,
                                ccheck_token:id,
                                user_choices:array[string],
                                user_choices_translation:array[string]
                                correct_choice:integer]
```

C.3.2 The Real-time Interview Executor

The RTIE can be implemented using function calls to the DATABASE object. These functions access the underlying database (questions, answers, and conversation check questions), and modify the appropriate entries when necessary. This is used, for example, after the student selects a particular topic of discussion, and the buddy expects a random question to be presented to the interviwee. A database "access" and "get_question" commands will return the appropriate start and end frames for a randomly selected question at the specified "topical" level.

The set of external functions for RTIE are as follows:

```
DATABASE$ACCESS(topic:string, level:integer) returns
                question_token:id

DATABASE$GET_QUESTION(question_token:id) returns
                question:string,
                qstart_frame:integer,
                qend_frame:integer

%% randomly returns one question
```

```
%% modifies database by putting checkmark on this
%% specific question -- cannot be used again


DATABASE$GET_ANSWER(question_token:id) returns
                answer_token:id,
                answer:string,
                astart_frame:integer,
                aend_frame:integer

%% randomly returns one answer to question
%% modifies database by putting checkmark on this
%% specific answer -- cannot be used again


DATABASE$GET_CHECK_QUESTION(answer_token:id) returns
                ccheck_token:id,
                cquestion:string,
                cstart_frame:integer,
                cend_frame:integer

%% randomly returns one check question to conversation
%% modifies database by putting checkmark onthis
%% specific conversation check -- cannot be used again


DATABASE$GET_USER_CHOICES(ccheck_token;id) returns
                choices_text:array[strings],
                correct_choice:integer,
                translation:array[strings]

%% the choices_text is all the user choices in Japanese
%% the correct_choice is an integer index to choices_text array
%% the translation is the English translation of user choices
```

C.3.3 The Interview Editor

The IE is a program which accesses external DATABASE functions and modifies its contents. The IE could be a stand-alone editor which can be used with other

applications for creating large databases of conversation exchanges. There will be a need for some form of an interview editor in any game design which adopts our interaction methodology presented above.

The following is a list of external functions provided by DATABASE for IE use:

```
DATABASE$ADD_TOP_LEVEL(name:string) returns
                new_topic_token:id

DATABASE$GET_TOP_LEVEL(name:string) returns
                topic_token:id

DATABASE$ADD_QUESTION(  topic_token:id,
                        level:integer,
                        phrase:string,
                        start_frame:integer,
                        end_frame:integer)
                returns question_token:id

%% Note level 0 is high level topic

DATABASE$ADD_ANSWER(    question_token:id,
                        phrase:string,
                        start_frame:integer,
                        end_frame:integer)
                returns answer_token:id

DATABASE$ENABLE_NEXT_LVL(answer_token:id,
                        nxt_lvl_questions:array[id])

DATABASE$CREATE_CHECK_Q(answer_token:id,
                        phrase:string,
                        translation:string,
                        start_frame:integer,
                        end_frame:integer)
                returns ccheck_token:id

DATABASE$CREATE_USER_CHOICES(ccheck_token:id,
                        choices_text:array[strings],
                        translation:array[strings],
```

```
correct_choice:integer)
```

C.4 Extensions of the Interview Model

As described earlier, our decision to design a centralized database oriented interview model was based on issues of future extensibility. The design of this model followed directly from the application of our interaction methodology, and provides room for the following extensions:

1. Cross-indexing among different questions and answers for hyper-textual links in interactive conversation modes. Implemented as link fields in the DATABASE object.

2. Utilizing better voice navigation and recognition technologies to interface with underlying contextual speech of the characters. For example, the student can interrupt the video clip by uttering a word which will be recognized by the voice recognition system, and another appropriate video clip will be played in response to the student's request. Implemented through non-deterministic access to lower level conversation topics.

3. Creation of other O-Miyage-like games where foreign language acquisition is the primary focus. In addition, other types of applications may want to use this interactive conversation model. For example, next generation interactive adventure games where player moves are voice-navigated, and conversations with other characters of the Game are voice-recognized.

4. Creating conversations and a conversational model where the goal for the student is not to "question" the video characters, but to convey some information to them. An example

5. Creating conversational models where there is no explicit purpose. The interaction is generally between friends who already know each other, and the purpose is just to stop and say hello, with no predetermined paths of where the conversation should go.

6. Creating conversations where the questioning is integrated between both student and video characters. The student may not understand something that the video character is trying to say, and the video character may not understand something that the student is trying to say. Continual questioning can be done by either party to clarify their understandings.

Appendix D

Proposed Software Implementation of Lesson

D.1 Overview

the Lesson program at the highest level has the modular breakdown as shown in Figure D-1.

The "Startup" and "Lesson Selection" modules have a flow diagram as shown in Figure D-2.

The "Watch Dialog" module has a flow diagram as in Figure D-3.

Within Watch Dialog, the student has the option of free viewing the entire core conversation or viewing the core conversation indexed by sentences.

The "Practice Dialog" module has a flow diagram as shown in Figure D-4.

There are four levels of difficulty provided for student practice. Each of these levels is described in more detail in Section 4.2.3.

In addition to these functionality modules, a student can bring up windows which contain a complete Japanese script and English translations of conversations. A sentence-card window shows the current sentence the video is on in the case of sentence

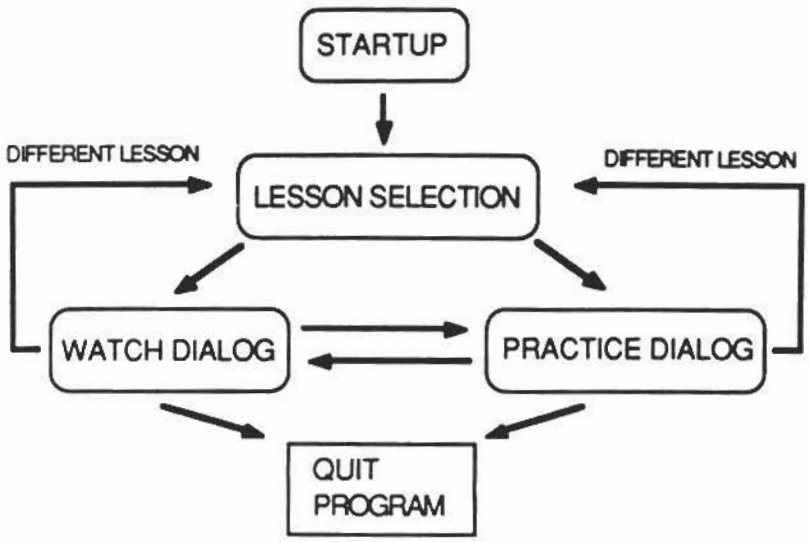

Figure D-1: Lesson high level module breakdown

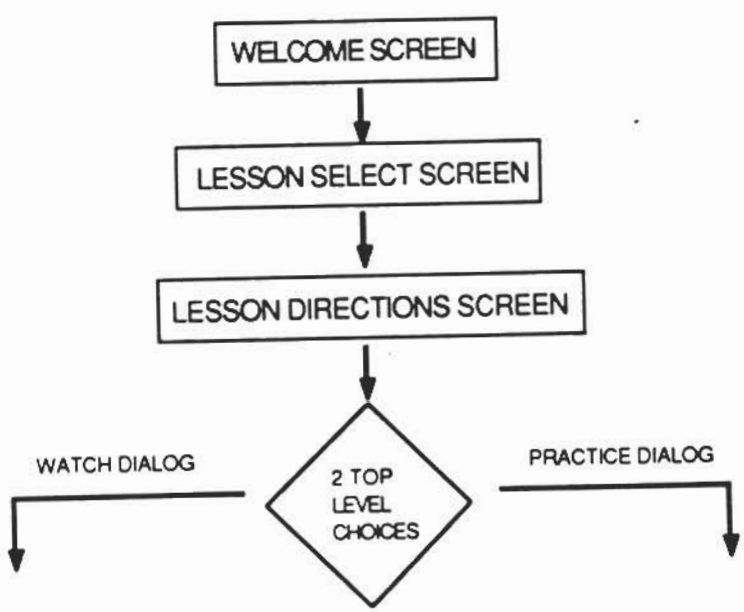

Figure D-2: Flow chart for "Startup" and "Lesson Selection" modules

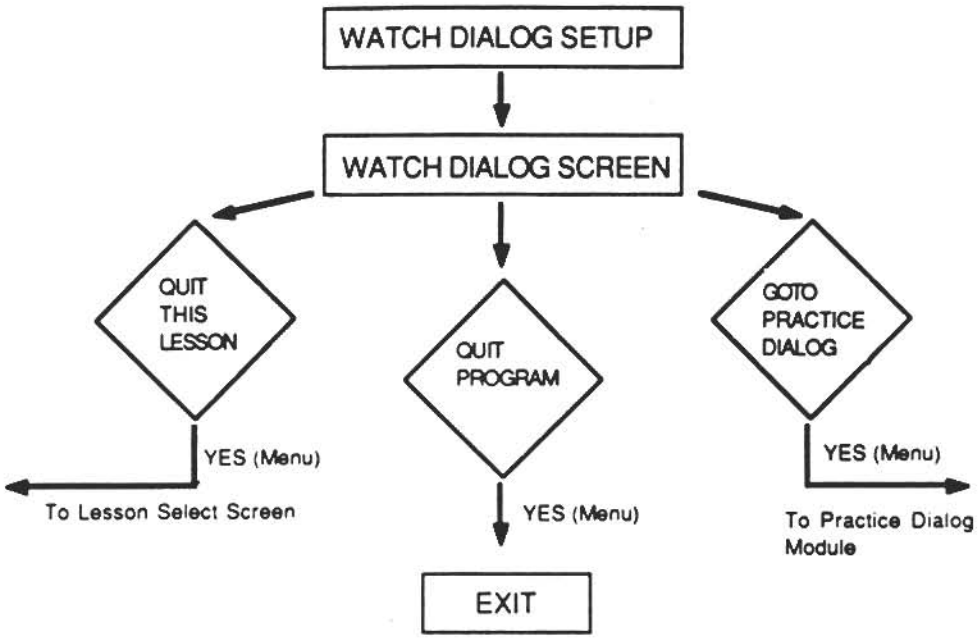

Figure D-3: Flow chart for "Watch Dialog" module

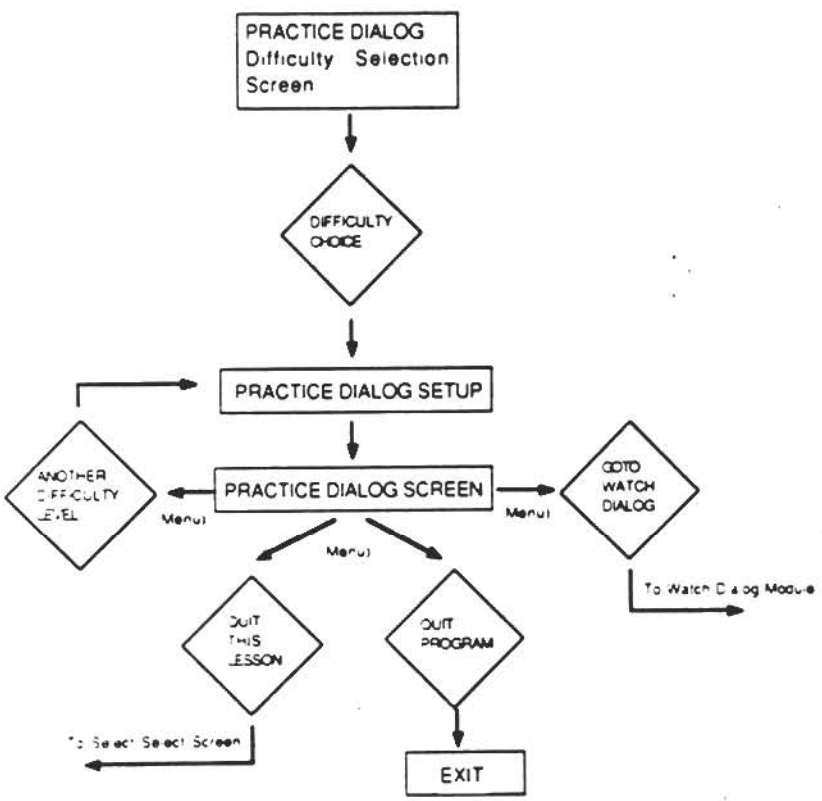

Figure D-4: Flow chart for "Practice Dialog" module

indexed viewing, or shows the current sentence to be practiced in the case of practice dialog. General help is available at any time from a "help" menu option.

Furthermore, as a result of student evaluations, we decided to implement a message window at the bottom of the screen. This message box displays messages at different stages of the Lesson program, and gives suggestions to the best ways to utilize the viewing and practicing mode at that point. We concluded that this learning guidance is absolutely crucial for the students to achieve maximum efficiency during their learning sessions. Specific details of this guidance aspect of the Lesson program is described below.

Appendix E

Integrating Our System within the Curriculum

E.1 Overview

Following is a detailed description of how our software can be incorporated into the Japanese curriculum at MIT, including time-lines, etc. We recommend that the Japanese department fund more extensive testing of our software, and compile results across students of different levels of language ability. In order to fully integrate our system into the curriculum, a completed system would require additional filming of video, but the software itself would not need to be modified.

Based on our evaluations with current Japanese students, and feedback from professors, we believe our system could be integrated easily with the Japanese curriculum at MIT. This system will significantly impact the learning process of these students as well as their speaking and comprehension abilities. This achievement would be consistent with the MIT Japanese Department's goal of becoming "...the most technologically advanced language department in the country...."

We recommend the following plan for integrating our Lesson portion into the

curriculum:

E.1.1 Phase I: Spring Term, 1992

Completion of evaluation with selected students using the Lesson portion for the remaining of the term. The students should use the Lesson portion every week for the rest of the term to memorize dialogs and gain real time fluency. The repeated use and surveillance will reveal more strengths/weaknesses, and produce additional suggestions on how to improve the system.

E.1.2 Phase II: Summer, 1992

Adding of features. Additions to the current portion (including a vocabulary quiz, a cross-referenced Kanji quiz, and grammar notes), would give the system the flexibility to make the textbook less essential. These additions will reduce the study time not just for the dialogs, but for studying the Japanese language in general. These additions can be implemented rather easily by anyone who has some experience using Hypercard or Supercard for the Macintosh. Since some of these features (Kanji quiz for example) exist as stand-alone programs, they would only need to be linked or ported to our application. Others would need to be fully designed and implemented. One or two individuals, working full time for a month or two could easily add the required features, as well as make changes based on students' feedback from Phase I.

E.1.3 Phase III: Summer, 1992

Additional video filming. For the system to be used effectively over an entire term, video footage would need to be added to the system. Half of this footage could be taken from already available JSL materials, and the other half would have to be filmed in house. The system could easily be adopted for other textbooks and

curricula, assuming some video is available (or else all of the filming would have to be done in-house).

The second half of the first term Japanese class, along with second, third and fourth term Japanese would benefit most by using our system with the JSL curriculum (JSL is used for four terms at MIT). Fifth term and subsequent higher levels of Japanese focus more on reading and writing; therefore, the system might have to modified slightly. Still, we feel these students could benefit a lot from using our system. We recommend a dedicated individual to modify our system to account for the advanced needs and peculiarities of third year (and higher) Japanese classes.

Additional videodiscs need to be produced. There should be at least two disks available in the language lab so that more than one person can use the system. The language lab already has several Macintosh computers with Laserdisc players attached. The Japanese department has our permission to reproduce our software as often as they need.

E.1.4 Phase IV: Autumn '92

Introduction to students midway through Fall '92. By this time, students in first term Japanese would be practicing dialogs sufficiently long to benefit from our system. Third term Japanese students can be introduced to the system at the beginning of the term, and use it throughout the term.

Unless an individual can be found to modify the application for fifth and sixth term Japanese during the summer, that task can be done during the fall. It may be possible to introduce this version before the end of the fall term; although, unlikely if additional video filming is needed.

E.1.5 Phase V: IAP '93

Modifications based on feedback from students during the Fall term. This would make a good UROP for a student over IAP; in addition, he or she can prepare of the system for the Spring term. Assuming the system has been successful, other area schools using the JSL system may be interested in using the system. Further integration of the system could involve curriculum developers more closely including the JSL authors.

Survey Of Japanese Language Lab Use

THIS SURVEY IS PART OF A THESIS PROJECT TO DEVELOP POWERFUL TOOLS FOR FUTURE JAPANESE STUDENTS AT MIT. YOUR PROFESSORS WILL NOT RECEIVE THE RESULTS UNTIL AFTER THE TERM - **PLEASE BE HONEST**

I. LANGUAGE LAB USAGE:

1a. How many times **per week** do you go to the Language Lab?

___ I rarely go (maybe once a month or less)
___ I don't go consistently; some weeks I go, some weeks I don't go
___ at least once a week
___ at least twice a week
___ more than twice a week

1b. If you don't go to the language lab consistently, why not? _____

1c. Of all the time you spend using supplementary audio/video materials, what percentage of your time do you spend **in the Language Lab** (as opposed to recording this material and using it elsewhere):
____ % of total time.

II. AUDIO TAPE USAGE:

2a. How much time do you spend using the audio tapes per week (either in the lab or elsewhere)?
___ never ___ 0-30min ___ 30min-1hour ___ 1-2 hours ___ 2+ hours

2b. How often do you use the audio tapes when you are **in the lab**?
___ every time I go ___ usually ___ rarely ___ never
___ I record the tapes and use them elsewhere

FOR CORE CONVERSATIONS:

2c. How often do you use the audio tapes **to memorize the CCs**? (either in lab or elsewhere).
___ before **every** class session with CC check
___ before **some** class sessions with CC check
___ **never** used audio tapes to memorize CCs (skip questions 2d. and 2e.)

2d. When you go to the lab, how often do you use the audio tapes to memorize the CCs ?
___ every time I go ___often ___ rarely ___ never

2e. At the lab, how do you use the audio tapes to memorize the CCs?

__ I use the record option for practice
__ I use the record and hit the playback button often to hear myself and compare my response to the pre-recorded one.
__ I don't record - just listen and memorize

FOR PRACTICE DRILLS:

2f. How often do you use the audio tapes **to do the practice drills**? (either in lab or elsewhere).
___ for parts A and B of **every** lesson
___ for parts A and B of **some** lessons
___ **never** used audio tapes to do practice drills (skip questions 2g. and 2h.)

2g. When you go to the lab, how often do you use the audio tapes to do the practice drills?
___ every time I go ___often ___ rarely ___ never

2h. At the lab, how do you use the audio tapes to do the practice drills?

__ I use the record option for practice
__ I use the record and hit the playback button often to hear myself and compare my response to the pre-recorded one.
__ I don't record - just listen and memorize

FOR EAVESDROPPING:

2i. How often do you use the audio tapes **to practice eavesdropping**? (either in lab or elsewhere).

___ before **every** lesson quiz
___ **sometimes** before lesson quizzes
___ **never** used audio tapes to practice eavesdropping (skip question 2j.)

2j. When you go to the lab, how often do you use the audio tapes to do the practice drills?

___ every time I go ___often ___ rarely ___ never

USING THE BOOK/SCRIPT:

2k. While using the audio tapes, how do you use your book/script for CCs? *(check all that apply)*

___ I find it awkward to follow along the book while listening to the tapes. So, I don't use the book.
___ I find it awkward to follow along the book while listening to the tapes. BUT, I still use the book.
___ I find it very helpful to have the Japanese script handy.
___ I find it very helpful to have the English translation handy.

2l. Rate the **quality of the contents** of the audio tapes (ie. how appropriate are the CC's, drills and eavesdropping practices in relation to class material and exams):

___ excellent ___ good ___ fair ___ poor

2m. Rate the **clarity of the recordings** of the audio tapes:

___ excellent ___ good ___ fair ___ poor

2n. Any other comments of the audio tapes: _____

III. VIDEO USAGE:

3a. When you go to the language lab, how often do you view the **video tapes of the CC's**?

___ every time I go ___often ___ rarely ___ never

3b. If you don't use the video tapes, why not? _____

3c. How do you use the video tapes?:

__ I watch the video of the CCs without my book
__ I watch the video, with book at hand, and follow along
__ I watch the video, and use the FF and REW SCAN buttons often to catch and replay phrases, words, etc., while following along in my book

3d. Comment on the effectiveness of the video tapes for memorizing CCs? _____

IV. PERSONAL DATA:

4a. Current school year: ___ Freshman ___ Sophomore ___ Junior ___ Senior ___ Graduate
4b. Degree: ___ S.B. ___ S.M. ___ PhD. Other: _____
4c. Course of study: Undergraduate course number ____ or Graduate department: _____
4d. Sex: ___ M ___ F
4e. If undergraduate, is Japanese your field of concentration or planning to be: ___ Yes ___ No

THANK YOU FOR YOUR TIME -- GOOD LUCK WITH THE FINAL PRESENTATIONS...