

Design of Interactive Voice Learning System

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Abstract: *Due to rapid growth of network technology, more and more learning systems have implemented on the Internet. This article will design a system which is like radio but it implements the interaction functionality the radio can't implement. The system is called Interactive Voice Learning System (IVLS). The major goal of this system is to present teaching materials by voice. Instructors edit their own courses and learners learn through IVLS by phones or voice devices. Learners can talk with IVLS to achieve the interaction functionality so that they can learn anytime and anywhere and finally the mobile learning can be realized. For visually disabled people, IVLS supply the environment they can learn online. Through IVLS, visually disabled people can also get information on the Internet.*

Keywords : Mobile-learning , Voice Learning

1. Introduction

A lot of people have to listen to the learning programs on the radio. But these programs can't supply the interaction. Instructors teach in a radio; however, they can't interact with the learners at home. This article proposes a system called Interactive Voice Learning System (IVLS) . Instructors and learners can interact through IVLS by voice on the Internet. As for visually disabled users, they can learn through IVLS by voice on the Internet, too.

Learners are the major users for this system. General learning management systems (LMSs) are constructed on network with Server-Client structure, but the structure has a limitation for place. It can only work at the place which has network. If teaching materials could be presented by voice, learners don't have to read teaching materials on a small screen of a cell phone and the purpose of learning anywhere and anytime will be achieved and mobile learning will also be realized.

Part 1 is an introduction for IVLS and VoiceXML. IVLS is the system this article wants to present. VoiceXML is key tool for IVLS. Part 2 points out what IVLS needs and why IVLS needs them. Part 3 is the users analysis. It is prepared for system analysis. Part 4 will show the architecture of IVLS and explain the functionalities of six modules of IVLS. And final part is the short conclusions.

1.1. Introduction of IVLS

The major goal of Interactive Voice Learning System (IVLS) is to supply a platform to show the teaching materials by voice user interface (VUI). For learners, the method of presentation is a lot of dialogs. Learners can talk to IVLS. Learners can learn anywhere and anytime by a cell phone. Visually disabled users can also learn online by VUI on IVLS. For the other users, IVLS supplies a GUI to them as general systems. Figure 1 shows the major goal and the other goals.

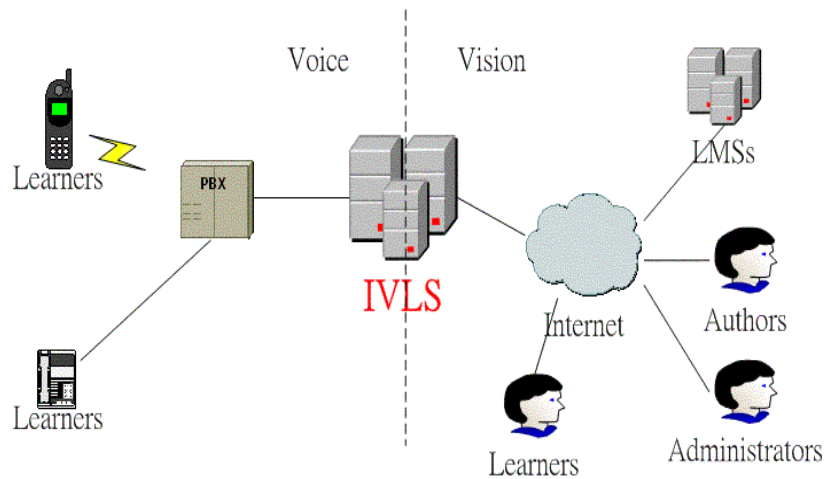


Figure 1. Goals of IVLS

Interaction between learners and instructors (authors) by voice is the major goal of IVLS. IVLS uses VoiceXML markup language to achieve the dialogs between learners and IVLS. The materials editing module on IVLS is a platform, and authors can use this platform to create their own audio teaching materials, i.e. VoiceXML files. This article will introduce VoiceXML later. Another important goal is that IVLS has to exchange teaching materials with the others systems. If a LMS is a SCORM-compliant system, it can share teaching materials with the other SCORM-compliant LMSs. Any teaching material can be packaged into a SCO to be exchanged with the others systems.

1.2 Introduction of VoiceXML

VoiceXML (Voice eXtensible Markup Language) is designed for creating dialogs by W3C. Its major goal is to bring the advantages of web-based development and content delivery to interactive voice response application. HTML is a language for a graphic web browser with display, keyboard, and mouse. VoiceXML is a language for an audio browser with audio input, audio output, and keypad input. The figure shows the differences below. (From VoiceXML Forum)

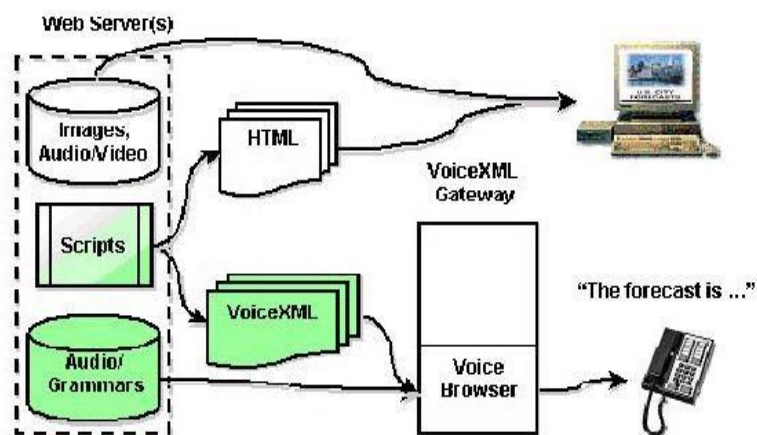


Figure 2. VoiceXML (From VoiceXML forum)

2. System environment

IVLS has two interfaces, VUI and GUI, and it can work on PSTN and network. Authors, administrators and LMSs can edit teaching materials, manage system and get SCOs from IVLS by GUI. Learners can learn by VUI. IVLS supplies a platform to authors to create VoiceXML files, and Learners browses these VoiceXML files by

phones or voice devices. In order to send voice data from network to PSTN, this system needs a gateway to handle the translation of voice data. In order to create voice data, this system needs a VXML interpreter which is responsible to read VoiceXML files to translate text data to voice data. IVLS supplies a GUI to authors, administrators and LMSs. GUI is a web-based interface, so IVLS has a WWW server which is responsible to supply a web interface to clients. This WWW server is also a VoiceXML document server and VXML interpreter can get VoiceXML files from this server. Figure 3 shows the environment :

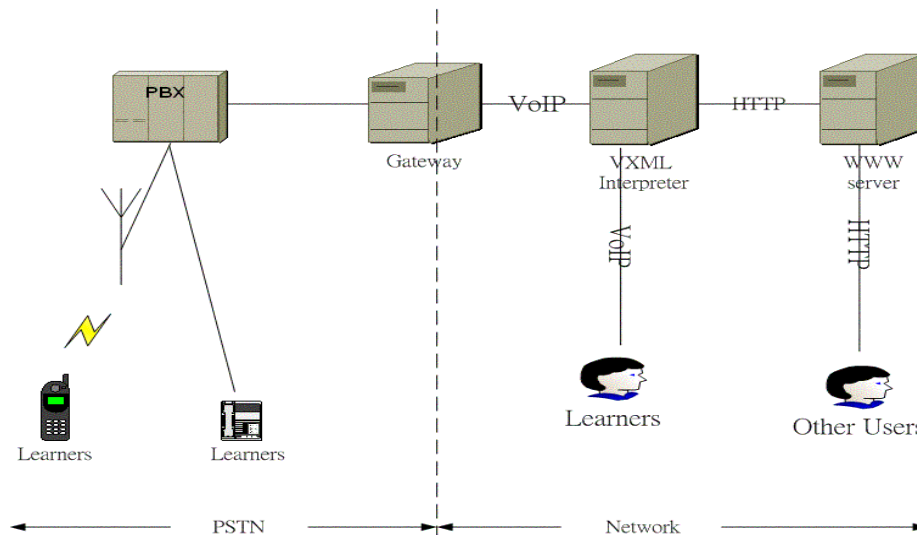


Figure 3. Environment

3. Analysis for users

There are some steps to know what functionalities IVLS has to supply. The first one is to analyze the users' needs and the second is to get use case model of this system. IVLS supplies services for four kinds of users, i.e. authors, administrators, LMSs and learners. An author on this system is like an instructor. An author can create a class and register the learners he likes to his class. After creating a class, the author has to edit a course and teaching materials for that class. So the author's main needs are the creations of teaching materials, test papers and management of classes.

An administrator on this system is like a school director. An administrator can manage the functionalities of IVLS system and teachers, but the administrator can't manage learners and the content of teaching materials. Learners and the content of teaching materials are managed only by authors.

IVLS is a LMS and the other LMSs can get teaching materials from IVLS or send teaching materials to IVLS. IVLS has to supply a platform to LMSs to download or upload teaching materials. How do LMSs get teaching materials from or send teaching materials to IVLS? Sharable Content Object Reference Model (SCORM) is the best answer presently.

4. System design

According to the users' needs, the use case diagram can be gotten. Figure 4 shows the Use Case Model.

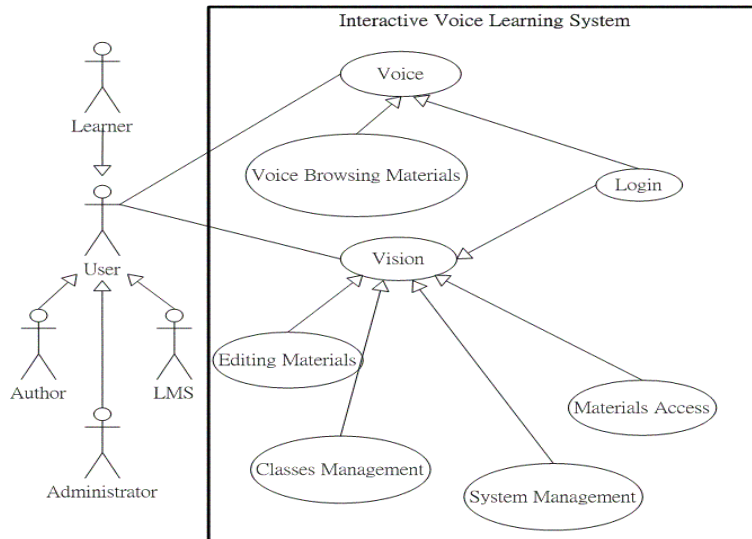


Figure 4. Use Case Model of IVLS

There are four kinds of users. They inherit user's functionalities. IVLS supplies mainly two functionalities, (--)-voice and vision. The functionalities of voice include the functionalities of voice browsing materials and login. The functionalities of vision include editing teaching materials \ classes management \ system management \ login and input/output teaching materials. The functionality of login is responsible to watch the system to check users' IDs and what they can do at this system.

From the use case, user has two interfaces, GUI and VUI. According to these functionalities, this article subdivides IVLS into six modules. Figure 5 shows the structure of IVLS.

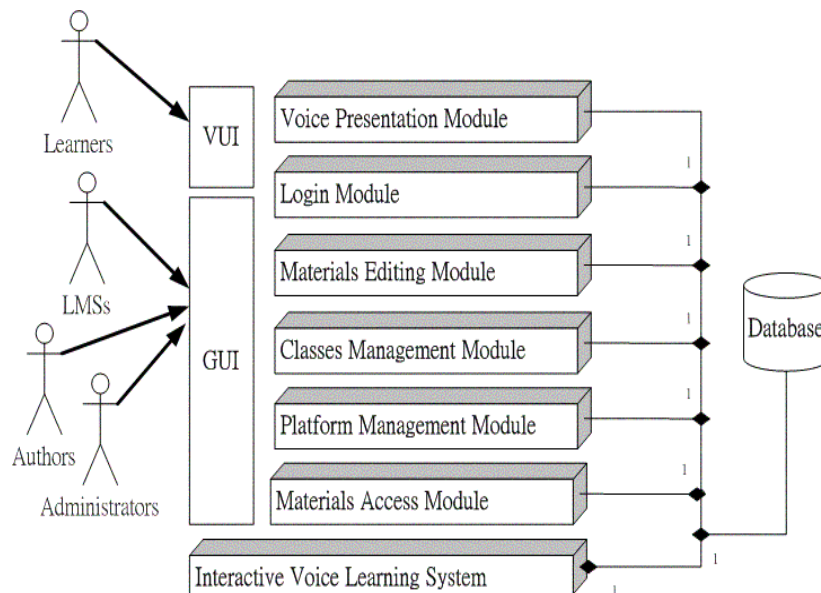


Figure 5. System Structure

4.1. Voice Presentation Module

Voice Presentation Module is responsible to translate VoiceXML files into voice to learners and learners can talk with this system from VUI by phones or voice devices. Here learners can speak directly the data they want to input or press DTMF keys. The method of presentation is a dialog between learners and Audio Presentation System.

4.2. Login Module

Login Module watches the whole system. It is responsible to manage the security of IVLS. An user must have account name and password of his own and then he can enter this system. Users who want to enter IVLS should interact with Login Module first. If users pass the test of Login Module, they can enter the other modules.

4.3. Teaching Materials Editing Module

Teaching Materials Editing Module is responsible to supply a GUI for authors to edit teaching materials. Authors can create their own voice teaching materials, i.e. VoiceXML files, at this module. Here this module will create metadata first from authors' inputs. The metadata are to describe the information of a VoiceXML file. The metadata will be included in the field, Resources, in a content package (SCO) when IVLS wants to export the content package. This module has another functionality, i.e. editing test papers. Authors can create three kinds of questions to learners, i.e. true-or-false question, multiple choice question and essay question. Because test paper presents dialogs to learners, the system has to add additional events, help, no response and again, on VUI. There are no these events on GUI. We show the sequence of dialogs of a multiple choice question on a test paper below.

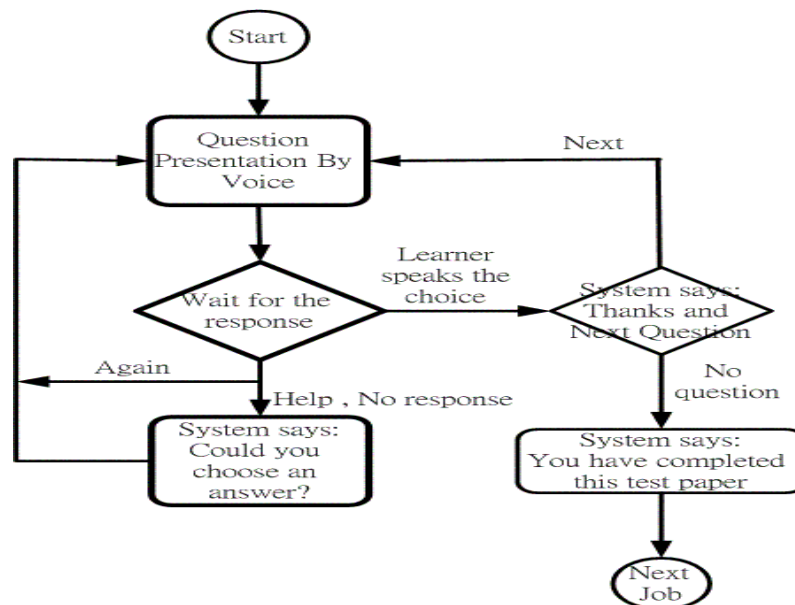


Figure 6. Dialog Flow Chart

This dialog sequence can also be the sequence of teaching materials, if we change the contents of the dialogs. The event dialogs, Again, Help and No response, are very important on VUI. If learners don't understand what the system said, they can speak the word, help, or make no response to "Help" dialog or speak the word, again, to listen to the question again.

4.4. Classes Management Module

Classes Management Module takes charge of most things. An Author creates a class here and assigns courses to that class. The learners are assigned to a class by authors. Learners can't register themselves to a class. An Author controls his own classes, teaching materials and students. Authors can leave a message to a learner. The message is also a VoiceXML file and the learner can get it by VUI. Authors can grade test papers here. This

module will show automatically the learner's grade to authors. There is a most important job here. Authors have to create the metadata of a course. The metadata is different from the metadata created by materials editing module. The metadata created here has to describe the sequence of subjects in a course and the information about the course. The metadata about sequence will be included in the field, Organization, in a content package (SCO) and information about the course will be included in the field, Meta-data. When a system gets these metadata, it will know how to direct a learner to complete a course. These metadata will be used when IVLS wants to export the content package.

4.5. Platform Management System

The users of the platform management system are administrators. Administrators can't manage learners, classes, (or) teaching materials. They manage authors and functionalities of IVLS. If an author creates an illegal teaching material, an administrator could stop the author's rights.

4.6. Materials Access Module

Materials Access Module is a gateway of IVLS. The information (i.e. SCOs) which are imported or exported will be through this module. In order to exchange teaching materials with the other LMSs, a course will be packaged into a sharable content object (SCO). The major job of this module is the content package. This module will gather the information from classes management module and assets from Asset Depository. When a LMS chooses a teaching material, i.e. a course, this module will compress the relational files and meta-data into a ZIP file. This ZIP file is a SCO. After a LMS gets the SCO, it can decompress it and handle it according to the manifest in a package (SCO), if the LMS is SCORM-compliant. IVLS can also get the SCOs from the others LMSs. This module will also decompress the SCOs and handle the physical files on the SCOs from the other LMSs. The picture shows the structure of the package (SCO) and how IVLS does compressions and decompressions.

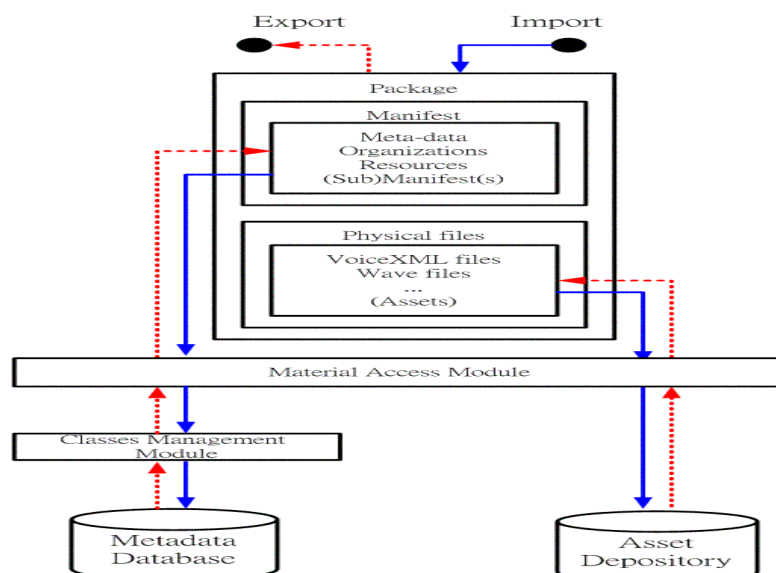


Figure 7. SCO

5. Conclusion

Generally speaking, people listen to the teaching programs on the radios without any interaction with instructors. As a result, instructors can't know any about learners. This article designs a system which is like

radio on the Internet. But this system implements the interaction functionality the radio can't implement.

Another important functionality is for visually disabled people. Because of their problems of their eyesight, they can't get information from the Internet over GUI, but now they can also learn online through IVLS. And general people can learn anytime and anywhere through this system by phones. Therefore, the mobile learning is realized.

6. Reference

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