

An Information-on-demand E-learning System

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Abstract—Due to the fact that Internet is widely developed, more and more people learn through network. Traditionally, an e-learning system is usually cooperated by Learning Management System (LMS), which is convenient for administrators to manage the course but difficult to get information there through. Until now, e-learning2.0 has become the main trend of current study. It indicates that users are being more interactive with each other. In this paper, we propose a novel information-on-demand e-learning system. The proposed system provides an audio-based information learning service, which lets us learn not only depend on text reading but auditory and visual learning. The proposed system searches and converts the customized information or user-specified articles on the Internet to audio, and no assistive tool is required on user sides. Via modern text-to-speech technology, the conversion can be done automatically. Moreover, our system provides the self-learning areas, in which the users can choose whatever material they like to upload. Our e-learning online platform has a large number of advantages including customized learning, convenience of acquiring information and abundant resources. The proposed system realizes the goal of ubiquitous and friendly access of the Internet for anyone from anywhere. We can learn wherever without time limitation.

Keywords - *e-Learning2.0; information-on-demand; self-learning; text-to-speech*

I. INTRODUCTION

E-learning [1, 2] was proposed by CEO forum [3] on education and technology (ET CEO) in June, 1998. Since then, governments, enterprises and schools began to take part in online courses and distance learning [4]. Nowadays, more and more people get the latest information from the Internet anytime, anywhere. Nevertheless, the development of e-learning is still slow, because people do not adapt themselves to the new way of learning and working. Therefore, the quality of e-learning is doubted no matter in academia and enterprises as a result e-learning still plays an assistant role. Even though the government offers large quantities of resources to develop e-learning and apply the system somehow, but they still ignore the most critical point that how to make people want to use e-learning to learn. That is

to say, if people are not motivated, people would not have interests to learn actively and automatically.

The term “Web2.0” was brought up by Tim O’Reilly [5] with four concepts, which are:

- All the functions are operated through the browser.
- Users can distribute their own information.
- In-time sharing and interaction between users.
- User-centered.

Currently, Web2.0 [6] is changing the learning and teaching methodology. Interactive web technology helps people to communicate easily. Suppose e-learning can make people connect to the issues they concern and be momentarily updated with latest information, it will provide a preferred and motivational environment for learners. On the other hand, Web2.0 [7] also emphasizes personalization, which everyone can pick subjects they are interested in and arrange the layout as per their preference.

RSS [8, 9] (Really Simple Syndication) adopts these concepts of Web2.0 and become a main technique of information exchange. RSS is used to share news and content of Internet and interchange information for people who follow XML [10, 11] standard format.

In this paper, we build an automatic web-based information-on-demand e-learning system (ODES) to assist the learner to learn the latest information through RSS. Computer science is the main learning resource of our system. First of all, we acquire the news information from RSS and we convert the information into audio type and capture the images through Google API. Then we can fulfill the requirement of e-learning with daily updated information.

With the new e-learning method of our system, we hope to turn the traditional face to face instruction into a worldwide web learning platform, so as to make the user be more active in learning activities, and thus to effectively increase the interaction with the digital learning and realize the goal of learning everywhere and smart living. The rest of the paper is organized as follows. We discuss the present weakness of e-learning and the development of RSS service in Section 2. The implementation of information-on-demand e-learning system is presented in Section 3. The comparison of our ODES and other e-learning system is described in Section 4. Finally, we conclude the paper in Section 5.

II. GROWTH OF E-LEARNING

A. Traditional teaching and e-learning

In the past, the learners must stay in the same space, face to face with their teacher in traditional instruction, and the learners have no freedom, which raise their spiritual pressure. The learners have less chance to arrange the time they want to spend on learning not to mention choosing places to learn for themselves. Nowadays Internet has been regarded as an interactive area for human to exchange their news and information. World Wide Web is also increasingly widely applied to teaching and learning. Learners do not have to go to school, not only stay at home, anyone can learn at any place. E-learning [12] has one of the best advantages is that people learn wherever without time limitation. When we use the Internet as a medium, we can reach any place in the world through web. Owing to our network, we can learn a lot of information by surfing the Internet. This will be the mainstream of education mode in the future. Users can build their own custom-made platforms according to their requirements. In addition, users can break the limitation of where they are, perfectly using their free time to learn. There are some benefits as follows: Reducing learning cost, resources being reused, and no spacious space needed.

The platform of e-learning1.0 [13, 14] usually includes LMS (Learning Management System) and LCMS (Learning Content Management System). LMS is an online teaching platform for learner to manage their learning conditions. LMS provides a catalogue of online courses [15, 16] to control the learning schedule, a registration system to help learners record their learning conditions, and useful tools to assist learners, such as a test system which gives the learners a test on the platform, e-mail groups and forum services for learner to communicate with each other. LCMS is also a platform and used to manage or modify the teaching materials. The resource of elearning1.0 is provided by supplier. Due to the provision of teaching materials are unidirectional, which require abundant of time to pre-make those teaching materials. Then, learners may acquire the content of courses through LMS. E-learning2.0 was proposed by Stephen Downs [17] in 2006. E-learning changed the method of traditional instruction. The information was not unidirectional provided by teacher. Learners can also provide the information to others. This pattern will establish great interaction. E-learning2.0 [18] is composed of many primary elements such as wiki, blog, RSS, social networking, mash up, Ajax [19, 20]. Because the information relies on global digital resources it is updated with a high speed.

B. RSS of e-learning

In traditional web pages, learners only can learn from static web pages. Learners need to find significant resources in disordered data, so that they spend so much time filtering resources. These resources are scattered therefore learners

cannot organize all the web content effectively. RSS is an e-learning resource that uses technical framework of XML. This technology allows learners to subscribe the information they want to acquire so as to get the learning resources, and reduce the time of searching in unprocessed data. In tradition, if people want to know whether there is any new information in the websites or blogs, they have to link to the URL and check the information on the web in person. Suppose people want to obtain the information in more than one website, they have no choice but to check all the web pages one by one. Eventually, RSS was created by Netscape that can be used to integrate the significant information from webs and blogs. When information is updated by web administrators, RSS will automatically notify the subscribers of new information. The subscribers can easily learn the content of web pages without linking to the URL. RSS is also widely used on blogs. When authors of blogs write new articles, RSS will notify the subscribers of new articles in blogs.

RSS gradually developed many new services, such as podcast [21]. The podcast is an audio-based online service. The podcast is, normally, a series of periodically released digital media files with some attributes, such as date, title and description. Users pick programs they like and decide when to listen or watch these programs through the podcasting service. In addition, any individual can create a podcast and make people who are interested in to subscribe. The subscriber can automatically receive new podcasts, without going to a specific site and downloading it there from. Podcasting is a broadcasting service on demand. E-learning2.0 [22, 23, 24] brings a different method for users to learn. It focuses on interaction between people for building the best learning experience and result. Podcasting service can be described as a RSS link with media files. All of the content provided to the services must be pre-made by human beings. Therefore, podcast offers a learning method just like users listening to the Internet radio, they can only get information provided by other distributors, but not themselves. If one wants to find some certain specific information, it will be not easy to obtain the information he really needs. He still has to download the media files and check it one by one until the information be founded.

In this paper, our system provides a search tool helping users to find the information they exactly want. It will be much better for users to spend their precious time learning than checking through all materials they do not need.

III. THE INFORMATION-ON-DEMAND E-LEARNING SYSTEM

The information-on-demand e-learning system (ODES) is composed mainly of five modules. The system structure is presented in Figure 1.

These five modules include information capturer, information parser, text-to-speech (TTS) engine [25], photo search engine and e-learning platform.

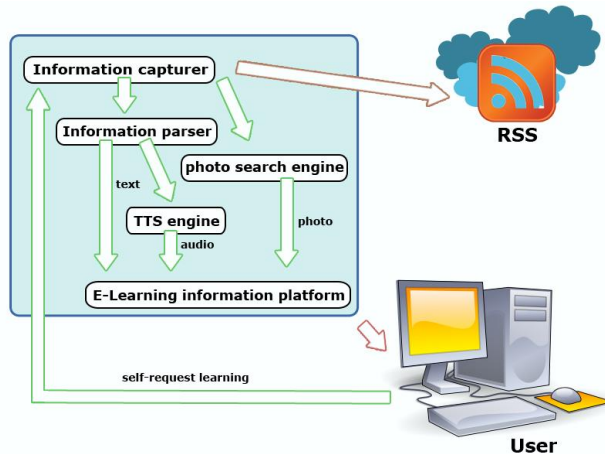


Figure 1. The architecture of the ODES system.

E-learning platform module is an initial area that links the user and information. Here we provide two novel models for users to get their information.

All of the modules are implemented in JAVA-based technology and techniques. The following introduces these 5 modules and two learning models:

A. Information capturer

Really Simple Syndication (RSS) is a standardized format of web information, and our system will automatically capture the specific link so as to make our website updated immediately with latest news and information, such as blogs, news headlines, audios, and videos. Our system collect full text with publishing dates of RSS document from other website, RSS can be a transmitting agent via which people communicate with each other. Therefore, our system captures the information of the text and makes it a learning resource. In other words, our system collects information and provides a platform for integrating all the information to form an information pool.

B. Information parser

When the remote RSS is updated, the system will obtain the information from RSS, and then update to the system. After getting RSS documents, which will be saved as separate files of XML format, our system then gives those files to information parser for analyzing the XML format, which is packed into a data structure, and in turn abstracts the text information, such as the path, size, category, subject and updated date. There are many ways to parse XML, the traditional analysis method is DOM [26], which is a W3C standard way dealing with XML documents. However, the memory needs to read the entire file and transform it into a structure of tree, thus it will spend more time to analysis, and use excessive resources. Our system is using SAX [27, 28], which will be more efficiently in analyzing, reading and

operating XML documents, because the files are analyzed right upon SAX reading the files. SAX is event-based processing model and functions with the generations of events. After processing via event handler, SAX changes the XML files into a series of events. When the events generate, only single corresponding event handler will be called to deal with them. Compared to parsing methods of DOM, SAX is more suitable for the system. The output of the module is in text format, and is delivered to both the TTS engine and e-learning platform.

C. Photo search engine

Information parser will deliver the significant sentence to photo search engine, and the photo search engine will find the pictures relating to the text by Google API. The picture will help users to understand the meaning of the foresaid sentence, and more to get information efficiently, as well as to enhance the absorption of learning.

D. Text-to-speech (TTS) engine

TTS engine can transform text into audio speech. The TTS engine is an implementation of Microsoft SAPI (Speech API) [29] interface, and is compatible with SAPI 5 specification. After information parser separates the text which will be passing to TTS engine and processed to speech. The TTS engine module converts text data to speech in WAV or MP3 format. There are many speakers to be chosen from TTS engine, including male and female vocals. User can use different settings to change the vocal of the speech. After the text is changed into speech, it will be placed to e-learning platform

E. E-learning platform

E-learning platform is the main core to this paper, and is a gateway that people can communicate with each other on it. On the platform we provide two learning methods as follows:

The first one is to directly use the information that stored in our system, the integration of speeches, words, pictures, and to provide a quick access to different subjects, including computer science, information security, digital life, Android, mediaPC, software, wireless, magazines and English learning. When the information is updated, our system will start to update the information to the e-learning platform, and keep all the information latest.

Our system has another feature, that is, English learning area. The English learning area is presented in Figure 2. There are many ways to learn English in the past; you may go to the language school etc., but all these ways will cost you a lot of money. If you use ODES, you can learn English for free, and you do not require any books or magazine to learn. With your computer and network, you will improve English ability, all on your own. Users will hear the voice to



Figure 2. The English learning of the ODES system.

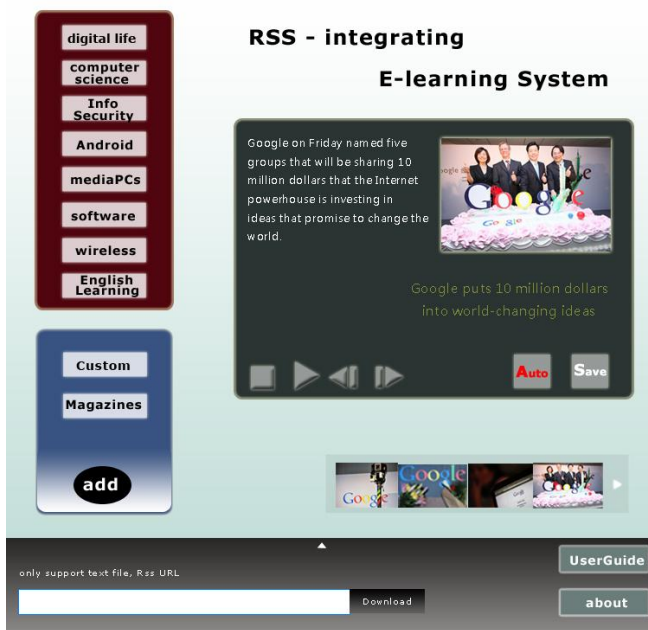


Figure 3. The home page of the ODES system.

read the English topic as well as the content of the article to study language from our learning area.

The second way is self-learning. This area let users upload text files or paste their RSS hyperlinks, and the information parser will analyze the XML and convey the words required to TTS engine. TTS changes the text into audio, Finally, it presents readable information on e-learning platform. It is a different pattern of ways to learn from the past. This kind of way to learn plays a better role as a learning tool, because it is easy to operate and make the users be motivated by their own interests so as to reach the goal of self-learning.

Except for the learning of general people, our system additionally helps the learning of the blind people. Because of physical disabilities, the blind cannot use those systems with visual interface. In order to allow those who visually disable to use our system, the information platform follows

the Web Content Accessibility Guidelines in the specification, such as Access Key etc.

IV. RESULTS

The proposed ODES, except the TTS engine module, was implemented on a PC with one Intel Pentium 4 3.0GHz CPU, 768MB RAM and 80GB disk space. The operating system was Microsoft Windows XP home edition. The TTS engine was implemented on a PC with one Intel Core 2 Duo E6550 2.33 GHz dual-cores CPU, 2GB RAM and 160 disk space. The operating system was Microsoft Windows XP professional edition. All of the modules in the ODES were implemented in JAVA language [30]. The home page of the ODES system is presented in Figure 3.

Our system is introduced to teachers from elementary schools to universities. By using our system, they can get the pictures and audios from the Internet as references, which make the courses more variously. Even students and ordinary people can make use of the system to obtain and learn the information they need in different ways. Through our system, we merge the information technology with education to offer multiple learning materials and develop different ways of learning. Moreover the traditional text-based instruction is no longer the main trend. Sounds and pictures make better learning result. User has the autonomy to make the best use of their time, and trigger the motivation of user's self-learning, so that e-learning can bring the maximal effectiveness of learning. To convey the information easily, our system hide the complexity of information. Our web interface of e-learning can clearly present the information; web pages can be operated mainly by a few buttons, including start, stop, next article, previous article, auto-play, and download. Except for using the mouse to manipulate the web, it can still be operated with the keyboard. As mentioned earlier, podcast must be pre-made by human beings. Compared to podcast, information of ODES are automatically acquired from RSS, so the cost is lower than podcast. TABLE I is the differences between podcast and ODES.

TABLE I THE DIFFERENT BETWEEN PODCAST AND ODES.

Difference	podcast	ODES
File output format	MP3	MP3
Input file format	MP3	Text format file
Program Quantity	determined by the number of recorded	determined by the number of RSS
download	Yes	Yes
Portability	High Portable	High Portable
Human Demand	Middle	low
Subscribe	Yes	No
Timeliness	On Demand	On Demand
Equipment Requirements	support Podcast software	network

V. CONCLUSION AND FUTURE WORKS

The system implementation, focusing on completing the following practical benefits:

- Learning anytime at anywhere.
- Assisting foreign language learning.
- Saving time from getting information.
- The easiest way to get the real-time information.
- Providing the customized area.
- Easier and more convenient way for users to learn.

Combining the above benefits, ODES is a very useful tool for us to acquire information or to learn foreign language. For example, if a person wants to teach himself English, he can find his most interested article in ODES, or upload articles himself. The system will automatically search pictures related to his article, enrich the original material. TTS engine can read this article for him, which he can listen to the practical pronunciation and imitate the speaker. He can also choose the voice and adjust the speed of reading according to his own level or habits. Our system offers a basically different idea which is customized and built as per the requirements of users not the one-way information from providers. This point will greatly motivate users to use our system. We also set up some buttons to help operating our system, such as button to play, replay, consistently play and if he wants to keep the audio in his own devices, then he click the save button and save the mp3 files to his notebook, mobile phone, and mp3 player. Therefore, ODES makes the learner learn anytime, anywhere, easier and more convenient.

For the future, the site has the following plan:

- Build a customized voice area, according to the demand of every individual to build a more customized learning area, save personal settings and customized content, facilitate the convenience of management. Combine voice and customized RSS.
- Except for the above benefits of this system, the system will be more emphatic on functionality and humanized interface, allowing users more easily to apply our system at the first time access.

Face to the era of information explosion that our technology is uninterrupted updating, whoever get the latest information will be the one catch the opportunity. Therefore humans keep on changing the way of learning and the method of acquiring news. Our system provide a new pattern of learning news and education, which reduces the time people spend on looking for the information they need and introduce a brand new way for people to change their behaviors from being passive to active. We believe it is the new mark of intellectual life and online learning.

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