

Implementation and Research about Information Accessibility Technology Service Platform

Haiyong Zhang, Ming Li, Jiacheng Xu, Qinyu Mei, Lin Zhang

Abstract—The rapid growth of the information technology development has brought great impact to our society and people's lifestyle. However, there are some obstacles for people with disabilities to obtain information. The number of China's disabled people is 82.96 million, and at the same time there are 140 million old people. All those people are in urgent need of the accessibility technology information. The information accessibility is a new potential research area in China, which attracts a large number of researchers. In this paper, we will introduce the research work of this area focusing on what the educational and research institutions in China have done at first, then the information accessibility technology service platform will be described in detail. SECBUU (Special Education College of Beijing Union University) joined the Liberated Learning Consortium in 2005 which was set up by Saint Mary's University and IBM. We will introduce the resources about the advanced foreign special education and information accessibility technology through the platform. We could integrate, collaborate and apply these information accessibility resources through the platform which provides comprehensive services. In the end, we will present a web teaching platform which is now being developed based on accessibility.

I. INTRODUCTION

To build a harmonious society, we need to create an environment of information accessibility. Therefore, the research on information accessibility technology is imperative. With the rapid development of computer and communication technology as well as the popularization and penetration of the Internet, the human society has entered into an era of rapid development of informationization and people have become more and more inclined to acquire information through the Internet. However, the weak group of the information world—the disabled, the old and the poor and weak, has yet to benefit adequately from the information technology progress. There are still many obstacles for the disabled in informationization. For example, many websites do not support the application of the screen-reader software, so that many blind people are excluded from the Internet

world; distant education enables people to have access to high quality education at any time, but the deaf cannot hear the wonderful teaching; on-line discussion makes it possible for people to talk to experts a thousand mile away, but many people cannot utilize the opportunity of acquiring information and expressing their views for they cannot normally operate the computer as a result of their disability of the limbs or other body parts. All of these are major social problems that cannot be ignored.

In China, the weak group of the information world is a relatively large social group. At present, the number of the Chinese disabled people amounts to 82.96 million, accounting for 6.34% [1] of the whole population of China, the number of people of 60 and above is 144.08 million, accounting for 11.03% of the whole population (among it, the number of people of 65 and above is 100.45 million, accounting for 7.69% of the total population) [2], they are all in particularly urgent need of the information accessibility technology. Advanced information accessibility technology will make it possible for them to take part in social activities and shorten the distance from the outside world. This is an important issue concerning the harmonious development of the society.

The Chinese government attaches great importance to the cause of information accessibility. The annual "China Information Accessibility Forum" has become a symbol of China's information accessibility cause. The research on information accessibility in China was initiated by researchers of several universities and colleges, and scientific research institutions. However, no mature information accessibility product has been developed from these researches and explorations. The present research of China's higher education institutions and scientific research departments focuses on the following three aspects:

- a. WEB accessibility construction;
- b. application of the speech recognition technology in teaching;
- c. integration of the accessibility technology information resources and its multi-mode propagation.

At present, many scholars such as Wen Jianping, Sun Zhenxiang, Zhang Jianian [3,4,5], Yuan Jun [6], Jiang Shujun [7], Sun Qinghua [8] and Fan Ge are engaged in the research of web accessibility, Xu Jing [10] and Li Ming [11] are probing the application of speech recognition technology in teaching, and Zheng Jian, Xu Jiacheng [12] and Qu Xueli [13] are making attempts at the web integration and propagation fields of the accessibility technology and special education resources.

In this research field, the research of Zheng Jian, Xu Jiacheng and Qu Xueli is all limited to theoretical discussions at present, and no practical web platform has

Haiyong Zhang is the Network Director of the Ministry of the Information Technology (the general manager of Beijing HengKaiWeiYe Tech. Co., Ltd).

Ming Li is the lecturer of the Special Education College, Beijing Union University.

JiaCheng Xu (Professor) is the president of Special Education College, Beijing Union University.

Qinyu Mei is the manager of the IBM China Human Ability & Accessibility Center.

Lin Zhang is the engineer of the IBM China Human Ability & Accessibility Center.

been developed. The main author of this paper is dedicated to the developing and researching of the web platform of information integration and propagation, with an effort to bring about innovation and break-through, achieve the application of specific products and play an active part in the popularization of the information accessibility technology in China.

II. METHODOLOGY

Through the analysis of the present research conditions both in China and abroad, joint-establishment and sharing of the resource platform is the best operating way of utilizing research resources and an effective way of transforming scientific technology research to scientific and technical services [14]. In 2006, China Communications Standards Association (CCSA) formulated *Framework of Information Accessibility Standards System*. The framework systematically explains the whole situation of the domestic information accessibility group, the present situation of the development of products and technologies, as well as the purposes of the domestic information accessibility standardization research. The framework explicitly put forwards that the realization of information accessibility means anybody, whether able-bodied or disabled, old or young, of what language or cultural background, well-paid or poorly-paid, can easily acquire the basic information or use the information communication methods under any circumstances at similar costs. In 2008, the Ministry of the Information Technology worked out the design requirements of YD/T 1761-2008 accessibility WEB websites. After that, the work of information accessibility has become gradually paid attention to in China. During the recent years, the concept of information accessibility has become clearer and clearer in people's mind and it has developed from original theories to specific products and technologies. Although websites related to information accessibility amount to over 3000, the present information accessibility construction is still in its early stage and lags behind that of some developed countries. Its information and technologies are mostly isolated, which seriously restricts the research and service of the accessibility technologies. The main reasons for this include the low popularization rate of the informationization of the relative weak group, the imperfection of the accessibility industry chain, and the lack of a proper equilibrium point to sustain the relationships between the operating subjects, technical research and popularization institutions and the government [13]. Therefore, according to the relative domestic and international standards of information accessibility, we must establish a joint-establishment and sharing system platform, improve the quality of the accessibility technology service and avoid repeated construction. We should provide a communication platform for the weak group of the information world, workers of the relative services, information technology experts and teachers of special education, unite through the establishment of the platform the strength of the government,

enterprises and academic research institutions to serve the weak group of the information world, and provide the research information of special education and information accessibility technology development, the application information of the information accessibility technology in education, and information on laws, regulations and policies, and development planning of the protection of the disabled.

As a result of the obstacles in language, channel and regional administration, we have very little knowledge about information accessibility in foreign countries and we lack communication methods and channel for applying their advanced technologies, so that we cannot make effective use of the foreign advanced resources. With the Special Education College of Beijing Union University joining the Liberated Learning Consortium set up by St Mary's University of Canada and IBM in 2005, the construction of this platform will enable us to interconnect with the Liberated Learning Consortium composed of over 10 universities and colleges around the world, popularize the advanced special education and information accessibility technology resources of foreign countries, integrate the relative domestic resources and carry out the information service and popularization of the accessibility technology. We should put information accessibility technology into practical use, gradually carry out accessible resource construction, information service, distant education and research cooperation and popularization of the accessibility technology.

Information accessibility technology service and popularization platform is a comprehensive business platform for resource integration, information co-establishment and sharing, information management, research cooperation and international communication support. Research on information accessibility technology is characterized by both long term and innovation. Information accessibility technology service and popularization platform involves standard popularization, research data incorporation, research work cooperation, accessibility service integration and accessibility system integration. Its specific functions are as follows:

2.1 Resource co-establishment and sharing will advance information incorporation and building the resource center is the basis of the information accessibility application.

Information accessibility technology research cannot go without resource construction. Through collecting and recommending the latest information of international special education, the latest research trends of the relative universities and colleges, information on the research achievements of the relative trades such as the scientific education industry and the information industry, and the latest research information of some domestic and international research institutions such as IBM, Microsoft, Chinasoft and Chinese Academy of Sciences, Beijing HengKaiWeiYe Tech. Co., Ltd., we can provide uniform data

reduction and information processing. The main contents of resource cosntruction can be illustrated as in Figure 1, and the main functions are as follows:

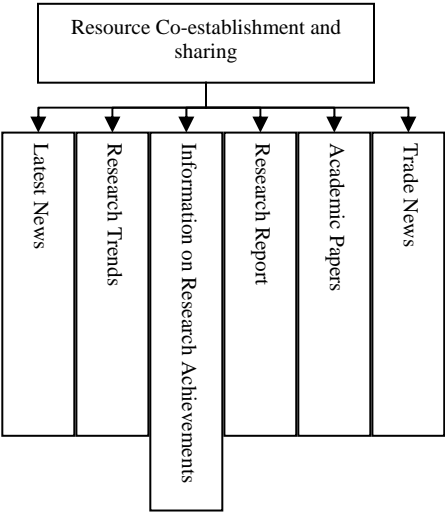


Fig.1 Resource Contents

2.1.1 Comprehensive classification

Since the resource contents are complicated and diverse, the platform provides three classification systems in order to find the required information in an easy, rapid and effective way. The first is to classify the regions based on the characteristics of the source, the second is the domestic trade classification system based on the domestic trade practice, and the last is to classify the information according to Bayers’ classification calculation method [15] , and it designs and realizes an automatic classification method suitable for WEB information. The three classification systems describe the resource type from their own independent angles. Meantime, they incorporate into each particular piece of resource information and express the resource information from different classifications, thus achieving a scientific classification.

2.1.2 Content retrieval, service of searching duplicate or new information

Retrieval of the existing contents can be done by means of the combination of classification, author, subject word, time, key word, quotation, ordinal number, code and technical terms, etc., fuzzy retrieval is possible and the retrieval scope includes primary document and secondary document.

As for the included document, the platform can find out the duplicate contents. Based on the resource center databank, the platform can retrieve and point out duplicate documents according to such important information as the title, key words and abstract, thus excluding the duplicate documents.

As for research topics to-be-carried-out, the platform provides the service of searching new contents. Based on the resource center databank, the platform can retrieve the same or similar documents according to such important information as the title, classification, time and abstract, and on the basis of such retrieval results, further examine the

originality of the new contents and make relative comments after comprehensive analysis by means of artificial appraisal.

2.1.3 Resource storage and multidimensional data form

In setting up the resource, we can store the multidimensional data which can be submitted to visual and auditory reading, recognition or language in a multidimensional array according to the characteristics of the resource, and write in the relation databank for storage. There are many sparse matrixes in this mode and people can observe the data through multidimensional views and flexibly satisfy the special requirements of different people. Meantime, multidimensional data includes the dimension of time, so that it can increase the speed of data processing, quicken the response and raise searching efficiency compared with the ordinary relational data.

2.1.4 Collecting through the main accessibility teaching resource

Since the construction purpose of the construction subject—Special Education College of Beijing Union University is to mainly serve the accessible teaching, the resource center especially collects the accessibility teaching resources. The resource collecting methods of the platform mainly include artificial entering and automatic collecting. Artificial entering means that the resource provider, following the instructions, gradually completes the submitting of all information on a uniform entering interface. While automatic collecting is to set up the website range of collecting according to the collecting rules formulated by man and write the relative resource information in the databank after data cleansing by means of PClawer. The main contents of collecting are resource contents and addresses of documents, practical examples (especially teaching application) and software products related to the accessibility technology on the Internet. In an effort to encourage the relative organizations and individuals, an appraisal center for outstanding accessibility technology coursewares is set up and the works which have won prizes are exhibited. The specific contents of the teaching materials of the resource center are shown in Figure 2.

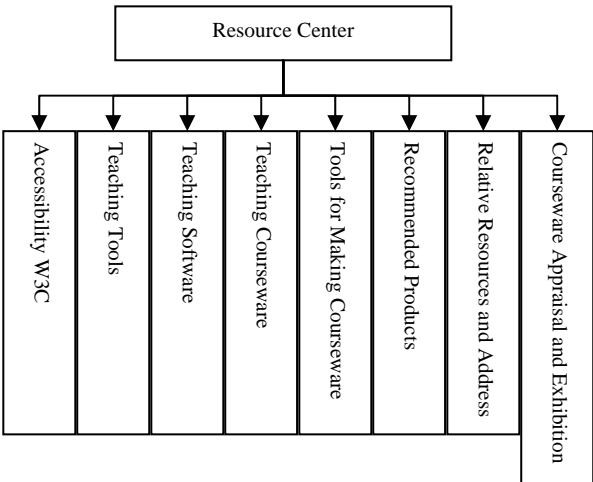


Fig. 2 Teaching Materials of the Resource Center

2.2 Information accessibility and teaching research cooperation platform is an important application field of special education and information accessibility research.

By means of data pre-processing, data cleansing, automatic abstract and automatic classification, we can collect documents on accessibility technology and teaching research, combine such tools as e-mails, calendar, instant communication, website writing and cooperation and set up a research cooperation platform. The main research scope of the research cooperation platform is shown in Figure 3. The development of the platform observes WCAG1.0/2.0 [16] and the norms of YD/T 1761-2008 [17]. It is applied to the teaching practice of special education and provides examples of implementation. It combines information on technologies and norms formulated by international or domestic authorities, propagates and implements the contents, scope, extension and service of the accessibility technology. It recommends and demonstrates the combination modes of audition, vision, colour and words that fit into the standards, good arrangement of tables, contents of the marking language and style. Targeting WEB accessibility application, it sets up guiding information of the contents, adjusts the webpages so that they are suitable for the reading of people with defective vision. Besides satisfying the needs of people with defective vision or audition, it also improves the displaying friendliness of WEB, increases the capacity of surfing webpages through the keyboard operations, and makes the operation of webpages more friendly.

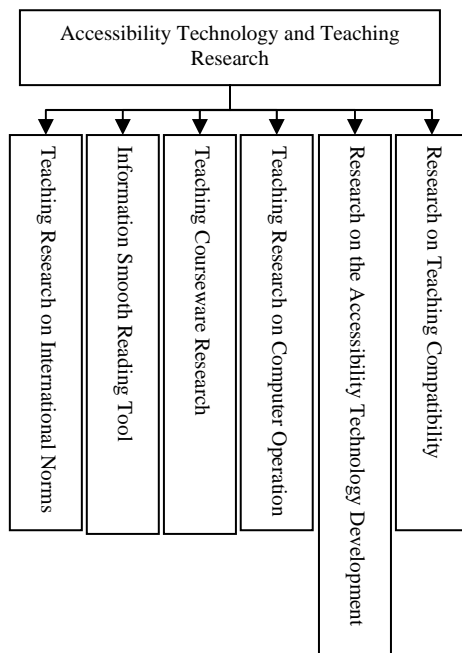


Fig. 3 Research Scope of the Accessibility Technology

2.3 International communication is an important developmental trend of the popularization of the accessibility technology.

The popularization platform of information accessibility technology can conveniently interface with the relative

resources of the Liberated Learning Consortium built up by St Mary's University of Canada and IBM, integrate the resources into contents related to the information accessibility technology in the way of XML, introduce and utilize the international advanced technical resources in a convenient way, provide the mode of RSS for subscribing the information on the international accessibility technologies, and supply favourable support to the accessibility international cooperation. The main contents are shown in Figure 4.

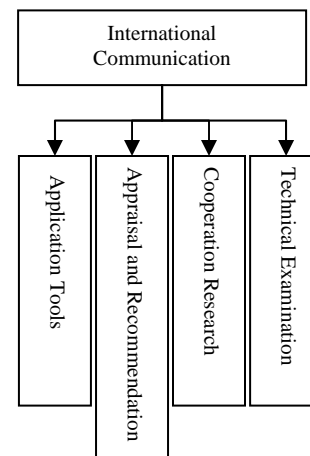


Fig. 4 Contents of the International Communication

a. Application tools

It introduces the universal tool software of foreign countries, collects information on the name, function, edition, volume, developer, software type, authorization mode, operating environment, update time and contact of the tool software, and provides the download service.

b. Recommending system

As for the international information accessibility application system and the system tool software, they are appraised by means of website voting, web use evaluation and appraisal by authorized organizations, the results are publicized and the good ones are recommended.

c. Cooperation research

The international information accessibility research cooperation is carried out through the cooperation research platform.

d. Technical examination

In view of the domestic information accessibility research achievements and the application of the information accessibility application system and the system tool software, the relative foreign appraisal institutions and organizations are authorized to carry out technical examination and present the evaluation results, thus improving the communication of the technology and achievements of the international information accessibility research.

III. RESULTS

Through the information accessibility service and the establishment of the popularization platform, we can

realize firstly providing the information accessibility service for the weak group—the disabled, the old, the poor and the weak, and secondly, providing information on special education and information accessibility technology development for disabled workers, experts on information communication technology and teachers for special education. Thirdly, by taking advantage of Special Education College of Beijing Union University's joining the Liberated Learning Consortium in 2005 set up by St Mary's University of Canada and IBM and composed of over 10 universities and colleges around the world, we can popularize the advanced resources of special education and information accessibility of foreign countries.

IV. CONCLUSION

We will extend the platform in the future and carry out research based on accessible Internet teaching platform. We will gradually improve the comprehensive educational system of the special education industry and enhance the design of the ground-level system platform of the computer-aided teaching by means of optimizing resources of good tutors, increasing special education rate, reducing the limitations on the time period and place of teaching, increasing the content scope of teaching and improving the interest in teaching and learning of teachers and students. The basic presumption is to establish a set of tools to help students construct the learning environment suitable for their own needs and employ the “cooperative” learning method in their learning process, in an effort to cultivating the students' abilities of creativity, analysis, appraisal and self-evaluation. As for the teachers, the system can administer the teaching, follow the students' learning process and manage the time easily and flexibly in carrying out effective communication and instruction with students in the virtual space of the Internet. The platform can also be applied to ordinary teaching, and accessible Internet teaching environment will be more beneficial to the learning of ordinary students. Information accessibility technology service platform is the first to conduct information accessibility service and popularization work in mainland China. The platform has just been built up and it is still a long way to go before the information service and popularization will yield effects, in particular, accessible Internet teaching platform is only attempted in the Special Education College of Beijing Union University. However, it has greatly pushed forward the research and teaching on information accessibility and will play a very important part in promoting the teaching and research in the field of information accessibility of China and foreign countries.

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