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Automatic Mobile Translation System for Web Accessibility based on Smart-Phone

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Abstract

As mobile devices like smart phone prospers, the necessity of mobile web pages is ever increasing while the traditional web services are performed with the existing web pages. To satisfy the those requirement, this paper introduces an automatic mobile translation system that can examine the legacy web pages and produce new mobile web pages in accord to the web accessibility. For this purpose, the regulation for the web accessibility should be built first and the recommendation for a new web page would be performed based on the regulation by the system.

Keywords. *web accessibility, translation system, regulation*

1. Introduction

We are facing lots of web pages every day for shopping, entertainment and works. In addition, we cannot be disconnected to the Internet as the usage of smart phone has been spread widely. These web pages, however, should follow the web accessibility for every people to access including disable people. Those web pages are created and maintained by various people like academies, companies and governmental organizations. In Korea, we have the law of banning the discrimination of the disable people, which is called 'Anti-Discrimination Against and Remedies for Persons with Disabilities Act and Enforcement Decree'. According to the anti-discrimination law for the disable people, all web sites in Korea should provide other web pages that can be used by the disable people. For example, every web page should be equipped with the audio assistance for the blind people. This law was announced in the year of 2008 first in Korea. And it has the stepwise activation by the end of 2013.

Therefore, a new web site with lots of web pages should be built based on the web accessibility. However, the existing web pages need to be transformed appropriate for the anti-discrimination law for disable people. For this purpose, it would be very convenient if every existing web page should be examined and new web pages for the web accessibility is recommended. In this paper, we are introducing the automatic translation system that can examine the existing web pages and recommend the new web pages with the essential elements. Furthermore, as the smart devices are spreading widely, we are using more and more mobile web pages instead of traditional web pages. The proposed translation system also provides a new mobile web page with the elemental information for the existing web pages. The proposed translation system is mainly producing mobile web pages with elemental ingredients for the mobile web pages after examining the existing web pages.

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2. Web Accessibility

A. Concepts of Web Accessibility

Web accessibility refers to the inclusive practice of making websites usable by people of all abilities and disabilities. When sites are correctly designed, developed and edited, all users can have equal access to information and functionality. For example, when a site is coded with semantically meaningful HTML, with textual equivalents provided for images and with links named meaningfully, this helps blind users using text-to-speech software and/or text-to-Braille hardware. When text and images are large and/or enlargeable, it is easier for users with poor sight to read and understand the content. When links are underlined (or otherwise differentiated) as well as colored, this ensures that color blind users will be able to notice them. When clickable links and areas are large, this helps users who cannot control a mouse with precision. When pages are coded so that users can navigate by means of the keyboard alone, or a single switch access device alone, this helps users who cannot use a mouse or even a standard keyboard. When videos are closed captioned or a sign language version is available, deaf and hard-of-hearing users can understand the video. When flashing effects are avoided or made optional, users prone to seizures caused by these effects are not put at risk. And when content is written in plain language and illustrated with instructional diagrams and animations, users with dyslexia and learning difficulties are better able to understand the content. When sites are correctly built and maintained, all of these users can be accommodated without decreasing the usability of the site for non-disabled users.

The needs that Web accessibility aims to address include:

- Visual: Visual impairments including blindness, various common types of low vision and poor eyesight, various types of color blindness;
- Motor/Mobility: *e.g.*, difficulty or inability to use the hands, including tremors, muscle slowness, loss of fine muscle control, etc., due to conditions such as Parkinson's Disease, muscular dystrophy, cerebral palsy, stroke;
- Auditory: Deafness or hearing impairments, including individuals who are hard of hearing;
- Seizures: Photo epileptic seizures caused by visual strobe or flashing effects.
- Cognitive/Intellectual: Developmental disabilities, learning disabilities (dyslexia, dyscalculia, etc.), and cognitive disabilities of various origins, affecting memory, attention, developmental "maturity," problem-solving and logic skills, *etc*.

B. Web Accessibility Evaluations

Web accessibility is evaluated like in Figure 1. Those processes can be described like follows.

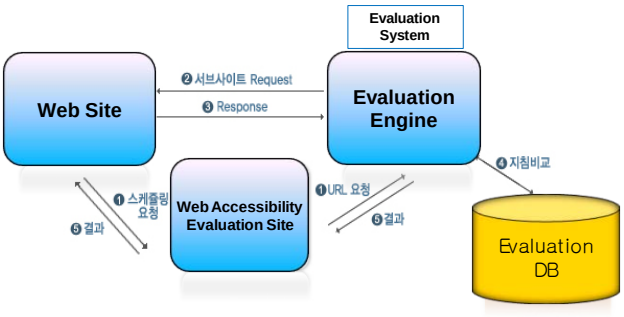

Figure 1. Web-Accessibility Evaluation Process

1. Evaluation request through evaluation URL.
2. Request for the sub web site through the evaluation engine.
3. Transfer the information of the sub web pages to the evaluation system.
4. Evaluate the web site based on the web accessibility regulations.
5. Transfer the evaluation results

3. Automatic Translation System

As mentioned earlier, the recommendation for the web accessibility should be followed after the web site has been examined based on the criteria of the web accessibility. Basically the transformation system should find the information that was indicated by the evaluation tools and should perform the translation process based on the pre-found information.

The architecture of the translation system can be described like in Figure 2. The procedure of the process follows like this.

1. Request the sub site of the evaluating site.
2. Deliver the information of the sub pages of the evaluating web site to the evaluation system.
3. Analyze the web site based on the data base.
4. Produce the whole site architecture when it goes through the evaluation engine and produce the evaluation result when it goes through the evaluation engine.
5. Optional modification by using the evaluation list or site map.

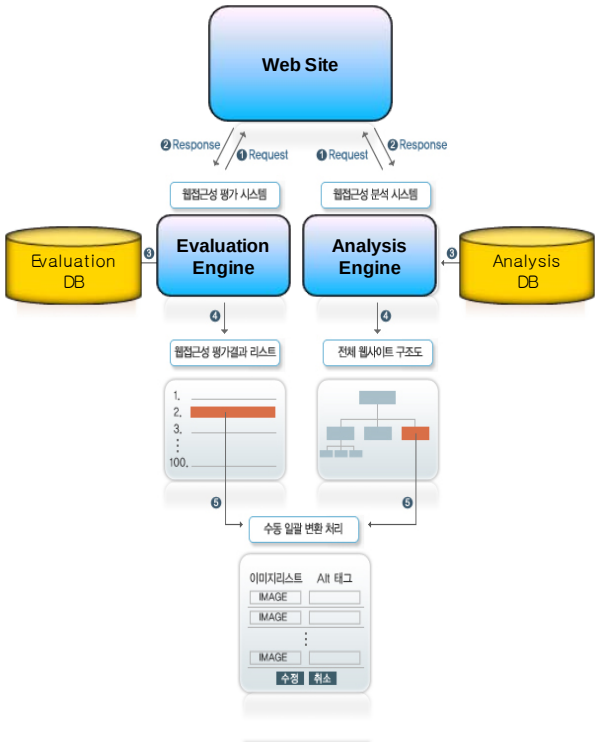

Figure 2. Web-Accessibility Evaluation Process

According to the examination result through the above evaluation procedure, the administrators of the existing web pages can find the web accessibility of the web site they are managing and perform the appropriate actions to improve the web pages.

4. Implementation of the System

The proposed system for web accessibility has been developed supposing that the most users will access the Internet with smart phones. Therefore, the proposed system is based on smart phone apps. The developed system has been designed as smart phone app to extract the texts and the images of the web pages, which is because smart phone app has a different user interface from PC application that has a keyboard and a mouse. Usually smart phone users are more familiar with web pages that are equipped with more images. For this purpose, the analysis of the proper web pages should be preceded and with the results of analysis the proper web page translation is following.

However, the intended web translation was difficult at first due to various versions of Android OS. So, the extraction of the texts and images from the source web pages has been performed after analyzing the source codes of the target web pages. Then the composition of new web pages will be done based on the sorted materials.

The figure 3 shows the analysis of the existing web pages, Hansung University web pages. As shown in the figure, the text and image information has been highlighted among the web page.

```
args.length = 5
IConstants.ROOT  = http://www.google.com
IConstants.TEMP = temp
IConstants.PRINT = true
IConstants.COMMENT = false
path = D:\temp\www.google.com
path = D:\temp\www.google.com : rootDir = D:\temp\www.google.com : create = false
Total Link Count = 19
수집 URL : http://www.google.comhttps://mail.google.com/mail/?tab=wm
수집 URL : http://www.google.com/url?sa=p&pref=ig&pval=3&q=http://www.google.co.kr/ig%3Fhl%3Dko%26source%3Diglk
수집 URL : http://www.google.com/preferences?hl=ko
수집 URL : http://www.google.comhttps://accounts.google.com/ServiceLogin?hl=ko&continue=http://www.google.co.kr/
수집 URL : http://www.google.com/search?q=%EC%9D%B4%EC%A4%91%EC%84%AD&amp;ct=Lee_Jung_seob-2012-hp&amp;oi=ddle
수집 URL : http://www.google.com/advanced_search?hl=ko
수집 URL : http://www.google.com/language_tools?hl=ko
수집 URL : http://www.google.com/intl/ko/ads/
수집 URL : http://www.google.com/intl/ko/about.html
수집 URL : http://www.google.com/intl/ko/policies/
TOTAL 수집 URL Count :  10
urlString = http://www.google.comhttps://mail.google.com/mail/?tab=wm
currDir = ttps://mail.google.com/mail/?tab=wm
file = ?tab=wm
currDir = ttps://mail.google.com/mail
java.net.UnknownHostException: www.google.comhttps
urlString = http://www.google.com/url?sa=p&pref=ig&pval=3&q=http://www.google.co.kr/ig%3Fhl%3Dko%26source%3Dig
currDir = url?sa=p&pref=ig&pval=3&q=http://www.google.co.kr/ig%3Fhl%3Dko%26source%3Diglk&usg=AFQjCNF3pMpDWm9LTq
file = ig%3Fhl%3Dko%26source%3Diglk&usg=AFQjCNF3pMpDWm9LTq5fxrpq8_LwuLpRUQ
currDir = url?sa=p&pref=ig&pval=3&q=http://www.google.co.kr
java.io.FileNotFoundException: D:\temp\www.google.com\url?sa=p&pref=ig&pval=3&q=http:\www.google.co.krig%3Fhl%3
```

Figure 3. Analysis of Hansung Univ. Web-pages

While analyzing the existing web pages, the proper mobile web pages will be produced automatically through the automatic translation process, which is depicted in Figure 4.

1. A manager of web site or administrator of the web accessibility translation system set up the template information of web page that should be translated into mobile web pages.
2. The information about sub web site of the web site that is going to be evaluated is required by the administrator.
3. The information about sub web site of the web site for evaluation is delivered to the evaluation system.
4. The template information of the web site is transferred from the translation template DB.
5. Translation engine transforms the web site into the mobile web site that is following the web accessibility by using the template information.

6. After transforming, the trivial part of translation is going to be done by the administrator.

Besides of automatic translation mentioned above, the more specialized part like video clips are recommended for the acquisition of web accessibility. For example, some of video clips, which can be possibly attached to the web site for advertisement, are accompanying the hand language explanations and can provide better web accessibility to the deaf.

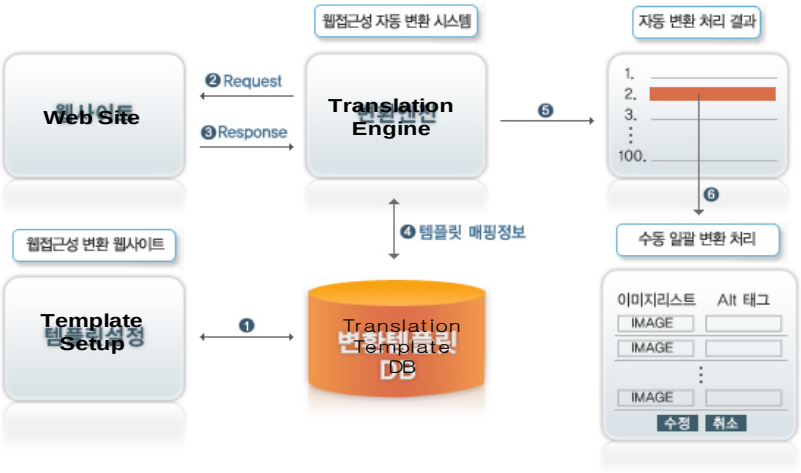

Figure 4. Automatic Translation Process

For more tests, we made the test web page with more images and texts like shown in Figure 5. The Figure 5 shows the usual web page for PC users. This is usually appropriate for PC users. This is not good for the mobile users and web accessibility

After analyzing the web page in Figure 5, the new mobile web pages with text only and image only are shown in Figure 6 and 7. Those are assisted with audio files for the people with hearing disability.

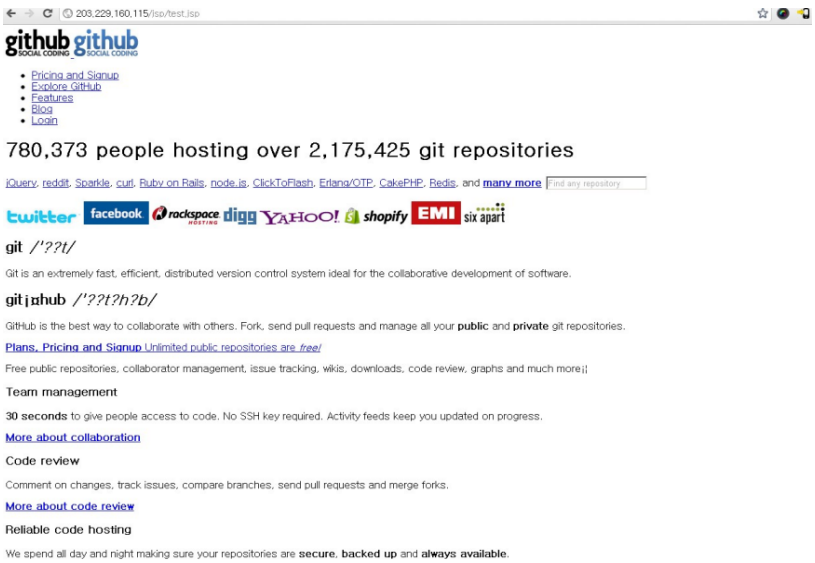

Figure 5. Test Web Pages

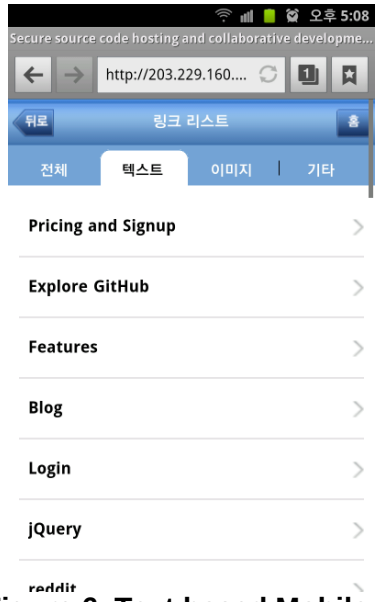

Figure 6. Text based Mobile Web Pages

Figure 7. Image based Mobile Web Pages

5. Conclusions

This paper introduces the translation and transformation system that can evaluate the existing Internet web pages according to the web accessibility and produce new mobile web pages considering user's request.

The web accessibility has been built based on the anti-discrimination law for disable people. And lots of web pages are expected to be changed because of the appearance of the smart devices.

The proposed system has aimed to make the system that can only produce the new mobile web pages according to the web accessibility. The final goal of the system, however, is to have an ability that can make the new user-interface according to user's various smart information device environments.

As the new smart information devices appear, we are forced to make another version of the new web pages for every new smart device. Therefore, the further work is required to make the improvement of the proposed system.

Acknowledgements

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