

A Study of Web Accessibility of Websites Built in HTML5 - Focusing on the Top 100 Most Visited Websites -

Eun-Ju Park, Yang-Won Lim and Han-Kyu Lim¹

*Dept. of Multimedia Engineering, Andong National University,
388 Seongcheon-Dong, Andong-City, Gyeongsangbuk-Do, Republic of Korea*

eunju8921@naver.com, limyw@andong.ac.kr, hklim@andong.ac.kr

Abstract

HTML5 is the next generation of web standards, and needs to be used to improve Web accessibility. To do this, Korea has taken various activities, such as laying down laws and standards related to web accessibility and investigating the realities of web accessibility. Recently, the market for web accessibility has been growing. This study compared the rates of building up HTML5, focusing on the top 100 most visited websites in Korea and abroad. Also, this study assessed the web accessibility of websites built in HTML5, and compared the web accessibility of Korea to those of foreign countries, verifying any efforts made to decrease any information gap. The results of this study show that Korea has built fewer HTML5 web sites than foreign countries. However, the web accessibility in Korea has steadily increased, and there is not much difference in web accessibility between Korea and foreign countries.

Keywords: *Web Accessibility, Web Standard, Mobile Accessibility, UI Interface*

1. Introduction

As the Internet advances, all areas of life are affected, including politics, the economy, society, culture, and public administration. The more web services and usage extend, the wider the information gap between people who use the web and those who don't [1]. The web ensures that any user, challenged or elderly, can access all information provided by websites in any case without much technical skill as much as those without any handicaps [2]. To accomplish this, W3C (World Wide Web Consortium) has laid down various standards for the Internet, promoting them.

Korea has already become a super power in the area of information communications. A real IT power should minimize the information gap for the underprivileged and utilize up-to-date techniques. In order to increase web accessibility, Korea has made various efforts, including implementation of related laws and standards. Since the year 2005, it has surveyed the realities of web accessibility. However, 2010's assessment of web accessibility for corporate websites in Korea, the USA, and Japan showed that 63.6% of Japanese corporate websites, 30.3% of American corporate websites, and 6.1% of Korean corporate websites were rated as 'excellent'. For Korea, a very small percentage of corporate websites were thought of as excellent in web accessibility [3].

¹ Corresponding Author : Han-Kyu Lim, hklim@andong.ac.kr

Thus, this study has investigated the possibility of accepting and utilizing HTML5, a new technique, along with efforts to reduce the information gap for the underprivileged. The introduction examines the background of compliance with web accessibility standards. Chapter two defines web accessibility, and examines the elements of HTML5, which support web accessibility. HTML5 is a new technique as the next generation of web standards. Chapter three compares and analyzes the results of testing web accessibility for websites built in HTML5 after selecting the top 100 websites in Korea and abroad that have been most visited. Chapter four shows the conclusion of this study and direction of future studies about web accessibility.

According to the results of this study, the rate of building web sites in HTML5 is lower in Korea than abroad, but web accessibility in Korea has increased, showing no great difference from that of other countries.

2. Studies Related

2.1. Web Accessibility

Web accessibility is the ground on which the web is based. Tim Berners-Lee, best known as the inventor of the World Wide Web said that the power of the web lies in its universality, indicating this universal accessibility as the most important element of the web. This is because this property of the web makes it possible for all people, regardless of handicap, to access the web [2, 4]. Web accessibility ensures that all people including those with disabilities and the elderly can access all information provided by websites in any case without much technical skill.

There are two kinds of standards in web accessibility: the standards by W3C (World Wide Web Consortium), which is an international organization for standardization, and those of individual countries. The first includes WCAG (Web Contents Accessibility Guidelines), ATAG (Authoring Tools Accessibility Guidelines), and UAAG (User Agent Accessibility Guidelines). For the standards in web accessibility, the USA enforces Section 508 of the Rehabilitation Act and Japan, JIS X 9341-3 [5].

To improve web accessibility for those with disabilities, in 1997, W3C laid down WAI (Web Accessibility Initiatives), and international standardization related to web accessibility is underway now. W3C announced WCAG 1.0 in May, 1999, which presented guidelines to comply with web accessibility standards when making content. In 2008, W3C laid down WCAG 2.0 and publicized it, focusing on practical uses for those with disabilities.

By 'the law about prohibition of the discrimination against those with disabilities and the remedies of their rights', which began to be effective in April, 2008, Korea made it explicit to comply with web accessibility standards step by step. Accordingly, public organizations have been required to comply with web accessibility standards since April 11, 2009, and private industries since April 11, 2013.

As for the domestic standards of web accessibility, IWCAG (Internet Web Contents Accessibility Guidelines) 1.0 was implemented as the national standards by KISC (the Korea Internet Security Center) in December, 2005. KWCAG (Korea Web Contents Accessibility Guidelines) 2.0 was stipulated in 2010, and has been used as the guidelines on which to judge web accessibility [6, 7].

2.2. Web Accessibility of HTML5

HTML5 is the next generation of the web standards that W3C is standardizing, and it is an industrial standard in which web browser vendors participate. It includes semantic markups,

the convenient function of a web form, and API, a rich web application [8]. HTML5 makes much of compatibility with subversions and between various browsers. When working on web standardization, W3C is considering web accessibility as an important item and working out ways to improve web accessibility. W3C and WAI (Web Accessibility Initiatives) have made the Wiki Page, in which anyone interested in the accessibility of HTML5 can participate. Compatibility with subversions and between browsers are not affected by any tool or browser, but can be granted the same web service. This is an important element of web accessibility. Also, HTML5, including the option of WAI-ARIA (WAI Accessibility Rich Internet Application), is trying to improve the accessibility of web content [9].

2.2.1. Semantic Structure: Compared with its previous versions, HTML5 is subdivided in order to express definite meaning of file structures and meanings of data inserted in files. It is composed of elements and properties with which to express meanings definitely [8]. HTML5 uses semantic markups such as <head>, <footer>, and <section>, contributing to expressing the meaning of file structures definitely. HTML5 has various kinds of input elements, making it possible to leave the testing of input forms to browsers.

HTML5 also has elements such as <section> and <hgroup> which are related to file structures and semantics, and multimedia elements.

New properties are added to HTML5, which can be combined to the <form> element in the tag element related and the id value without a markup of the form control within the form element. HTML5 has improved web accessibility, so it is possible to perceive which data are put into which area by providing labels such as label elements and title properties in order to distinguish form controls.

2.2.2. Canvas: Canvas in HTML5 is the element of a two-dimension graphic API, which has the functions of spinning and changing each object in tags, and producing various effects like gradients and image creation [10, 11]. The element of canvas is a proper DOM interface. Figures, internal areas, and other graphic designs can be drawn on a bitmap canvas whose pixel is not affected by using Javascript [8].

However, the element of canvas focuses on visual information, not having alternate content, the most important element of web accessibility. Thus, it is not thought to be usable as alternate content. Its improvement is underway.

2.2.3 Audio and Video: The elements of <audio> and <video> in HTML5 are those for built-in video and audio playing. They function as multimedia, which give support to play media data without using an external plug-in of Adobe Flash or Microsoft Silverlight [11]. Playing elements of conventional plug-in-based multimedia were difficult to access in that they were accessible only if both plug-in and a web application complied with accessibility. The elements of <audio> and <video> in HTML5 are expected to improve web accessibility by playing movies and audio through their own native support without using an external plug-in. They are semantic as tags have their own meanings, which is an element for web accessibility.

2.2.4. Frame: When a frame is used for a file, several pages appear on one window. The web shows a page by a proper URL. This contradicts the preposition of using a frame, and brings about a serious problem with usability. This also has a shortcoming that bookmark showing, printing, and sending URL to others cannot be automated [2]. HTML5 does not define elements such as <frame> <frameset> and <noframes> that affect accessibility and usability, but only the element of <iframe>.

2.2.5. WAI-ARIA: WAI-ARIA (WAI' s Accessible Rich Internet Application Suite) can improve web accessibility by providing HTML extension function that is used to analyze HTML elements, and by defining the roles, statuses, and additional properties of HTML elements through the use of ARIA [8, 10].

Using Javascript, WAI-ARIA contributes to web accessibility when using moving content or user interfaces. The method of renewing user interfaces and content for RIA may not provide web accessibility for those using a screen reader and those who cannot use a mouse or a keyboard. In this case, WAI-ARIA is the standard to solve the problem with the web accessibility of RIA. It defines a new method providing the function of web pages to equipment of information communications

2.3. Charset

Wiki Encyclopedia defines charset as an encoding method in order to store a set of characters and signs in the computer, or to use it for communications. Utf-8 is variable size character encoding, an industrial standard that is designed to consistently express and manage differing world characters used in the computer. A file with an encoding form of utf-8 can show websites expressed in any language in the same pattern.

The unicode is an international code regulation, being able to express all characters in the world. This has the merit that a file written in Korean can be expressed without any problem in a computer which does not utilize Korean. The assignment of charset may not be an essential element for web accessibility, but considering various environments, universal character readability can enhance web accessibility.

3. Analysis of Web Accessibility to Websites Built in HTML5

When selecting websites to be analyzed in Korea, this study has selected the top 100 most visited websites based on rankey.com on April 16, 2013 [12]. Selecting the top 100 most visited websites abroad is based on the service provided by alexa.com on April 13, 2013, which shows page views, popularity, and ranking in each field of websites in the world. The top 100 most visited websites in South Korea provided by Alexa are mostly abroad, and few of them do service in Korea [13]. To compare the web accessibility of websites in Korea and that of abroad websites, this study has referred to the information on the websites of rankey.com. For some of the comparative analysis, this study has consulted a preceding study done in November, 2012 [14].

This study found the rate of setting charset and the rate of building in HTML5 for websites in Korea and abroad. Also, to discover the web accessibility of HTML5, the next generation of web standards, this study has compared the results of assessing web accessibility for websites built in HTML5 and in previous versions in Korea and abroad.

As the web accessibility in Korea advances, this study compared the web accessibility assessments of each website in order to find any difference between websites in Korea and those abroad. For the web accessibility assessments, this study used automated assessment, using K-WAH4.0 provided by the National Information Society Agency. K-WAH 4.0 is a program which inspects the compliance of websites with web accessibility standards according to KWCAG 2.0 [15]. When assessing web accessibility, K-WAH 4.0 sets the charset and doctype for the page to be assessed, and then assesses web accessibility. As a result, K-WAH 4.0 makes it possible to assess web accessibility more exactly than previous versions.

3.1. The Rate of Websites Setting Charset and Built in HTML5 in Korea and Abroad

The following Figure 1 shows the number of websites in Korea and abroad which set charset in utf-8 and which are built in HTML5. Forty-two websites in Korea and seventy-three abroad websites have set charset in utf-8. Domestically, the number of websites (54) which use euc-kr. is larger than that of websites (42) assigning utf-8. This means that in foreign countries, people cannot read a file written in Korean. It can be said that this pattern

of setting does not consider various environments. As for the rate of building websites in HTML5, 20% of Websites in Korea and 66% of abroad websites are built in HTML5, showing 9% increase in Korea. Considering that 66% of the top 100 most visited websites in Korea are built in HTML5, this increase of 9% is very low. However, in November, 2012, building websites in HTML5 was confined to abroad enterprises, game industries, and IT industries. Now, this method of building websites have been expanded to various portals such as www.daum.net, www.nate.com, zum.com, shopping malls like www.gsshop.com, and broadcasting companies like www.kbs.co.kr. This shows an increase in the rate of websites built in HTML5.

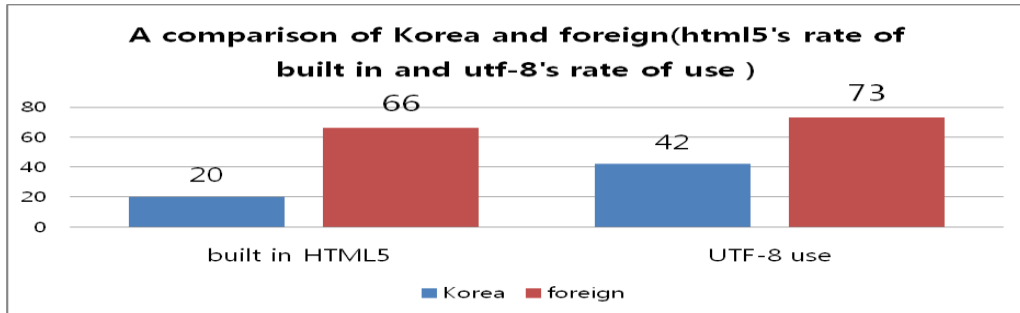


Figure 1. A comparison of Korea and foreign (html5's rate of built in and utf-8's rate of use)

3.2. Assessment of Web Accessibility to Websites of Korea in November, 2012 and in April, 2013

This study examined the improvement of web accessibility to websites built in HTML5 in November, 2012 has improved. In November, 2012, eleven of the top 100 most visited websites, which were selected by rankey.com, built their websites in HTML5. In five months, they were assessed for the improvement in web accessibility through an uploader or changes in websites in April, 2013.

For websites built in HTML5 in November, 2012, Figure 2 below shows the results of assessing web accessibility twice in November, 2012 and in April, 2013. It can be seen that all areas except alternate text show improvement in their web accessibility, judging from the results of assessing web accessibility in April, 2013. This means that each website consistently has in mind web accessibility when changing websites and adding an uploader.

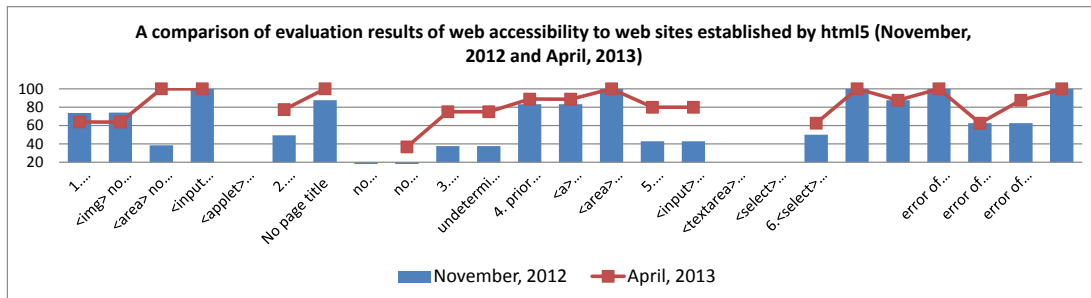


Figure 2. A comparison of evaluation results of web accessibility to web sites established by html5 (November, 2012 and April, 2013)

According to the preceding study in November, 2012, out of the top 100 most visited websites, the number of websites built in HTML5 was eleven, increasing to twenty in April, 2013. For the nine websites which were not built by November, 2012, but later built in HTML5, this study compared the results of assessing web accessibility. As seen in Figure 3 below, compared to the websites built in HTML4 or XHTML by November, 2012, those built in HTML5 in April, 2013 show higher web accessibility in most of the items except for alternate text in and providing labels in <input>. This shows that when building a new site, web accessibility is kept in mind, but the lowered rate of building alternate texts, which is basic to web accessibility, requires interest from website developers.

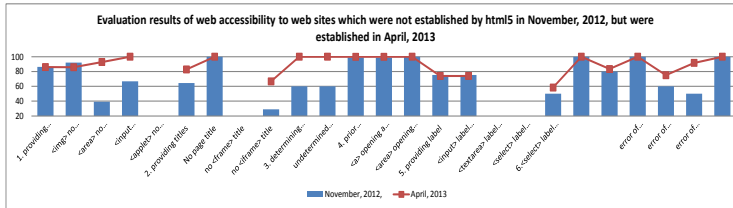


Figure 3. Evaluation results of web accessibility to web sites which were not established by html5 in November, 2012, but were established in April, 2013

3.3. Assessment of Web Accessibility to Websites Built in HTML5

This study assessed web accessibility for each item and compared the results between Korea and abroad, which Table 1 below shows. On the whole, abroad web accessibility is 77.5% and that in Korea, 73.8%. Abroad websites show higher web accessibility than those in Korea.

The results of assessing web accessibility for websites built in HTML5 show that the accessibility of websites in Korea is higher than that in foreign countries. The number of websites built in HTML5 is 20 in Korea, and 66 abroad. However, the whole web accessibility in foreign countries is higher than that in Korea. When comparing web accessibility of websites built in HTML5 and that of websites built in other versions, the first is 85.4% and the second, 73.8% in Korea; abroad, the first is 79.8% and the second, 77.5%. It can be said that websites built in HTML5 has higher web accessibility than those built in all versions both in Korea and abroad. In Korea, interest in web accessibility is gradually increasing, and nine out of 20 websites built in HTML5 is thought to have considered web accessibility. Thus, websites built in HTML5 in Korea are assessed to have higher web accessibility.

Table 1. Web Accessibility evaluation for assessment items

Items for web accessibility assessment	Accessibility of assessment items for built in HTML5		Accessibility of assessment items for entire Web site	
	Korea	foreign	Korea	foreign
1. providing alternate text	77.0	82.1	80.6	81.2
 no alternate text	76.8	82.3	80.6	81.3
<area> no alternate text	94.6		74.3	50.0
<input type=image> no alternate text	100.0	60.0	87.1	60.0
<applet> no alternate text				

2. providing titles	77.3	88.6	70.0	89.1
No page and title	100.0	100.0	99.0	98.6
<frame> no title			25.0	
<iframe> no title	51.2		44.4	
3. determining basic language	90.0	47.1	67.3	44.4
undetermined basic language	90.0	47.1	67.3	44.4
4. prior notification of opening a new file	96.1	90.6	92.6	92.8
<a> opening a new unknown file	96.1	90.6	93.2	92.8
<area> opening a new unknown file	100.0		92.9	100.0
5. providing label	73.1	65.1	57.5	55.8
<input> label not provided	73.1	65.1	57.5	55.8
<textarea> label not provided				
<select> label not provided				
6. markup grammar	55.0	78.4	27.6	69.4
error in duplicate ids	100.0	100.0	100.0	100.0
error in duplicate property name	85.0	92.2	84.7	91.7
error of omission in the opening and closing tag	100.0	100.0	100.0	100.0
error of omission in the closing tag	65.0	86.3	36.7	76.4
error of omission in the opening tag	85.0	94.1	62.2	88.9
error of nested tags	100.0	100.0	100.0	100.0
average	83.7	81.6	73.8	78.6

Figure 4 below is a graph that shows the results of web accessibility assessment items including sub-elements in Korea and abroad. As seen in the graph, the items of providing alternate texts, prior announcement of a new file opening, and providing labels have almost the same level of assessment in Korea and abroad. However, with the item of basic language definition, websites in Korea comply better than those abroad. But with the items of providing titles and grammar markups, websites abroad comply much better than those in Korea.

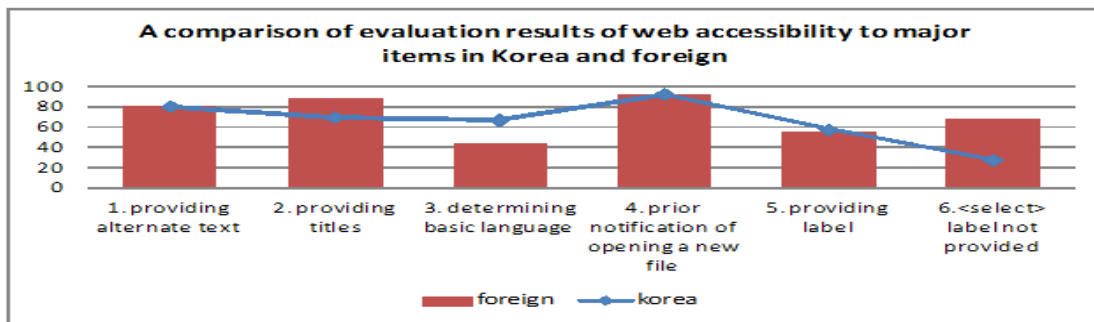


Figure 4. A comparison of evaluation results of web accessibility to major items in Korea and other countries

Figure 5 below is a graph which compares the accumulated rate of compliance with web accessibility standards in Korea and abroad. The rate over 90% of compliance with web accessibility standards is graded as 'excellent' and that over 80%, 'average'. This study represents only the rates over 80%.

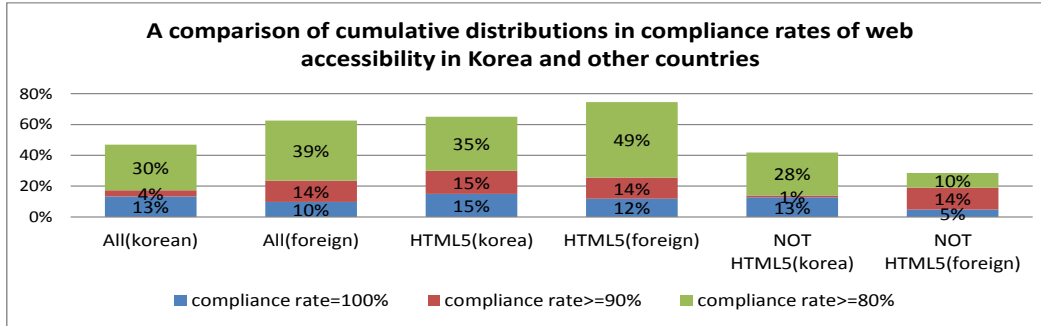


Figure 5. A comparison of cumulative distributions in compliance rates of web accessibility in Korea and other countries

The whole means all websites built in HTML5 or in other versions. The graph shows that abroad websites have a higher portion graded as 'average' and 'excellent' than those in Korea. 47% of the websites in Korea and 63% of those in foreign countries are graded as 'average' and 'excellent'. In other words, 63 out of 100 websites are not difficult to access. As for websites built in HTML5, 75% of the websites abroad are graded as 'average' and 'excellent,' while 65% of those in Korea are 'average' and 'excellent.' The portion graded as 'average' and 'excellent' is higher abroad than in Korea. The number of websites whose compliance with web accessibility standards is over 80% is 63 abroad compared to 47 in Korea. The rate of websites whose compliance with web accessibility standards is 100% is 13% in Korea compared to 10% in foreign countries. In terms of 100% compliance with web accessibility standards, Korea is better than abroad. This is because as of April 11, 2013, the law related is extensively enforced regarding private industries, which are required to comply with web accessibility standards. They mostly built websites with high accessibility.

4. Conclusion

Web accessibility means ensuring that anyone including those with disabilities and the elderly can access all information provided by websites in any technical environment without much special skill. To accomplish this, W3C and each country have made great efforts to make standards and laws. Korea has also tried continuously to improve web accessibility. Thus, this study examined how hard Korea is trying to reduce the information gap between other countries and Korea, and how actively Korea accommodates and utilizes HTML5, a new technique. To achieve this goal, this study compared and analyzed the rate of websites built in HTML5 and websites accessibility in Korea and abroad. The rate of websites built in HTML5 in Korea (20%) is much lower than abroad (66%). However, starting from 11%, the rate in Korea has been growing since November, 2011. The assessment of the items for web accessibility shows that website accessibility abroad (78.6%) is higher than in Korea (73.8%). Though the web accessibility to websites built in HTML5 in Korea (83.7%) is higher than abroad (81.6%), the general web accessibility in Korea is lower than abroad because of the low rate of websites built in HTML5. This is because web accessibility to websites built in HTML5 is higher than that to all websites. As for web accessibility, Korea is better than abroad in terms of compliance with 'basic language definition'. Other countries abroad are

better than Korea for compliance with the items of 'providing titles' and 'grammar markups'. This shows that compliance with web accessibility standards is more affected by what codes developers use in building websites than by what standards are used.

As for the web accessibility to each website, 47% of websites in Korea and 63% of websites abroad are not difficult to access. In other words, 63 out of 100 websites abroad are easy to access. 75% of the websites built in HTML abroad are easy to access. This rate abroad is higher than in Korea (65%). 13% of websites in Korea and 10% of websites abroad completely (100%) comply with web accessibility standards.

Judging from these results, web accessibility to the top 100 most visited websites in Korea is lower than abroad, as of April, 2013, but there is no great difference between the two. Korea is thought to try continuously to improve web accessibility. However, the use of the program, K-WAH, which is a Korean standard, may have favored the assessment of web accessibility in Korea. In the future, expanding this study and using a universal program standard will bring about a new web accessibility assessment beyond regional limitations.

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Authors



Eun-Ju Park

She received the B.S. degree in Computational Statistics from Andong National University, Korea, 1993, and M.S. degree in computer engineering from Andong National University, 2001. She is studying Ph D course in multimedia engineering from Andong National University, Korea. Her research interests include Web Accessibility and Mobile Accessibility and Web Standard..



Yang-Won Lim

He received the B.S. degree in computer engineering from Chungju National University, Korea, 1999, and M.S. degree in computer engineering from Andong National University, 2001. A Ph D. degree in Information communication engineering from Andong National University, 2011. He is currently a full-time lecturer at Andong National University. His research interests include Multimedia contents, Mobile web and UX.



Han-Kyu Lim

He received the B.S. degree in computer engineering from Kyungpook National University, Korea, 1981, and M.S. degree in computer science from Yonsei University, Korea, 1984. A Ph D. degree in computer engineering from Sung Kyun Kwan University, Korea, 1997. He is currently a professor at Andong National University. His research interests include multimedia contents, Web application and NLP.