

2003

WML2

2 0 0 4

WML2

論文 碩士學位 論文 提出

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論 文 概 要

가 ,

가 가 가 가

CPU, 가

PDA(Personal Digital Assistant)

가 WAP(Wireless Application Protocol)

WAP Forum , WAP2.0 가

WML2(Wireless Markup Language)

HTML

HTML WML2

HTML

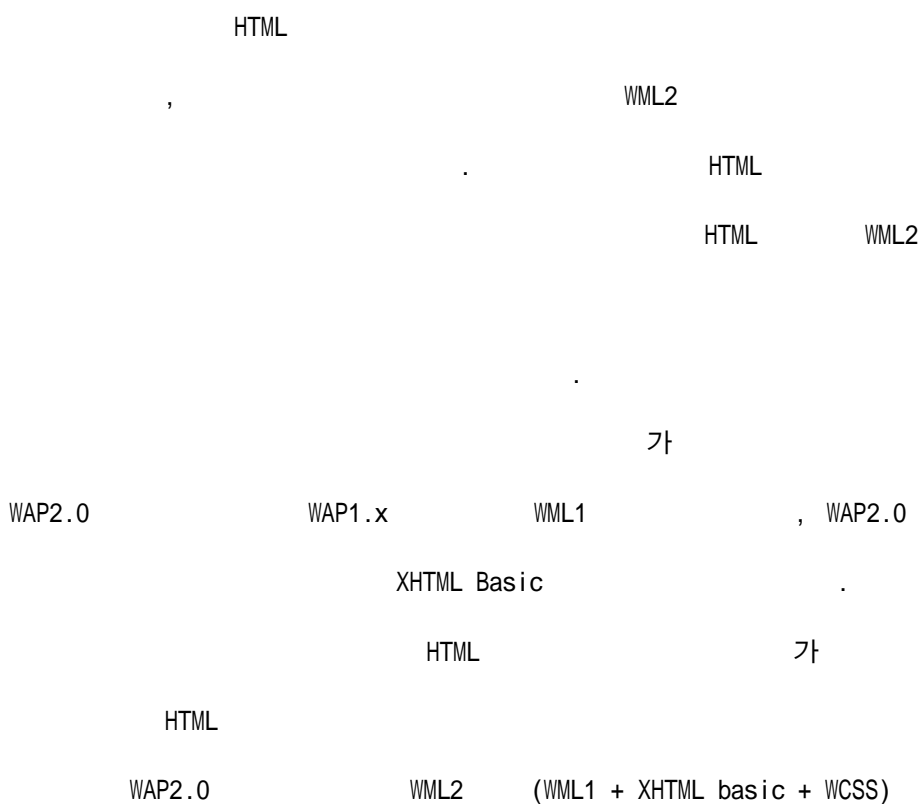
XSL

WAP2.0

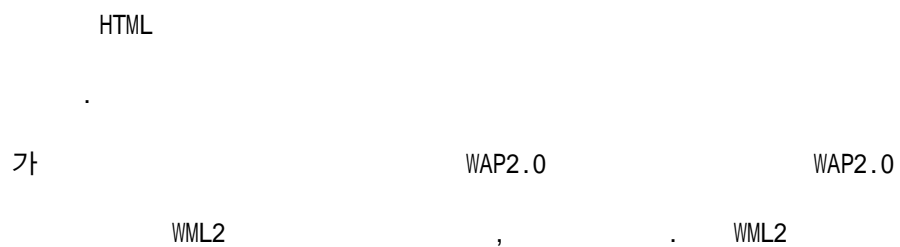
WML2

,

가



1.2



WAP1

WML1 XHTML Basic

.

.

HTML

HTML

, ,

XSL

WAP2

WML2

.

.

가

.

1

WAP

WML

. 2

. 3

,

가

.

.

Application Protocol) 1 WAP2.0(Wireless
 Language) 2 WML(Wireless Markup

2.1

가 (Wireless Network)

, PDA ,

(Protocol)

가

WAP2.0(Wireless Application Protocol) .

WAP2.0

WML1(Wireless Markup Language), WML2, XHTML

Basic .

WAP2.0 WAP2.0

WML1, WML2, XHTML Basic

2.1.1 WAP2.0(Wireless Application Protocol)

WAP1.0(Wireless Application Protocol) 1998 , , ,
 Phone.Com 200 가
 WAP . WAP

WAP1.x WAP2.0 WAP1.x
 TCP/IP [2].

WAP2.0 , WAP , ME ,
 i-Mode

가 2.5G, 3G ,
 LCD 가 LCD .

WAP2.0 HTTP [2.1] .



[2.1] WAP HTTP

➤ WAE(Wireless Application Environment)

WAE WAP WAP

. , WAE WAP

가 가

. WAE

. WAE가

WAP

WAP1.x WML1

W3C XHTML Basic WCSS (Wireless Cascading Style Sheets), WML1 WML2 가 .

➤ WP-HTTP(Wireless Profiled HTTP)

WAP HTTP request/response

. WP-HTTP end-to-end CONNECT

➤ TLS(Transport Layer Security)

WAP1.x ,

end-to-end WAP2.0

end-to-end .

➤ WP-TCP(Wireless Profiled TCP)

WAP TCP TCP connection
end-to-end

➤ WAP 2.0 가

✓ WAP

WAP

✓ MMS(Multimedia Messaging Service)

MMS 가 (, , ,) ,
MMS
store-and-forward non-real-time delivery

✓ User-Agent Profile

2.1.2 WML(Wireless Markup Language)

2.1.2.1 WML1

WML1 WAP1 가

. WML1 ,

HTML ,

Tag

, WAP

Phone.com HDML XML

WML 4가 . , WML

, 가 . ,

(Deck) (Card) [4],

가 ‘ ’ ,

. HTML ,

가 .

, HTML 가 HTML , WML

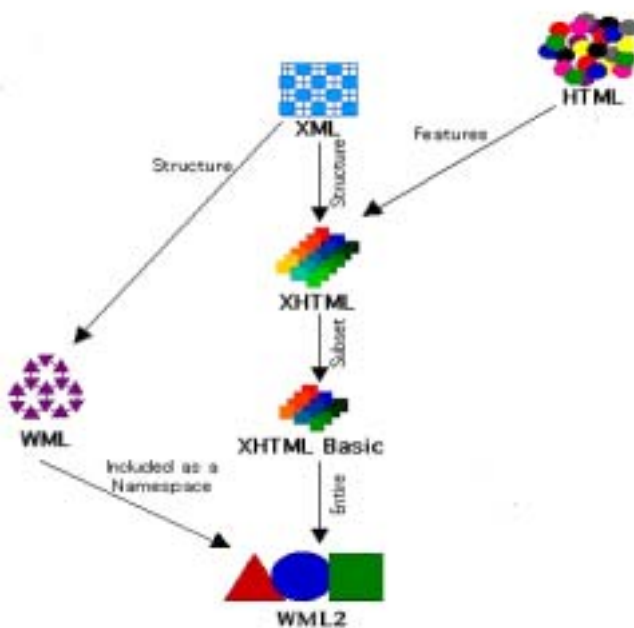
. , WML

,

가 .

2.1.2.2 WML2

WML2 XHTML Basic WML1 WCSS . XHTML Basic
XHTML 가
CSS . Plug and Plat [2.3] , WML2 [2.1]



[2.2]

[2.1] WML2

| | WML 2.0 |
|--------------|--|
| Text & Image | abbr, acronym, address, b, blockquote, big, br, cite, code, dfn, div, em, h1, h2, h3, h4, h5, h6, i, img, kbd, p, pre, q, samp, small, span, strong, u, var |
| Table | caption, table, tr, td, th |
| Form | fieldset, form, input, select, option, label, textarea, optgroup |
| List | dd, dl, dt, li, ol, ul |
| | a, base, body, hr, head, html, link, meta, object, param, style, title |
| WML1 Element | wml:anchor, wml:access, wml:card, wml:do, wml:getvar, wml:go, wml:noop, wml:onevent, wml:postfield, wml:prev, wml:refresh, wml:setvar, wml:timer, wml:widget |

2.1.2.3 HTML WML2

HTML WML2

[3.1]

[

3.2] WML2 HTML

CPU

Well-Formed Document

HTML

[2.2] WML2 HTML

| | WML 2.0 | HTML |
|--------------------|-----------------------------------|--------------|
| Spec | xHTML Basic base, WML1 DTD | HTML 4.01 |
| Document Structure | Head&Body, Deck&Card | Head&Body |
| Document | Well-Formed & Validation Document | |
| Navigation | Element | <a>, Script |
| Event | Key, Document Event | All Event |
| Variable | \$(varname) | Script Value |
| Entity | Font | All Entity |

[2.3] WML2 HTML

| | WML2 | HTML |
|--------|--------------------------------|---------------|
| DTD | xHTML Basic DTD, WML1 DTD | HTML DTD 가 |
| Header | "<?xml ... ?> <!DOCTYPE ...> " | 가 |
| | Element Attribute | 가 |
| | Element | 가 |

2.2

2.2.1

overhead

가

가

-
-
-

-
-
-
-

2.2.2

IBM WebSphere Transcoding Publisher 4.0[5],
 Seastien Aperghis-Tramoni HTML2WML[6], ArgoGroup WapTool[7]
 Mobile Converter[8], M-converter 2.5[9],
 M- [10] . 가

- WebSphere Transcoding Publisher 4.0 – IBM

WebSphere Transcoding Publisher

, JavaScript, Macromedia Shockwave

가

WebSphere Transcoding Publisher

. WebSphere

Application Server

JavaBeans

, ,

servlet .

[2.4] WebSphere Transcoding Publisher 4.0

| | | | | |
|------|----------|------|------------|-------------|
| | | | | |
| HTML | HTML | HTML | PalmNet | PalmOS HTML |
| | WML | XML | | , XSLT |
| | i-Mode | JPEG | GIF, WBMP | |
| | HDML | GIF | JPEG, WBMP | |
| | VoiceXML | | | |

- HTML2WML - Seastien Aperghis-Tramoni

WML , CGI

. Html2Wml 가

가

가 HTML .

- Mobile Converter -

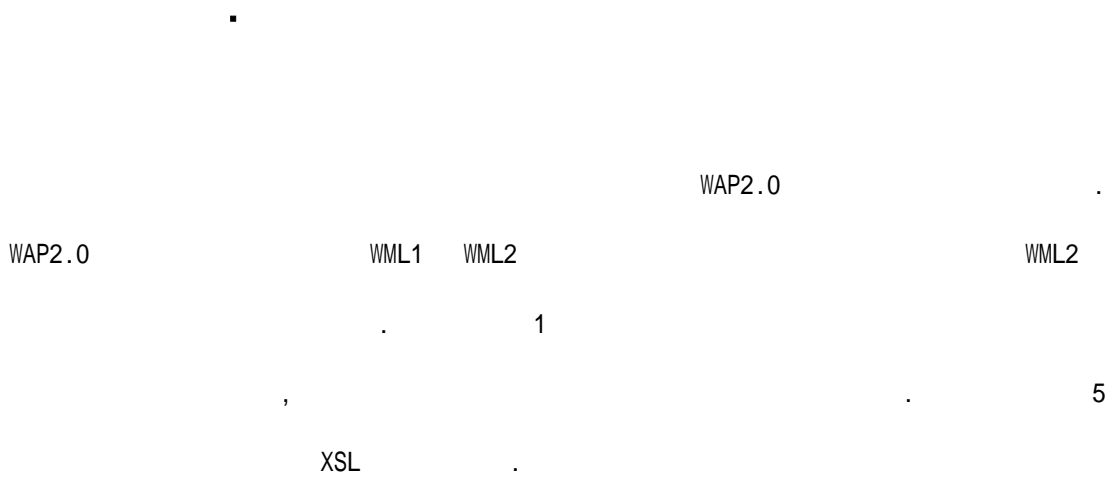
Mobile Converter mconverter Rule Editor, Image Converter .

mconverter

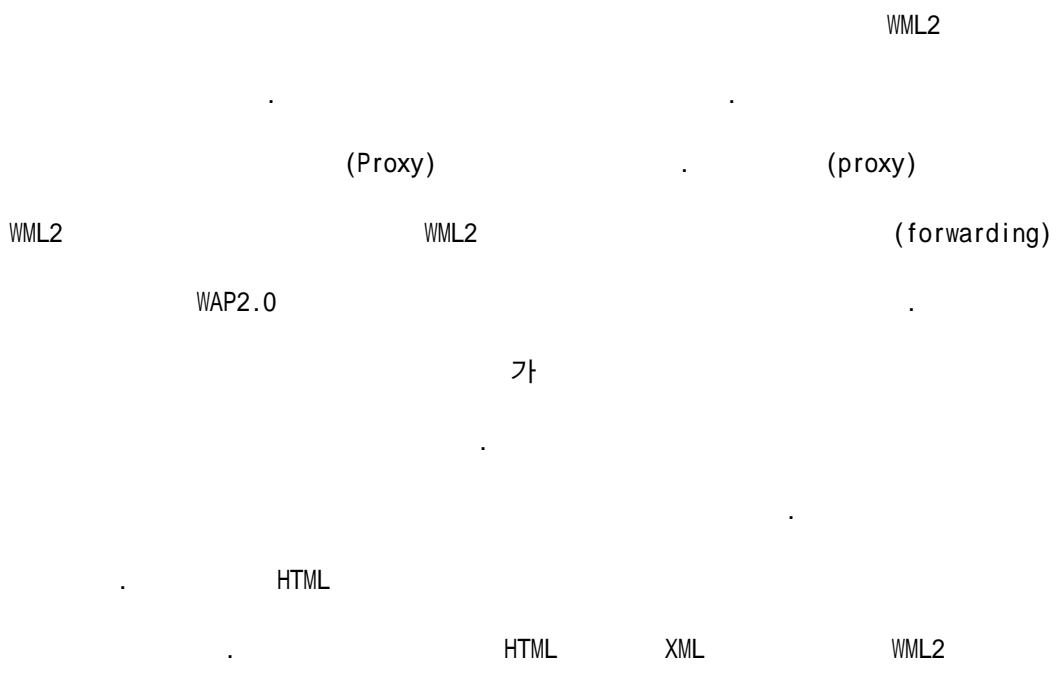
SML

SML

File Rule Editor . Rule File , Rule
. Image Converter
,
. .wbmp, .bmp, .gif.nbmp 가



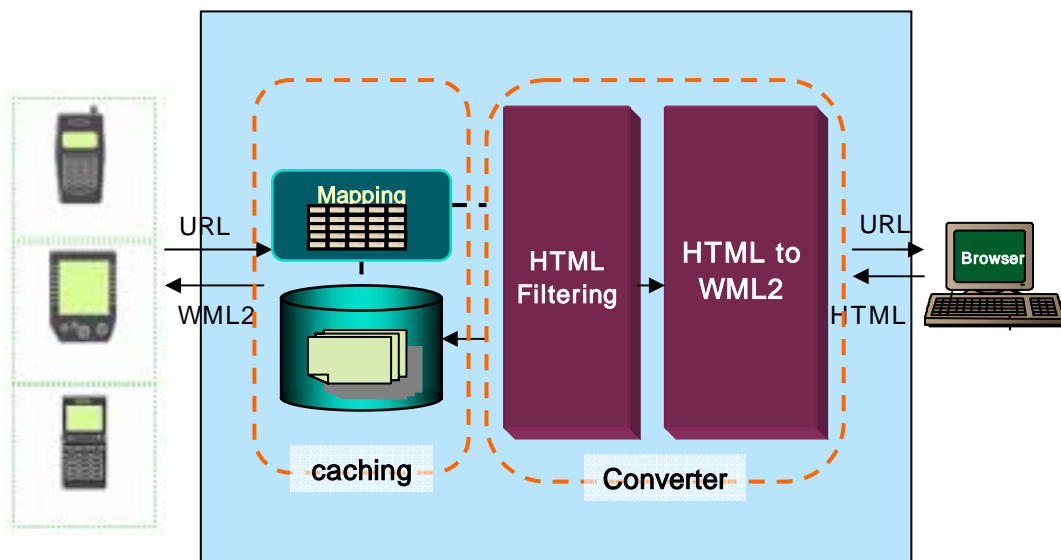
3.1



XSL XML WML2

Cocoon2

[11]



[3.1]

3.2

3 1

가

WML2

HTML

HTML

, , 가 HTML

HTML

3.2.1 HTML

HTML HTML , , 가
 . [3.1]

[3.1]

| | <!-- --> | . |
|---|----------|---------------------------------------|
| | <script> | . |
| | <p> | <wml:card> <p> </p> <p> . |
| | | 가 . |
| | <frame> | <frame src= " " > . |
| | <a href> | . |
| 가 | <div> | <div> 가 <div> . XSL <div> <card> |

3.2.2

HTML

WML1

<card>

[3.2] HTML .

```

<?xml version="1.0" encoding="iso - 8859 - 1"?>
...
<html>
  <wml:card id =card1 >
    <wml:do type="accept">
      <wml:go href="#card2"/></wml:do>
      <p>
        </p>
    </wml:card>

  <wml:card id =card2 >
    <wml:do type="accept">
      <wml:go href="#card3"/></wml:do>
      <p>
        </p>
    </wml:card>
    :
</html>

```

[3.2]

[3.2] <wml:do> action

type

accept

가 accept

<wml:go>

(>) 가 (<) 가

`<select>`
`<option></option> <option></option>... </select>` `<select>`가
`</select>`가 `<option>` 가

3.3

HTML Cocoon2 XML
 XML XSL WML2 Cocoon2
 sitemap XSL

3.3.1 Cocoon2 sitemap

Cocoon2 W3C (DOM, XML, XSL,
) Cocoon2
 Generator가 HTML
 Transformers가 XSL HTML WML2
 Serializer가 WML2 WML2
 Generator, Transformers, Serializer
 sitemap [13]. [3.3] sitemap WML2

Serializer

```

<map:serializer name="wml2" mime-type="text/html;charset=KS_C_5601-1987"
  logger="sitemap.serializer.xhtml"
  src="org.apache.cocoon.serialization.XMLSerializer"
  pool-max="64" pool-min="2" pool-grow="2">

<doctype-public> -//WAPFORUM//DTD WML 2.0//EN </doctype-public>
<doctype-system> http://www.wapforum.org/dtd/wml20.dtd </doctype-system>
<encoding> iso-8859-1 </encoding>
</map:serializer>

```

[3.3] WML2 Serializer

3.3.2 XSL

HTML Cocoon2 XML

XSL(Extensible Stylesheet Language) WML2 [12].

XSL XML

. XSL 2 가 XML

(Transformation) , (Formatting Semantics)

. XSLT(XSL Transformations)

XPath(XML Path Language) XSL .

XML

XSL (Rule) XSLT template
 (Template Rule) (Construction Rule)
 <xsl:template> match (Pattern)
 <xsl:apply-templates>
 (Result Tree)
 XSL

■ (/)

```
<xsl:template match="/">
  <html xmlns="http://www.w3.org/1999/xhtml"
        xmlns:wml="http://www.wapforum.org/2001/wml" xml:lang="kr">
    <xsl:apply-templates select="html/frameset"/>
    <xsl:apply-templates select="html/body"/>
  </html>
</xsl:template>
```

[3.4] XSL

HTML XML XML (/) <html>
 <frameset> <body> <frameset>
 html

■ <wml:card>

```
<xsl:template match="div">
  <wml:card id="{@id}">
    <wml:do type="accept" >
      <wml:go href="#{@class}"/>
    </wml:do>
    <p><xsl:apply-templates/></p>
  </wml:card> </xsl:template>
```

[3.5] <card> XSL

가

<div> ,

</div>

<div>

가

<card>

■ <frameset>

```
<xsl:template match="frameset">
  <wml:card>
    <p>
      <b>FRAME </b>
      <xsl:apply-templates select="frame" />
      <xsl:apply-templates select="./frameset/frame" />
    </p>
  </wml:card>
</xsl:template>

<xsl:template match="frame" >

  <a href="{@src}">
    <xsl:apply-templates select="@src"/>
  </a>
  <b/>
</xsl:template>
```

[3.6] <frameset> XSL

. <frameset>

<card>


```

<frameset>
    <frame> <a href>
    <a href >

```

■ <select>, <option>

```

<xsl:template match="select">
  <select>
    <xsl:copy-of select="@id|@class|@xml:lang|@name|@tabindex" />
    <xsl:apply-templates select="option|optgroup" />
  </select>
</xsl:template>

<xsl:template match="option">
  <option>
    <xsl:copy-of select="@id|@class|@xml:lang|@title|@value" />
    <xsl:apply-templates select="text()|onevent" />
  </option>
</xsl:template>

```

[3.7] <select> <option> XSL

■ <a>,

```

<xsl:template match="a" >
  <a href="{@href}">
    <xsl:apply-templates/>
  </a>
</xsl:template>

<xsl:template match="img" >
  
</xsl:template>

```

[3.8] <a> XSL

3.4

가

가

가

WML2

[14].

3.4.1

WML2

HTML

URL

,

WML2

가

,

WML

HTML

HTML

가

HTML

가

WML2

,

HTML

WML2

WML

가

가

,

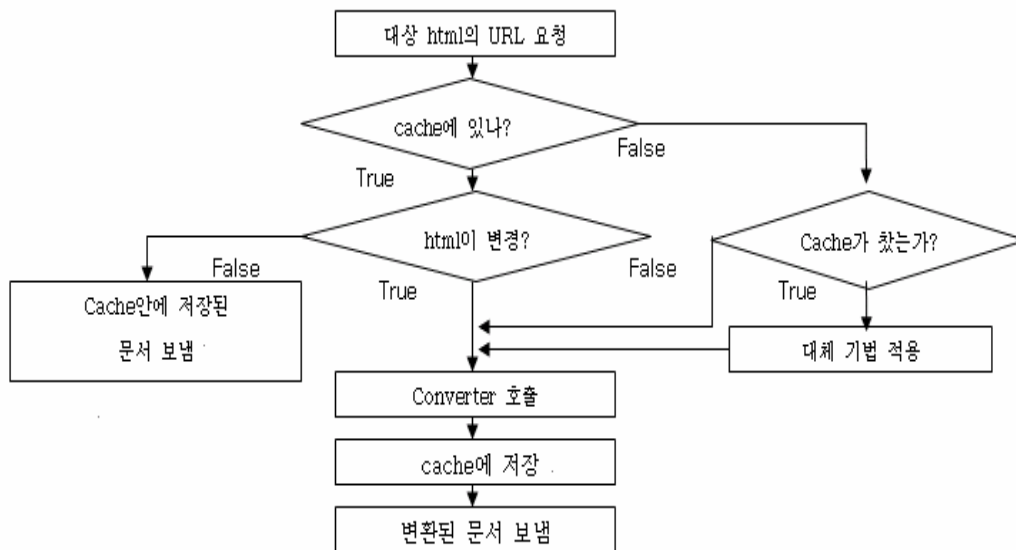
WML

,

,

WML

[3.9]



[3.9]

3.4.2 Mapping Table

| Mapping Table | WML2 |
|---------------|--------|
| URL | WML2 가 |
| Mapping Table | HTML |

Mapping Table

- ID :
- URL : html URL
- Last_Modified_date : html
- Last_Date : hit

- **Converting_Time** :
- **Frequency_Count** : hit
- **Object_Size** : WML2

3.4.3

3.4.3.1

HTML WML2
 HTML Mapping Table
 Last_Modified_date HTML 가 .
 Last_Modified_date HTTP HTML 가
 . , Last_Modified_date
 . Last_Modified_date null

- Last_Modified_date null
 Mapping Table Last_Modified_date HTML
 Last_Modified_date ()
 WML2 , WML2 .

- Last_Modified_date null
 Mapping Table Last_Date
 WML2 . ,

HTML

3.4.3.2

LRU (Least Recently Used), LFU (Least Frequently Used), GDS(GreedyDual-Size), LFU_DA(LFU with Dynamic Aging), GDSF(GDS-Frequency)

Hit rate, CPU , GDSF

가 [15] GDSF

GDSF

```

L <- 0.0
for each request for object  $p$  do
  if  $p$  is in cache
    then  $H(p) <- L + f(p) * c(p)/s(p)$ 
    else while there is not enough free cache for  $p$ 
      do  $L <- \min\{H(q) | q \text{ is in cache}\}$ 
      Evict  $q$  which satisfies  $H(q) = L$ 
      fetch  $p$ 
       $H(p) <- L + f(p) * c(p) / s(p)$ 

```

- $F(p)$:
- $C(p)$: HTML WML2
- $S(p)$: WML2

IV.

HTML WML2 3

가

4.1

[4.1]

[4.1]

| | |
|------------|---|
| | Windows XP Professional |
| Web Server | Tomcat4.0.4 |
| | JAVA2 XSL(Extensible Style Sheet Language) |
| | Openwave SDK 6.2.2 |
| | Jbuilder 6 |

4.2

WAP2.0

(Openwave SDK 6.2.2)[16]

HTML

WML2

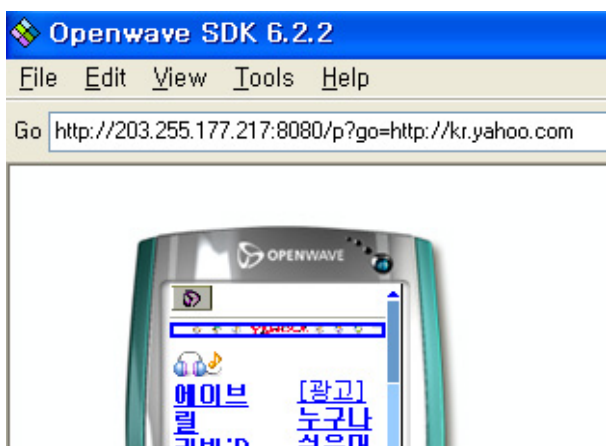
WAP

4.2.1 WAP

가

HTML WML2 [4.1]

- `http://` /p?go=`http://`



[4.1]

[4.2]

http://kr.yahoo.com , 38

accept OK 가

WML2 [4.3]



...

[4.2]


```

</table><table><tr><td/></tr><tr><td><b>      </b></td><td>
<a href="http://203.255.177.217:8080/p?go=http://kr.yahoo.com/r/p/ne">      </a>
<a href="http://203.255.177.217:8080/p?go=http://kr.yahoo.com/r/p/sp">      </a>
<a href="http://203.255.177.217:8080/p?go=http://kr.yahoo.com/r/p/we">      </a>

<wml:card id="card38">
<wml:do type="accept"><wml:go href="#card39"/></wml:do><pxmlns="">
<table><tr><td><table><tr><td>
<a href="http://203.255.177.217:8080/p?go=http://kr.yahoo.com/r/co/ad">
      </a>
<a href="http://203.255.177.217:8080/p?go=http://kr.yahoo.com/r/co/sp">
      </a>
<a href="http://203.255.177.217:8080/p?go=http://kr.yahoo.com/r/co/bi">
</a>
</html>

```

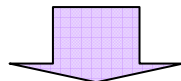
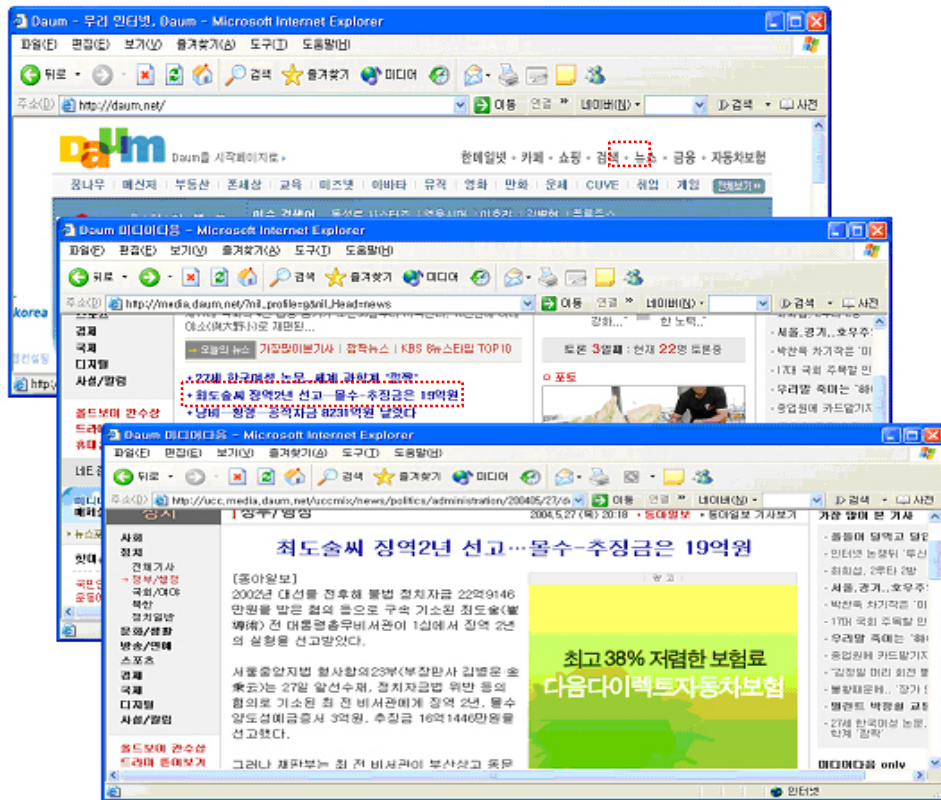
[4.3] WML2

●

[4.4]

WML2

http://daum.net

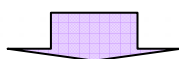
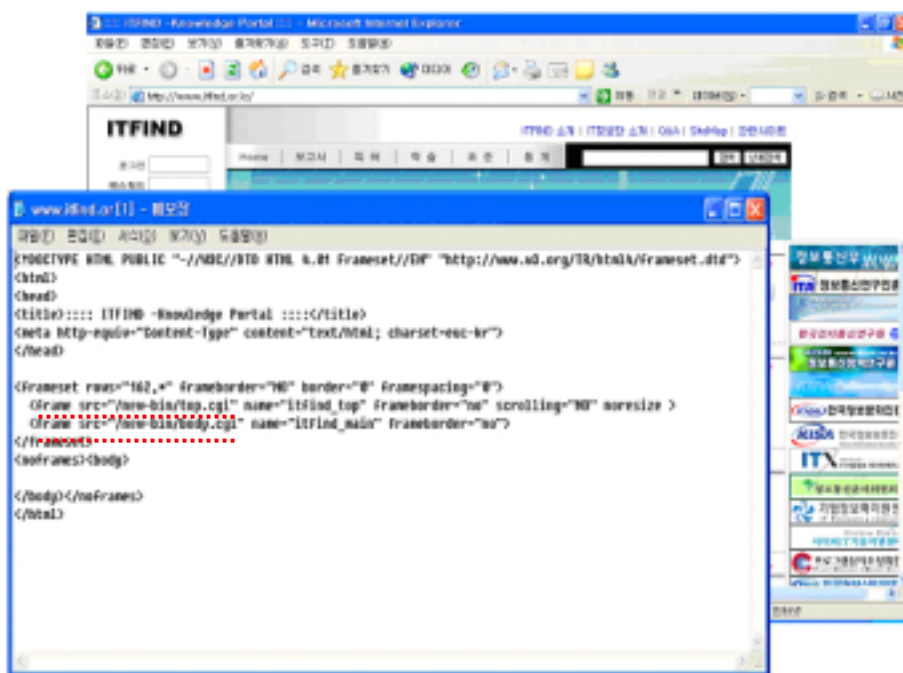


[4.4]

[4.5]

http://www.itfind.or.kr

body.cgi



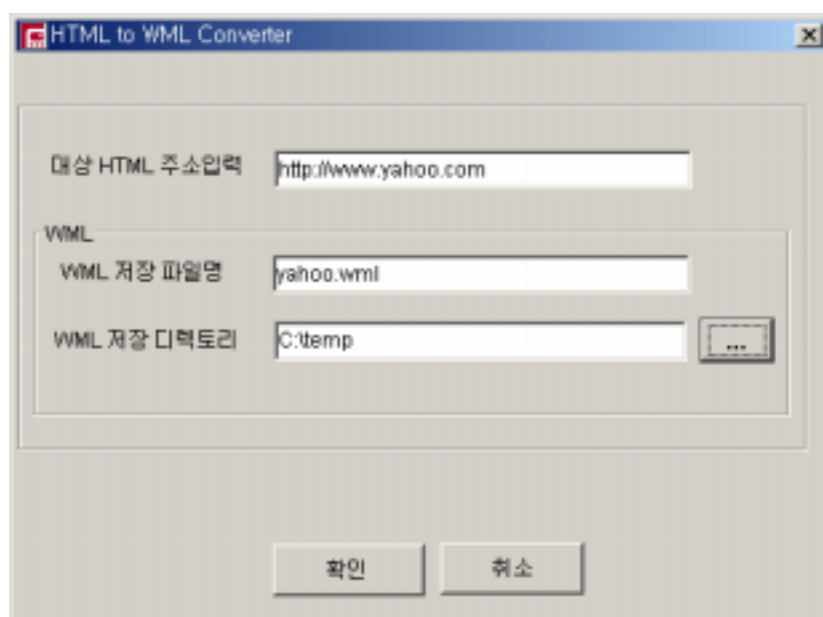
[4.5]

4.2.2 WAP

WAP

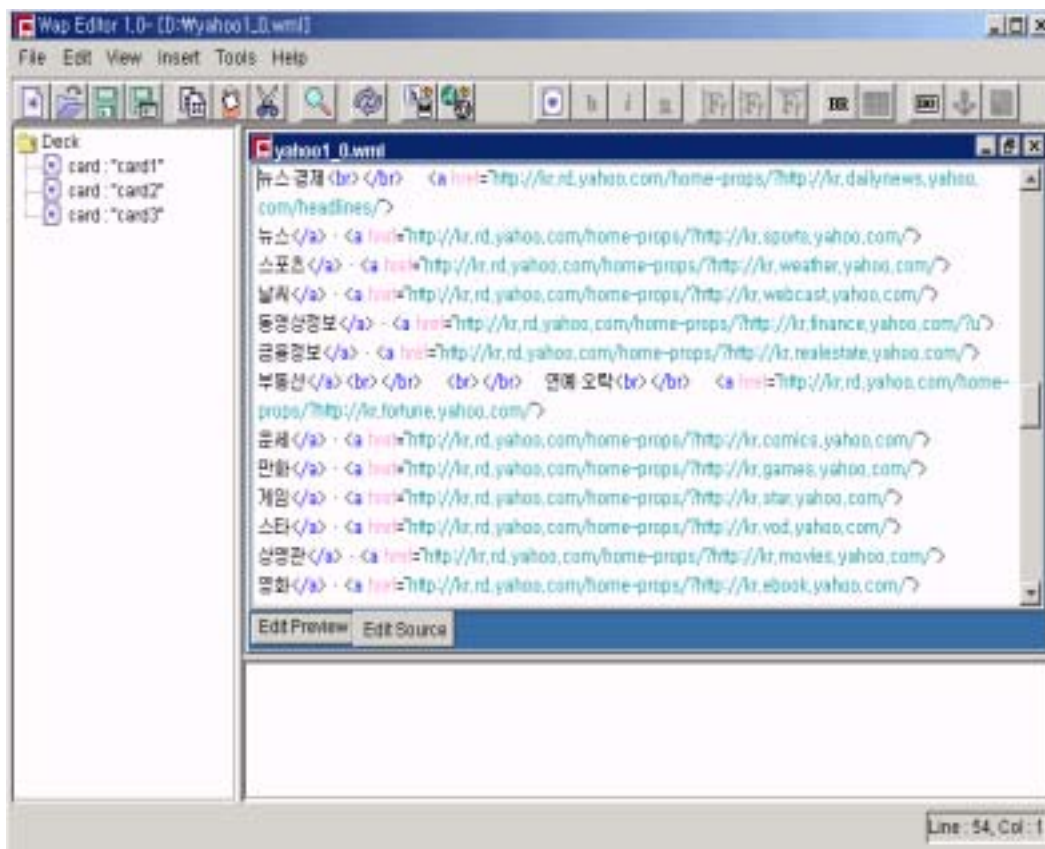
●

HTML



[4.6]

[4.7]



[4.7]

4.3 가

4.3.1

가 가 가
 [17].
 (, ...)

4.3.2 가

‘ / *100 ’
 [4.2]
 93%, / 가 87%, 가 100%, 가 85%
 91.2% .

[4.2]

| | | / |
|----------------------------------|------|------|
| http://www.yonsei.ac.kr | 31 | 100% |
| http://www.se-hwa.hs.kr | 1() | 100% |
| http://nowon.ms.kr | 26 | 100% |
| http://www.kaepo.es.kr/first.htm | 1() | 100% |

| | | |
|--|------|--------|
| http://www.hak1.net | 66 | 100% |
| http://www.ds.co.kr | 29 | 100% |
| http://www.ike.co.kr | 65 | 100% |
| http://www.kmobile.co.kr | 108 | 100% |
| http://www.drivingjoy.com | 60 | 100% |
| http://www.yoricook.co.kr | 1() | 100% |
| http://www.nanet.go.kr | 40 | 100% |
| http://www.moe.go.kr | 60 | 100% |
| http://www.e-hanja.co.kr/adult | 114 | 100% |
| http://www.seri.org | 40 | 100% |
| http://www.itfind.or.kr | 1() | 100% |
| http://www.shingu-c.ac.kr | 0 | 가 가 |
| http://www.kbs.co.kr | 67 | 100% |
| http://www.chosun.com | 31 | 100% |
| http://www.idaegu.co.kr | 24 | 100% |
| http://www.ohmynews.com | 142 | 97% |
| http://www.news.go.kr | 0 | |
| http://www.findall.co.kr | 59 | 100% |
| http://www.infomail.co.kr | 45 | 100% |
| http://ikissyou.com | 80 | 100% |
| http://www.hunet.co.kr | 35 | 100% |
| http://www.webpromotion2.com | 19 | 100% |
| http://www.linkprice.com /home/linkprice_home.htm | 18 | 100% |
| http://www.mra.co.kr | 51 | 100% |
| http://www.shinsegae.com | 123 | 100% |
| http://www.24mall.co.kr | 49 | 100% |

| | | |
|----------------------------|------|----------|
| http://www.daum.net | 24 | 100% |
| http://miznet.daum.net | 29 | 100% |
| http://www.ohcorea.com | 20 | 100% |
| http://www.metrixcorp.com | 19 | 100% |
| http://www8.jobkorea.co.kr | 1() | 100% |
| http://www.rankey.com | 0 | <body> 가 |
| http://www.arbi.co.kr | 183 | 100% |

IV.

가

, HTML

HTML

WAP2.0

WML2

HTML

WAP2.0

가

HTML

WML2

가

가

가

가

가

가 .

가

,

WML

.

.

- [1] Wapforum, Wireless Application Protocol WAP2.0 Technical White Paper, January 2002,
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ABSTRACT

Design and Implementation of a WML2 Converter for Automatic Generation of Wireless Internet Content

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Wireless internet presents major new challenges for computer science. The traditional hardware upon which a lot of concepts are based is no longer used. Instead tight restrictions on bandwidth, processing ability, power consumption; rendering and integrity mean new ideas must be developed to harness its potential.

In order to present wireless Internet users with previously created HTML contents and

applications, it is essential to research and develop the technology to efficiently convert HTML documents into WML documents.

This paper describes the design and development of a WML2 converter. The WML2 converter can convert HTML pages in real-time into WML2 documents that are suitable for the WAP environment. This converter investigates the problems associated with the conversion process and presents a solution through the design and implementation of a piece of conversion software. These tools enable the previous services based on HTML documents to be easily adapted to the wireless environment.