Mobile Detection Algorithm in Mobile Device Detection and Content Adaptation

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Abstract: This paper describes several approaches in the development of mobile web sites, including the concept of detection and adaptation for mobile content. A mobile site lacking optimization can lead to prolonged downloading of data as well as difficulties with browsing. For that reason, we need to optimize web content on such sites. Our research was conducted to determine the most adequate and most effective detection technique. This technique was then used in the development of the Mobile Detection Algorithm Based on Tera-Wurfl (MDABTW). The MDABTW algorithm is based on the Tera-Wurfl library and allows for the generation of web content in several markup languages. The basic principles of how this algorithm works are described in this paper. The MDABTW algorithm was further implemented in the regional mobile CMS, called Mobko, which is the main part of an integrated health IS providing counseling and education services for youth in the Subotica region.

Keywords: mobile web sites; mobile device detection; content adaptation; mobile algorithm

1 Introduction

The Web has revolutionized the way we interact, as well as how we collect and publish information. Until recently, web content was available only to desktop users. With the advent of mobile technology and with the proliferation of mobile devices featuring Internet access, the global availability of information has exploded. Standard (2G) mobile phones and smart phones (3G) have advanced so rapidly that nowadays even an entry level mobile phone allows for Internet access of some kind. This situation opens up a whole new arena for web content that has been adapted specifically for mobile devices [7].

Today, increasing numbers of people access the Internet via their mobile device instead of a PC. The number of mobile devices in use has already surpassed the number of personal computers. It is estimated that the difference between these two numbers will only increase in the years to come [9].

The first problem that can occur when creating a mobile web site is how to distinguish between mobile users and desktop users.

2 Mobile Web Sites and the Problem with Content

Most often we have seen that there is no optimization and adaptation of existing sites or new sites for mobile users. The web content might be too wide to fit the screen of mobile device – user equipment (UE). Font size can also be problematic, being too small or too large to read on UE easily. If the web content also includes images, it is uncertain whether those can be displayed correctly, if at all. The same applies to multimedia files, which frequently cannot be viewed on mobile devices. Often, web pages that have been initially designed for desktop computers are too encumbered with content, so they are practically unsuitable for users accessing them via mobile devices.

Creating content for mobile devices has some specific restrictions imposed by the limited resources on the UE, including: a small size screen, limited wireless bandwidth, small data storage capacity and processing power, and a limited number of keyboard buttons to be used for web navigation. Sites designed for mobile devices should deliver content that is tailored to the characteristics of the accessing device. In order for a mobile content to load faster, they should be adapted and formatted, taking into consideration both the users' needs as well as the capabilities of mobile devices.

Mobile web sites can be created by using several technologies (e.g. WML, HTML, and XHTML MP). Existing mobile devices have different levels of support for these technologies, and for this reason, the creator of a mobile web site should create multiple versions of the web site. This means that the developer should be very familiar with all the required technologies in order to implement them properly. This could be an issue as it requires additional investment in development and learning.

3 Content Adaptation

Content adaptation, which is sometimes also called multi-serving, is the delivery of content based on the capabilities of the access device.

Detection, adaptation and support for multiple devices have historically been a painful point in design and development of mobile content. Although there are several strategies and techniques available to tackle this problem, each of them use in some form the DAD (*Detect Deliver Text*) mode. This mode includes:

1 Detection

2 Adaptation

3 Deliver

Different techniques are used for the adaptation, including the detection, redirection, set up of correct MIME types, the changing of links, and the removal or scaling graphics. The LCD method (or the "Lowest Common Denominator") establishes a minimum set of characteristics which are expected from the mobile device. Web content is then developed by following such guidelines. The minimal set of features is also called DDC (Default Delivery Context) [4].

Adaptation in accordance with the capabilities of accessing mobile device is an ideal solution for the delivery of mobile content. At the same time, most programmers prefer to first start with the LCD approach before going into adaptation. The reasons for this are many. Adaptation involves additional costs and complexity. It also requires changes on the server side to detect and deliver content in a tailored manner, which cannot be accomplished for all device types. However, the LCD method can be sufficient in the case of a limited use of mobile content [4].

Based on the paper by Adzic, Kalva and Furht [1], there are three possible levels at which the adaptation can be performed: 1) at the server which hosts web content; 2) at the intermediary proxy server; 3) and at the client side (i.e. UE). The main difference among the three lies in what supplies the content, and what the content is [12].

Server-side adaptation involves committing additional resources and software on the server that stores content for delivery. The main advantage of this approach is that the content at every web page can be converted and tailored for the specific needs of a receiving mobile device.

The proxy server or intermediary adaptation is performed between the server (content provider) and the mobile client (content consumer). It can be implemented by the content provider or by the third party device [1]. However, this form of adaptation is usually outside of your control.

In the client-side adaptation, the user can define preferences and determine the type and scale of the adaptation process [1]. Client side adaptation usually relies on using the media selectors associated with CSS (Cascading Style Sheets). While this can be a useful form of adaptation, it is limited. The mobile browser downloads the same XHTML markup as the desktop browser, which might unnecessarily consume the user’s air time and consequently cost for the content that ends up not being displayed [5].

The following section of this paper will present several approaches in the development of mobile sites.

3.1 Approaches in Mobile Development

In the development of mobile web sites, there can be defined several approaches:

a) Do nothing
b) Remove formatting
c) Filter media
d) Find the target device - redirection
e) Implement the full detection and adaptation

Some of them use some kind of adaptation which is executed at different levels (i.e. server side, client side or at the intermediary proxy server).

3.1.1 Do Nothing

The first approach is still used for many sites because the site owner or developer does not fully understand the significance of mobile-oriented content or prefers to wait until the UE technology is mature enough to handle their web site as is. In other words, the web content gets published only once, whereas the mobile device is expected to be smart enough to handle it and display web pages as appropriate. The most important adjustment techniques are adopted in the Opera's Small Screen Rendering (SSR) system, used for the new Apple iPhone and Nokia Browser, which provides very good results. The new generation of mobile phones have web browsers which attempt to optimize the web content on the UE in real time. Often it only involves reducing the page views without reducing actual download time, thus contributing additional (and unnecessary) cost to the user.

The issue with this approach is that it does not work for standard (2G) non-smart phones, which do not have web browsers capable of optimizing content in real time. Considering that large number of users who still have regular mobile phones, this approach will deprive them of getting proper information. Even smart phone users, with browsers featuring optimization in real time, can sometime give up on accessing classic web sites because the site is either just not functional enough or has pure navigation system with does not allow for the easy finding of the desired information. In this approach the transcoders are often used to reformat the content of classical sites and transform them into a more mobile “friendly” version.

When to use this approach

- If you do not expect too many mobile visitors to your web site
- If the majority of your users are using smart phones or other devices featuring large screens and an optimized web browser
- If people want to use your website in exactly the same way as used via PC, (i.e. no need for mobile-specific features)
- If you do not have time or resources to implement another method(s)
- If you do not have sufficient expertise to include multiple technologies in your development

When not to use this approach

- If you want to reach the maximum number of potential visitors to your site
- If mobile users visiting your site have ~~a~~ specific task they want to accomplish quickly and efficiently
- If you want to provide the best browsing experience for mobile users

3.1.2 Remove Formatting

One of the biggest problems for mobile browsers is to parse the HTML code and page layout. Complex formatting rules mean more computer operations that may be a challenge due to UE limitations in regards to processor and memory. Most mobile web users pay for service on the basis of downloaded data in kilobytes; therefore large HTML pages and images will not be a good solution. If you remove the formatting from the page layout, including all images, the mobile user will get text and links only.

When to use this approach

- If you want a quick way to create a mobile version of your web site
- If you want to cover the majority of mobile browsers
- If your site features mostly textual content and has good navigation structure

When not to use this approach

- If your site features good user interface design
- If the site content is not very useful for mobile users

3.1.3 Filter Media

If you want to use the same XHTML site for both desktop and mobile devices, the solution is to change the site design and format related pages by using a CSS file. The CSS standard enables you to create multiple styles for each document, taking into account that site content might be displayed on various types of media. This approach involves creating two or more versions of CSS files and using those as media attribute to generate corresponding pages.

When to use this approach

- When you are confident that the access devices fully support the filtering of media
- When you make a mobile website that is dedicated to a specific group of users who have devices with the possibility of filtering media
- When you are familiar only with the client side of internet technologies

When not to use this approach

- When you are not sure whether all access devices support the filtering of media
- When you create a mobile web site that is expected to draw a large number of visitors with different types of phones

3.1.4 Find the Target Device – Redirection

This approach uses a detection technique to find the type of target device. Specifically, it tries to decide if the user is accessing the web site via a mobile device or via computer. If the detection is successful, the user is redirected to the appropriate version of the site (mobile or desktop). An enhanced version of this strategy involves the detection of supported Markup Language.

When to use this approach

- If you only need to determine whether the user accesses you site via mobile devices or desktop computers
- If it is not necessary to create content that is fully optimized for the characteristics of the accessing device
- If the user provides multiple choices to select the mobile version of the site because it does not detect the preferred hypertext markup language

When not to use this approach

- If you create a site whose content partly needs to be optimized for the features of the device
- If it is necessary to determine the preferred hypertext markup language

3.1.5 Implement the Full Detection and Adaptation

This approach requires adaptation in the framework by taking into consideration several related variables. Firstly, it requires the detection of the user agent and its characteristics. This is usually determined by:

- Preferred markup language
- Screen size in pixels
- The existence of the touch screen
- Support for certain graphics formats
- Support for certain multimedia files and Java
- Support for styles

Based on the detection of the preferred language and UE features, the user gets redirected to the corresponding site version. In this strategy, you need to create multiple versions of your site. In the event that the detection of the preferred markup language has failed or the user wants to switch to a different version of your site, the option should be provided for selecting the language for content generation.

When to use this approach

- If you want to create a site which fully supports the features of access device
- If you do expect a large number of visitors to your mobile site
- If you do not have to worry about the resources on your server

When not to use this approach

- If you have limited resources on your server
- If you have no need for partial or full optimization

3.2 Header of Request

A request header sent from the mobile browser to the web server has many attributes defined by the reader in the case of direct client-server communication (i.e. without using any proxy, gateway or a transcoder). Some of the headers that may be useful are listed in Table 1.

Table 1
Listing of useful headers

User-Agent	Name of browser, user agent or platform from which the request originates
Accept	Comma separated values (CSV) which are MIME types that are supported by user agent.
Accept-Charset	Specifies the character set that supports the user agent.
Accept-Language	Contains information about the supported languages in the user agent
X-wap-profile and Profile	Provides information about the UAProf (User Agent Profile) XML file that is unique to each device.

3.2.1 User Agent

The user agent is a client application that implements the network protocol used in the client-server communication. It typically contains a series of different information, from which can be identified: which device is used, on what operating system it is based, what version of software is running, who the manufacturer is, and what type of content the device is able to read. The format of information differs between manufacturers of mobile devices.

The User-Agent header is useful in the following situations:

- If we need to identify specific models of mobile devices.
- If we need to distinguish between mobile devices or user agents from different companies.
- If we need to determine whether the user agent browser to your desktop computer or a mobile device microreaders.

3.2.2 UAProof

The UAProf (*User Agent Profile*) is a standard defined by the *Open Mobile Alliance* (OMA, earlier WAP Forum). It provides information on UE capabilities in the form of an XML file which the server can access via the Internet. After this file has been uploaded onto server, it must be parsed in order to retrieve the desired information. The drawback of the *UAProf* specification is that many older devices do not support it. In addition, it can slow down the content generation on the server side as each application must retrieve and parse the XML file separately in order to obtain the pertinent information. A possible solution to speed up this process could be to store partial contents of the file in a database, after its initial upload, or to save the file local copy on the server [9].

3.2.3 WURFL

The WURFL (*Wireless Universal Resource File*) is a wireless universal resource file or an XML file that is regularly updated with information on mobile devices. It contains information on virtually all mobile devices that currently exist, and all their options. Practically, this file is a collection of a large number of UAProf files.

4 A Survey for Detection Techniques

As mentioned in Chapter 3, there are several ways to carry out the detection of an access device. Most of these detections can be classified into two general categories: a) detection using only information from the HTTP headers; and b) detection using the WURFL file. For the purpose of our research, we utilized both methods, namely:

1. The so-called "Simple detection"
2. Detection by using the Tera-Wurfl library.

For "Simple Detection" we used PHP script, which makes a distinction between computers and mobile devices by comparing the user agent data and values from HTTP headers with specific text values. This technique also determines the preferred hypertext markup language.

The advantages of this technique include:

- No installation process
- There is no need for a database
- Takes up less space on the server
- Fast execution time

The disadvantages of this technique are:

- Relatively poor accuracy
- No community that contributes to the development
- Limited set of functions to detect more capabilities
- Inability to complete the adaptation

Tera-Wurfl is a PHP- and MySQL-based library which uses WURFL to detect the individual features of mobile phones. The advantage of Tera-Wurfl over other systems for detection is that it relies on a database to find the best matching mobile phone. Tera-WURFL loads the data from the WURFL file into a MySQL database for faster access and uses it to determine which device is the most similar to the one requesting your content. The library then returns the capabilities associated with such device to your scripts via PHP associative array. In our research we used the WURFL with 29 groups featuring a total of 531 capabilities.

Tera-WURFL takes the requestor's user agent and puts it through a filter to determine which UserAgentMatcher to use. Each UserAgentMatcher is specifically designed to best match the device from a group of similar devices based on the Reduction in String and/or the *Levenshtein Distance algorithm*.

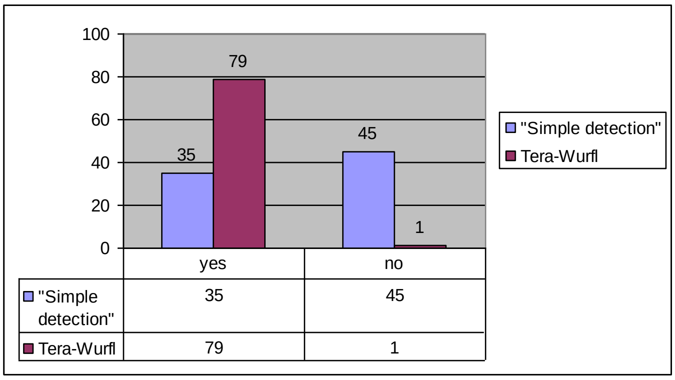
The advantages of this technique are as follows:

- High performance
- Accurate detection of mobile devices
- Fast detection of desktop vs. mobile devices
- Possibility of full adaptation

The disadvantages of this technique are:

- Need for a database
- Requirement for more space on the server

Our survey involved 80 students. This survey was conducted at Subotica Tech in the period from November to December 2010. Each student was given access to web pages on a server via his mobile phone. One page used the "Simple Detection" technique and the second used detection based on the Tera-Wurfl library. The aim of this research was to check how exact these two detection techniques compare. The results are shown below.



	yes	no
■ "Simple detection"	35	45
■ Tera-Wurfl	79	1

Figure 1
Result of accuracy of detection methods

Based on these results, it can be seen that the detection technique using the Tera-Wurfl library is more accurate and more suitable for implementation in mobile development.

5 Mobile Detection Algorithm Based on Tera-Wurfl (MDABTW)

The current research results described in Section 4 demonstrate that the Tera-Wurfl technique is the better one for detecting the characteristics of accessing devices. This library includes a large amount of data for each of the mobile devices, which is contained in the WURFL file.

The Tera-Wurl library also contains an optimizer for the WURFL file. The Optimizer is a very useful feature since, based on the selection of certain characteristics, it can reduce the file and database size, reduce the occupancy of space on the server and speed up the process of detection. In addition to optimization, device detection also requires the selection of significant device characteristics to be utilized for detection. For that purpose, we have developed the Mobile Detection Algorithm Based on Tera-Wurfl (MDABTW) algorithm. The MDABTW is an algorithm for the detection of mobile devices based on Tera-Wurfl library. It allows for the detection and generation of mobile content in WML, XHTML MP and XHTML languages, using WAP CSS or CSS as needed.

In this algorithm, web sites for mobile devices are divided into four groups: simple web sites – *SIMPLE*, multimedia web sites – *MULTIMEDIA*, dynamic web sites – *DYNAMIC* and integrated web sites – *INTEGRATED*.

We have implemented this algorithm in the mobile CMS called Mobko. Mobko plays a key role in an integrated model for mobile learning in the health information system and counseling services for youth in Subotica region.

The algorithm works as outlined in Fig. 2. After a visit to the website, the processing of the request is started by detection of accessing device. For this purpose we used user agent data. In the event that the access device is not a mobile device, it generates content for the standard web site, using XHTML language and CSS technique. In the case that the access device is mobile device, the MDABTW algorithm starts with one of subprograms. Which subprogram will be used depends on the chosen model of web site and the mobile web site group.

Every group has associated subgroups. Subgroups vary based on the application of certain elements. These groups differ according to the type of content that is delivered and the manner of interaction with the user.

For detection, the same procedure is used for each of the above groups. However, in the subsequent process of the adaptation and generation of web content, some special actions are taken based on the customized WURFL file containing the essential features. As mentioned earlier, the WURFL file used in the current case contained 29 groups with a total of 531 capabilities. This constitutes a large amount of information. For faster detection, it is better to use and optimize only the characteristics that are important for the kind of web site involved.

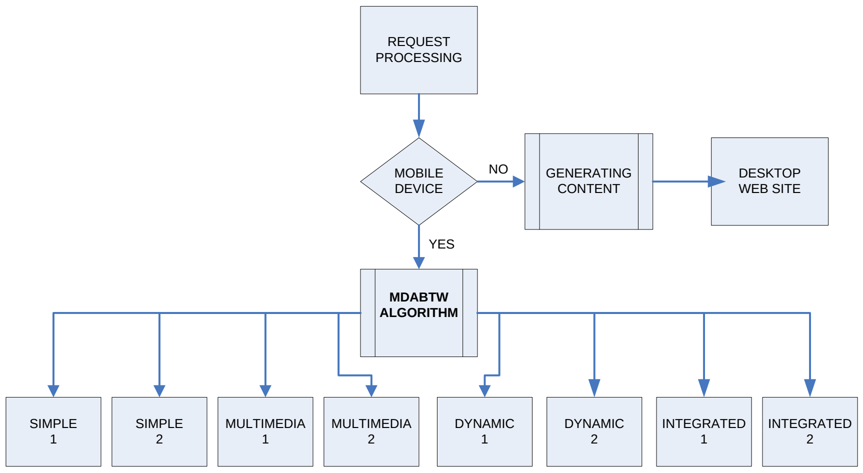


Figure 2
Detection process schema

Table 1
Short description of subprograms

Subprogram	**Description**
Simple1	Handles web sites with static content only.
Simple2	Handles web sites with static content and supports the use of web forms.
Multimedia1	Handles static web sites with multimedia content.
Multimedia2	Handles web sites with multimedia content and web forms in it.
Dynamic1	Handles dynamic web sites where the content is generated based on the data from database.
Dynamic2	Handles dynamic web sites where the content is generated based on the data from database and supports use of web forms.
Integrated1	Handles web sites which have multimedia and dynamic content.
Integrated2	Handles web sites which have multimedia and dynamic content and supports the use of web forms.

For each type of website, the detection process identifies only the selected capabilities which are site-specific rather than being group capabilities. However, there are also situations when the detection process needs to identify group capabilities as well.

These are the groups of capabilities used in the algorithm:

- Product_info (PI)
- Playback (P)
- Wap_push (WP)
- MMS (M2)
- Display (D)
- Image_format (IF)

- Wml_ui (WU)
- Xhtml_ui (XU)
- Html_ui (HU)
- Streaming (S)
- Css (C)
- Markup (M)
- Bugs (B)
- Object_download (OD)
- Sound_format (SF)
- Ajax (A)

Table 2 provides an overview of the subprograms and capability groups where F indicates when "Full", P indicates when "Partial" detection is done and the sign "-" indicates that this group is not used.

Table 2
List of capability groups and subprogram

	Capability group															
Subprogram	**PI**	**P**	**WP**	**M2**	**D**	**IF**	**WU**	**XU**	**HU**	**S**	**C**	**M**	**B**	**OD**	**SF**	**A**
Simple1	P	-	-	-	F	P	P	P	P	-	P	P	-	-	-	-
Simple2	P	-	-	-	F	P	P	P	P	-	P	P	P	-	-	-
Multimedia1	P	F	F	F	F	F	P	P	P	F	P	P	-	F	F	-
Multimedia2	P	F	F	F	F	F	P	P	P	F	P	P	P	F	F	-
Dynamic1	P	-	-	-	F	P	P	P	P	-	P	P	-	-	-	F
Dynamic2	P	-	-	-	F	P	P	P	P	-	P	P	P	-	-	F
Integrated1	P	F	F	F	F	F	P	P	P	F	P	P	-	-	F	F
Integrated2	P	F	F	F	F	F	P	P	P	F	P	P	P	F	F	F

5.1 Description of Subprogram

The Simple1 subprogram works based on the following principles:

1. Firstly, the device pointing method is detected, which means that the access device can be either a phone with a touch screen or a standard mobile phone without touch screen. This information is very important because it drives the design of the complete navigation structure for a web site.

2. The next step is to use an appropriately optimized WURFL file for the detection of the device's capabilities. This includes the preferred markup language, DTD (Document Type Definition) and MIME type.

3. If the access device is a standard mobile phone without a touch screen, after the capabilities detection in point 2, the algorithm checks if the preferred markup language is WML. This step is missing in mobile devices that have touch screens because these phones in most cases do not support the WML language and the performance of these phones impose a need to create richer content.

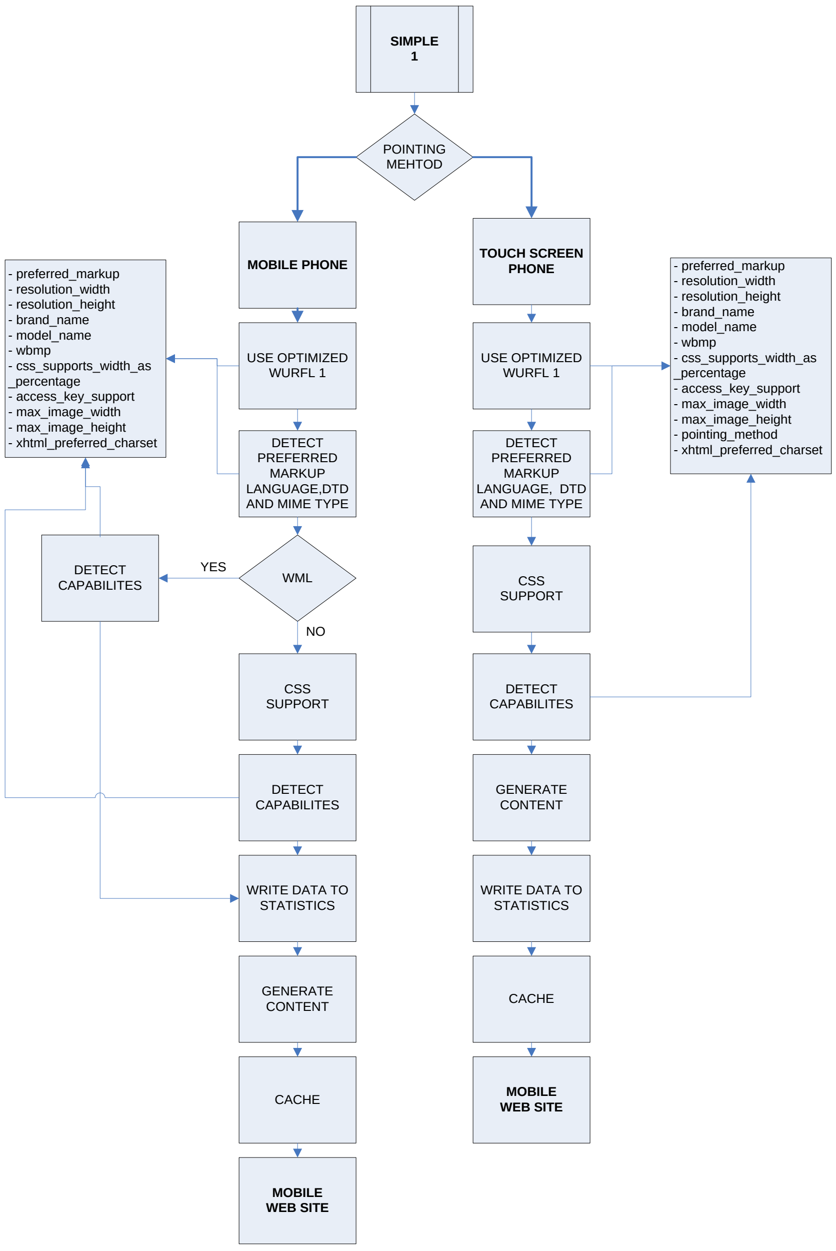


Figure 3
Working schema of Simple1 subprogram

4 If these data are related to the WML language, there is no need to determine support for the CSS as WML does not support it. After that, the capabilities that are necessary for WML content generation are considered detected.

5 In the case when detected data do not belong to WML, the CSS support is important since, based on that, the device capabilities are detected.

6 After detection, data are written in the database for statistics and the optimized content of the web site is generated. The optimized content could be generated in any of three versions: WML, XHTML or XHTML MP.

7 The generated site is saved in the cache memory for faster access next time

8 Finally, the user is provided with access to the optimized mobile web site.

Simple2 subprogram differs from the Simple1 in regard to the detection of input masks as well as some other capabilities that are significant for the use on web forms. The other subprograms work like the Simple1 subprogram but the main difference lies in the characteristics that are detected.

5.2 Configuration and Implementation

The configuration file *TeraWurflConfig.php* needs to be set properly in order to use one of the chosen subprograms. The following parameters are the most important ones:

```
public static $WURFL_FILE = 'wurfl-integrated2.xml';

public static $LOG_FILE = 'wurfl-integrated2.log';
```

The first parameter contains the name of the optimized WURFL file while the second parameter is a log file for this WURFL file. These settings are enough when installing the system according to the tutorial and updating WURFL database from the local optimized WURFL file. After the initial installation, there is the possibility to update the WURFL database with the latest version of this xml file from the internet. As the optimized files are used in the algorithm, one does not want to update and insert all data of the WURFL file from internet, just the essential characteristics for every subprogram. For that purpose, a $CAPABILITY_FILTER variable within the *TeraWurflConfig.php* configuration file should be set. This variable is of the array type. It is possible to set complete capability groups or individual capabilities in this variable. To this end, every subprogram configures the specific parameters in a different way.

In the following code, the settings for the *Simple1* subprogram are shown.

```
public static $CAPABILITY_FILTER = array(
"pointing method",
"model name",
"is_wireless_device",
"brand_name",
"wml_make_phone_call_string",
"access_key_support",
"xhtml_preferred_charset",
"xhtml_avoid_accesskeys",
"xhtml_make_phone_call_string",
"xhtml_display_accesskey",
"xhtmlmp_preferred_mime_type",
"css_supports_width_as_percentage",
"preferred_markup",
"max_image_width",
"resolution_height",
"resolution_width",
"max_image_height",
"jpg",
"gif",
"wbmp",
"png",
);
```

With these parameters, TeraWURFL allows one to store only the specified capabilities from the WURFL file.

The following code presents the usage. First the session is started, then the important files are included. In the next step, the instance of the Tera-WURFL object is created, and data from the HTTP_USER_AGENT header is received. This data helps to determine if the user comes with mobile device (is_wireless_device) or not. If not, the program redirects the user to a non-mobile version of the page. If the user agent is a mobile device, the associative array $_SESSION['d_c'] is set and the relevant characteristics for the used subprogram are detected and put in it. This array contains only the characteristics that are important for the generation of the web page layout and they are available in the whole web page due to the use of session variable.

```
// start the session
session_start();
// include the necessary files
include("include/config.php");
include("include/functions.php");
// include the Tera-WURFL file
require_once('../../Tera-Wurfl/TeraWurfl.php');
// Instantiate the Tera-WURFL object
$wurflObj = new TeraWurfl();
// Get the data from HTTP_USER_AGENT header
$ua = $_SERVER["HTTP_USER_AGENT"];
// Get the capabilities from the object
$matched = $wurflObj->getDeviceCapabilitiesFromAgent($ua);
if(!check_session_variables())
{
if(!$wurflObj->getDeviceCapability("is_wireless_device")){
        header("Location:../index.php");
        exit();
}
//Get device capabilities
$_SESSION['d_c']=array();
$_SESSION['d_c']['pointing_method'] = $wurflObj-
>getDeviceCapability("pointing_method");
...
```

5.3 Testing the Algorithm in Practice

To test the MDABTW algorithm, it was used in an integrated learning system within youth counseling in Subotica. Figure 5 show the results of this algorithm implementation for two types of commercial handsets. On the right side there is the screenshot of the Nokia E51 phone (featuring a standard - non-touch screen) whereas the left side contains the screen shot of the Huawei U8110 phone (with touch screen option). These 2 phones differ in many aspects, including: preferred markup language, DTD, markup MIME type, screen size, pointing method, etc. Despite all these differences, Fig. 5 clearly demonstrates the complete success of the *MDABTW* algorithm at work. Namely, the process involving device detection and generating optimized content with the graphic files and text.

The most significant form of successful implementation of the algorithm is in the reduction of the size of the WURFL file and the MySQL database and the reduction in the size of the optimized web content. The size of the non-optimized WURFL file is 16 MB. After data entry from this file to the database, the MySQL database takes up 29 MB of space on the server. Table 3 presents the results of the reduction with the use of the MDABTW algorithm in every subprogram.

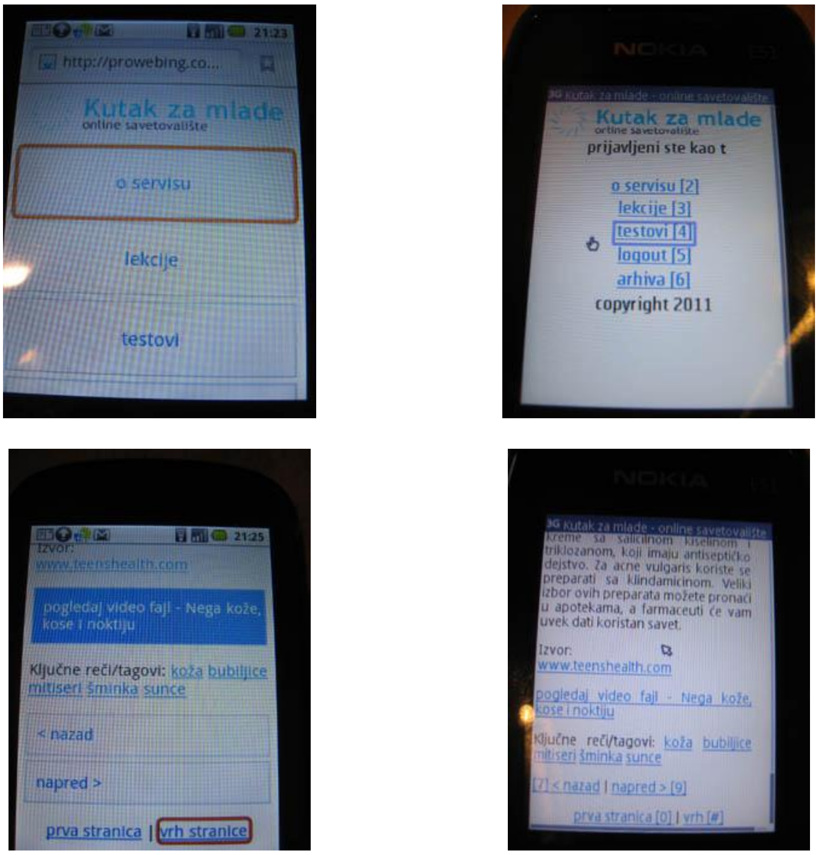
Table 3
Results of reduction with the use of MDABTW algorithm

Subprogram	Size of optimized WURFL file	Size of used MySQL database	Reduction of WURFL file in percentages	Reduction of MySQL database in percentages
Simple1	5.58 MB	17.2 MB	67%	41%
Simple2	5.62 MB	17.2 MB	66%	41%
Multimedia1	12.80 MB	21.3 MB	24%	27%
Multimedia2	12.91 MB	21.4 MB	23%	26%
Dynamic1	5.66 MB	17.2 MB	66%	41%
Dynamic2	5.7 MB	17.3 MB	66%	41%
Integrated1	12.99 MB	24.2 MB	23%	17%
Integrated2	13.03 MB	24.3 MB	22%	16%

Applying the MDABTW algorithm reduces the size of the generated files that are delivered to the client. The following table presents the size of the files generated for different access devices with different characteristics

Table 4
Size of optimized web content for different user agents with the use of MDABTW algorithm

	index.php	servis.php	lekcije.php	testovi.php	login.php	arhiva.php
Web browser	1296 KB	1295 KB	1264 KB	1295 KB	-	1299 KB
NokiaE51	8.3 KB	8.7 KB	9.8 KB	11.3 KB	8.5 KB	50 KB
Huawei U8110	10.4 KB	9.8 KB	12 KB	13.8 KB	9.7 KB	52.1 KB


21:23
http://prowebing.co...
Kutak za mlade
online savetovalište
o servisu
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NOKIA
Kutak za mlade - online savetovalište
Kutak za mlade
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copyright 2011
21:25
Izvor:
www.teenshealth.com
pogledaj video fajl - Nega kože, kose i noktiju
Ključne reči/tagovi: koža bubuljice mitiseri šminka sunce
< nazad
napred >
prva stranica | vrh stranice
NOKIA
Kutak za mlade - online savetovalište

kreme sa salicilnom kiselinom i triklozanom, koji imaju antiseptičko dejstvo. Za acne vulgaris koriste se preparati sa klindamicinom. Veliki izbor ovih preparata možete pronaći u apotekama, a farmaceuti će vam uvek dati koristan savet.

Izvor:
www.teenshealth.com
pogledaj video fajl - Nega kože, kose i noktiju
Ključne reči/tagovi: koža bubuljice mitiseri šminka sunce
[7] < nazad | napred > [9]
prva stranica [0] | vrh [#]

Figure 5

Algorithm in practice – optimized content for HuaweiU8110 and Nokia E51

Conclusions

This paper describes several approaches for the development of mobile web sites, including the concept of device type detection and content adaptation. Many web pages that have been originally designed for desktop computers are currently too encumbered with content, which makes them practically unsuitable for users accessing via mobile devices. For that reason, we need to optimize the content of such web sites. On the basis of our research, the appropriate detection technique was selected and used for creation of the *MDABTW* mobile detection algorithm. This algorithm utilizes the Tera-Wurfl library and allows for the generation of web content in WML, XHTML MP and XHTML languages, using WAP CSS or CSS as needed. Support for HTML5 and CSS3 can be easily incorporated into the *MDABTW* algorithm when these techniques become a widely adopted standard.

After initial testing and tuning, the *MDABTW* algorithm was implemented for the regional mobile CMS called Mobko – part of an integrated system for health counseling of young people in the Subotica region. This system includes the following: a) CMS Mobko; b) Web portal access to counseling services for the PC that enables viewing and downloading of educational materials and testing; c) Mobile version of the Internet portal for access to counseling services by mobile devices, where all content will be adjusted and optimized for the possibility of a user's mobile device; d) Stand-alone application for mobile phones allowing for training and testing in an on-line or off-line mode as well as for the SMS service used to distribute important information.

Our next goal is to investigate further the use of the mobile learning services within integrated IS and how it impacts the health education of the younger population, who are known to be technology savvy. The result of this planned investigation will be compared to other available theoretical and practical research results. In addition, we also plan to conduct several surveys intended to define guidelines for the future development and improvement of the existing *MDABTW* algorithm.

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