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(54) **WEB PAGE CONTENT TRANSLATOR**

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(51) **Int. Cl.**
*G06F 15/16* (2006.01)

(52) **U.S. Cl.** ..... **709/219**; 709/203; 709/217; 709/218; 709/226; 709/229; 709/232; 709/236; 707/10

(58) **Field of Classification Search** ..... 709/203, 709/217, 219, 227, 228, 230, 218, 226, 229, 709/232, 236; 707/10, 101; 379/88.02, 100.08
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,247,048 B1 * 6/2001 Greer et al. ..... 709/219
6,507,867 B1 * 1/2003 Holland et al. ..... 709/219
6,584,567 B1 * 6/2003 Bellwood et al. ..... 713/171
6,587,871 B1 * 7/2003 Schrader ..... 709/206
6,594,349 B2 * 7/2003 Fortman ..... 379/88.14
6,606,663 B1 * 8/2003 Liao et al. ..... 709/229
6,615,212 B1 * 9/2003 Dutta et al. ..... 707/10
6,654,786 B1 * 11/2003 Fox et al. ..... 709/203
2002/0087416 A1 * 7/2002 Knutson ..... 705/23

* cited by examiner

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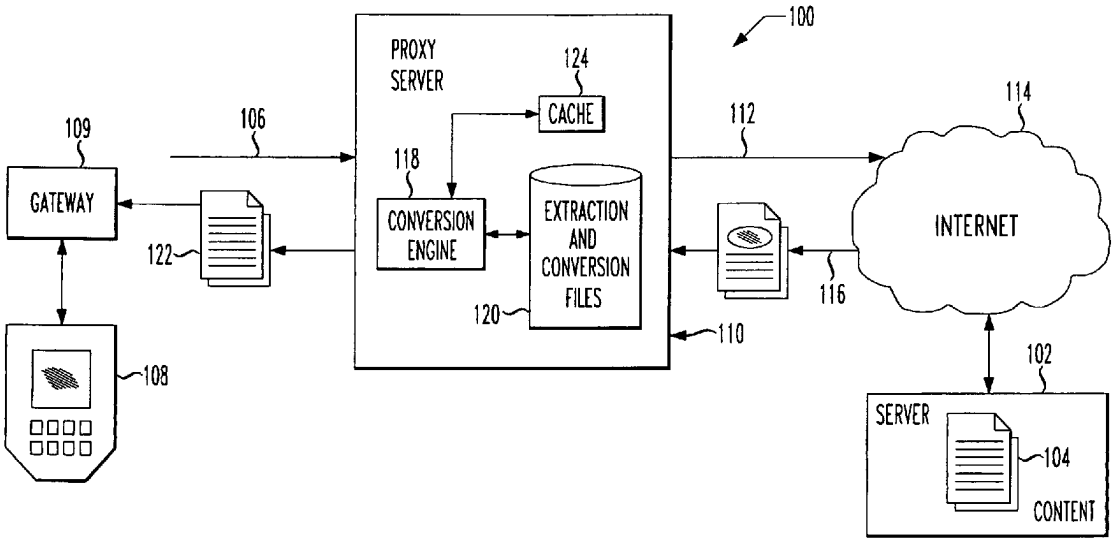
(57) **ABSTRACT**

A system, method, and computer readable medium for reformatting web content into a format readable on one or more mobile devices is provided. A user generates a user request for a web page from a mobile device to a proxy server. The proxy server forwards the user request to an origin web server, which returns the requested web page to the proxy server. A conversion engine within the proxy server extracts the desired content from the web page, and reformats the content in accordance with one or more predefined transform methods associated with the one or more mobile devices before transmitting the transformed web page with the desired content to the one or more mobile devices. Secure or unsecure connection provided via a decorated uniform resource locator can be used to connect a mobile device, the proxy server, and an origin web server.

**25 Claims, 11 Drawing Sheets**



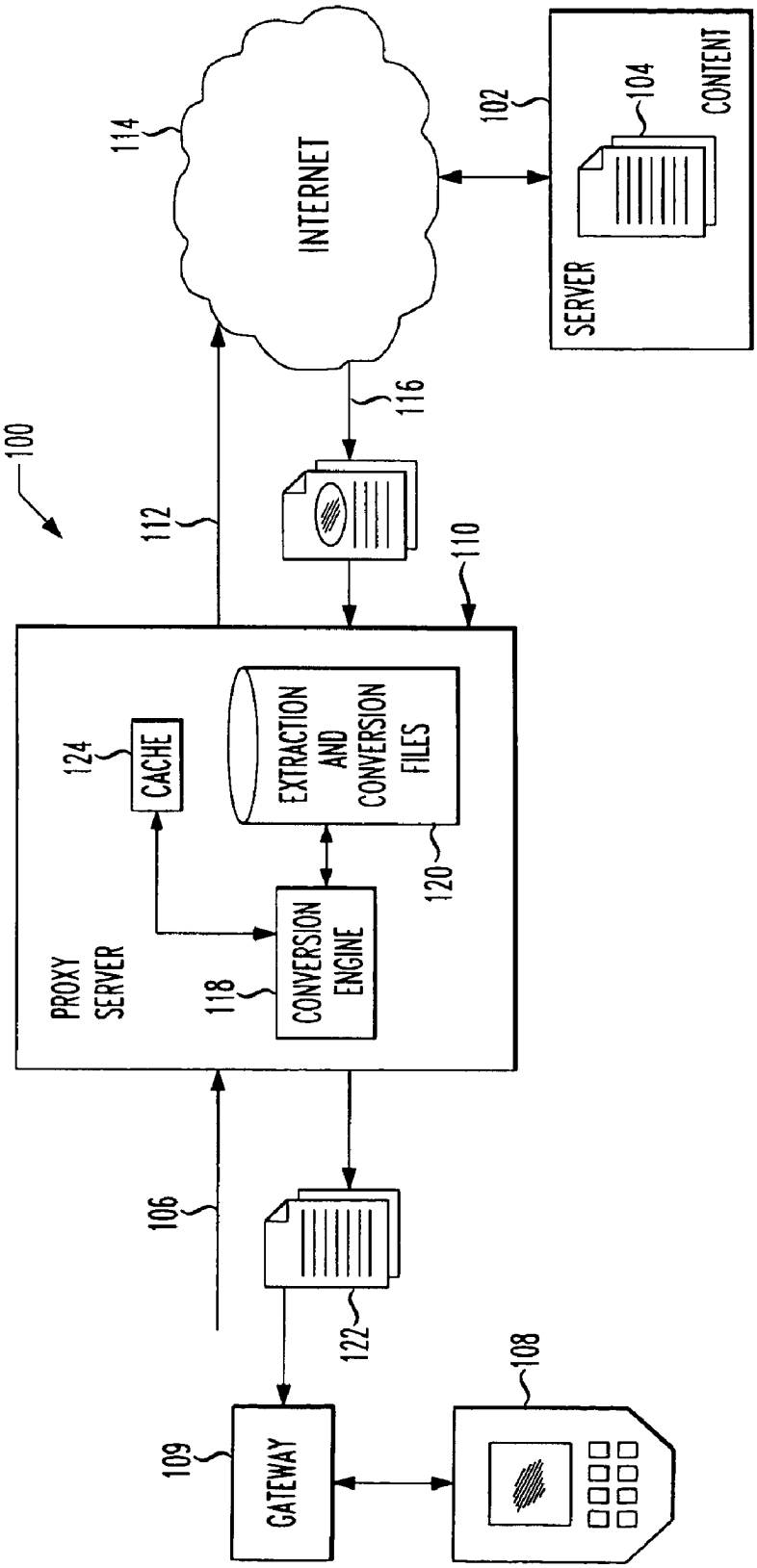
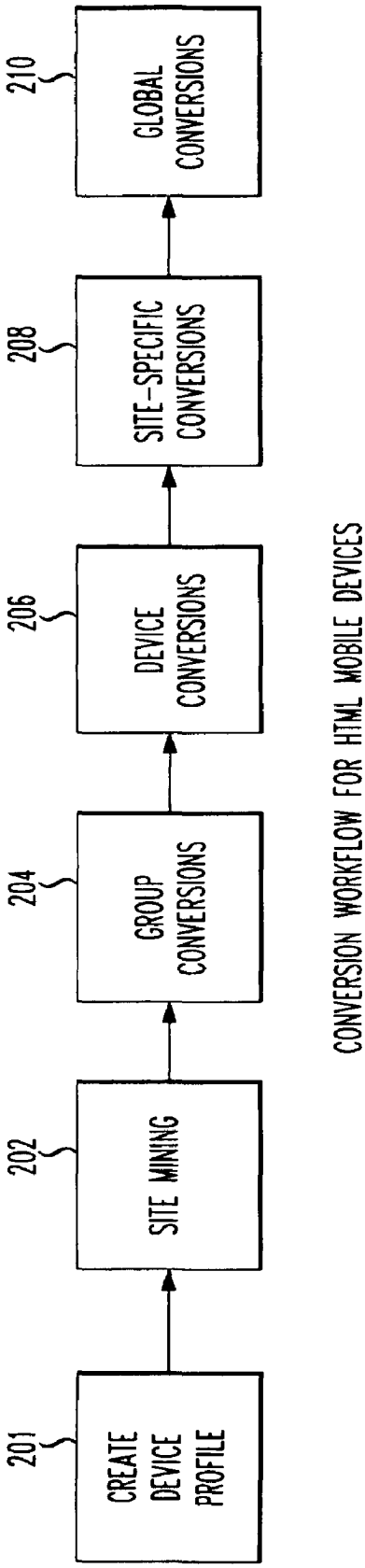

100
114
INTERNET
102
SERVER
104
CONTENT
116
112
110
PROXY SERVER
124
CACHE
118
CONVERSION ENGINE
EXTRACTION AND CONVERSION FILES
120
106
122
109
GATEWAY
108

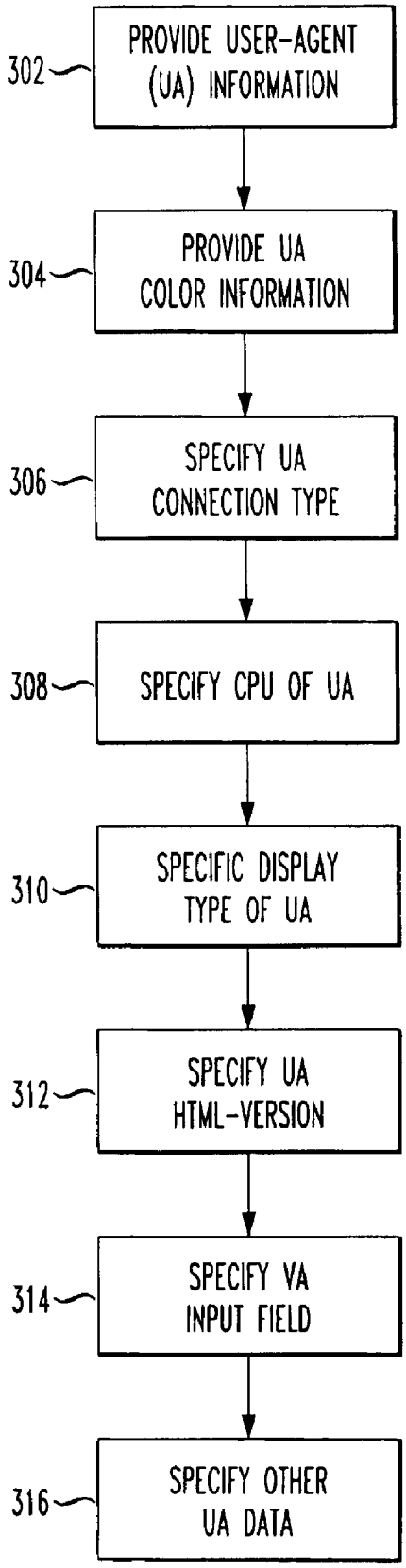
FIG. 1

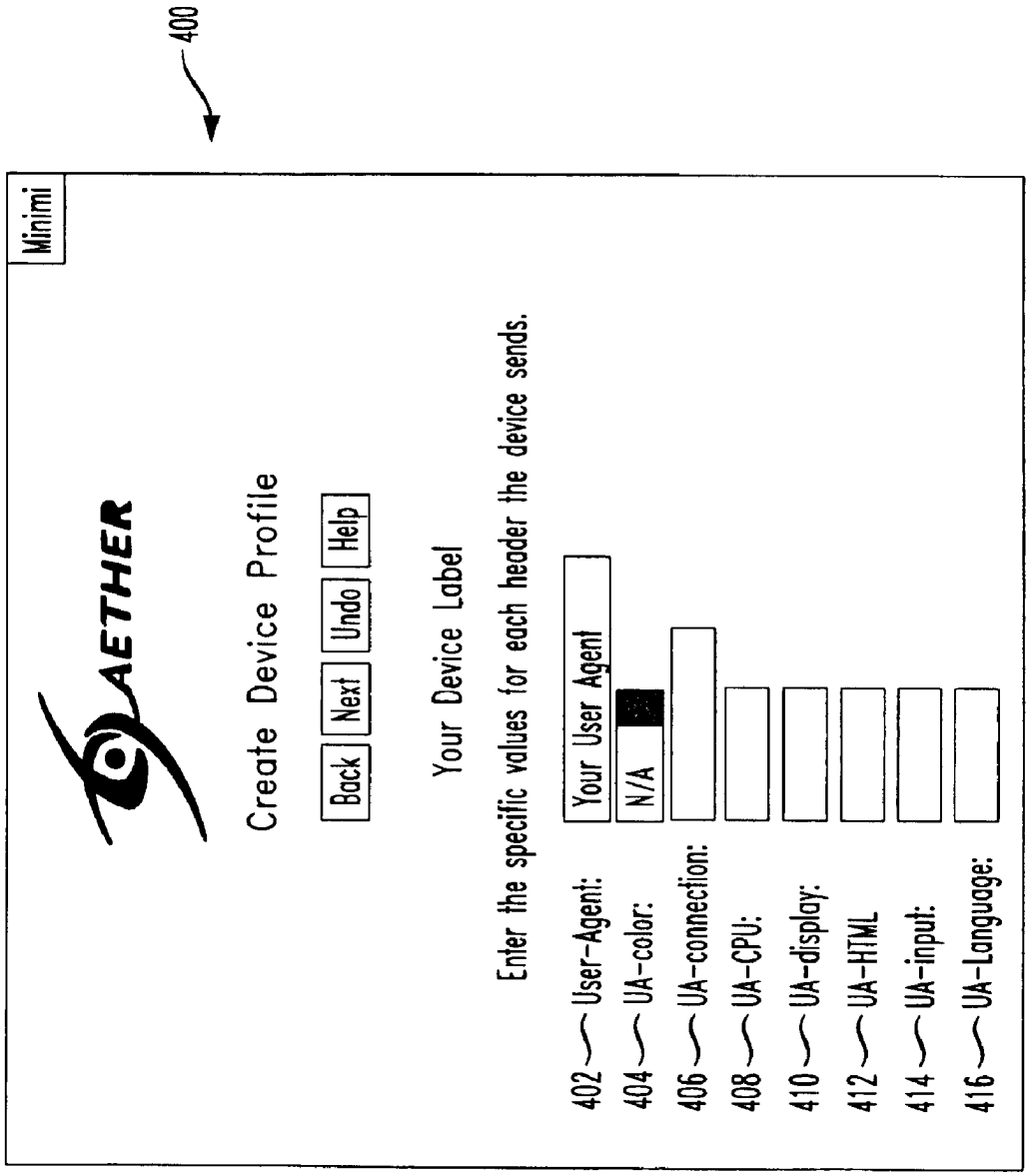



CONVERSION WORKFLOW FOR HTML MOBILE DEVICES

*FIG. 2*

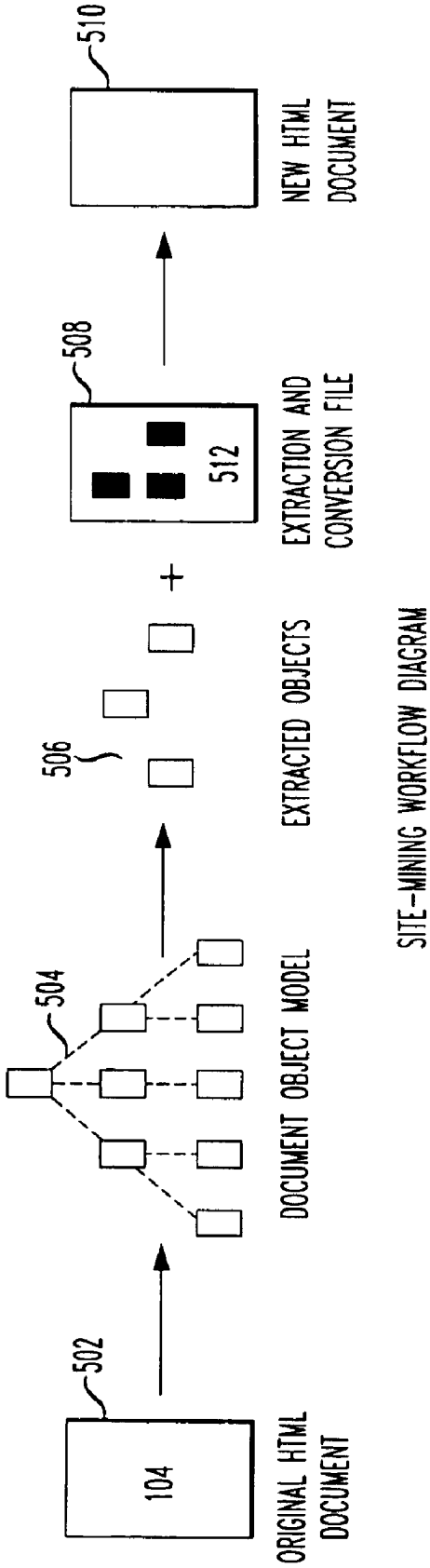
*FIG. 3*


302
PROVIDE USER-AGENT (UA) INFORMATION
304
PROVIDE UA COLOR INFORMATION
306
SPECIFY UA CONNECTION TYPE
308
SPECIFY CPU OF UA
310
SPECIFIC DISPLAY TYPE OF UA
312
SPECIFY UA HTML-VERSION
314
SPECIFY VA INPUT FIELD
316
SPECIFY OTHER UA DATA



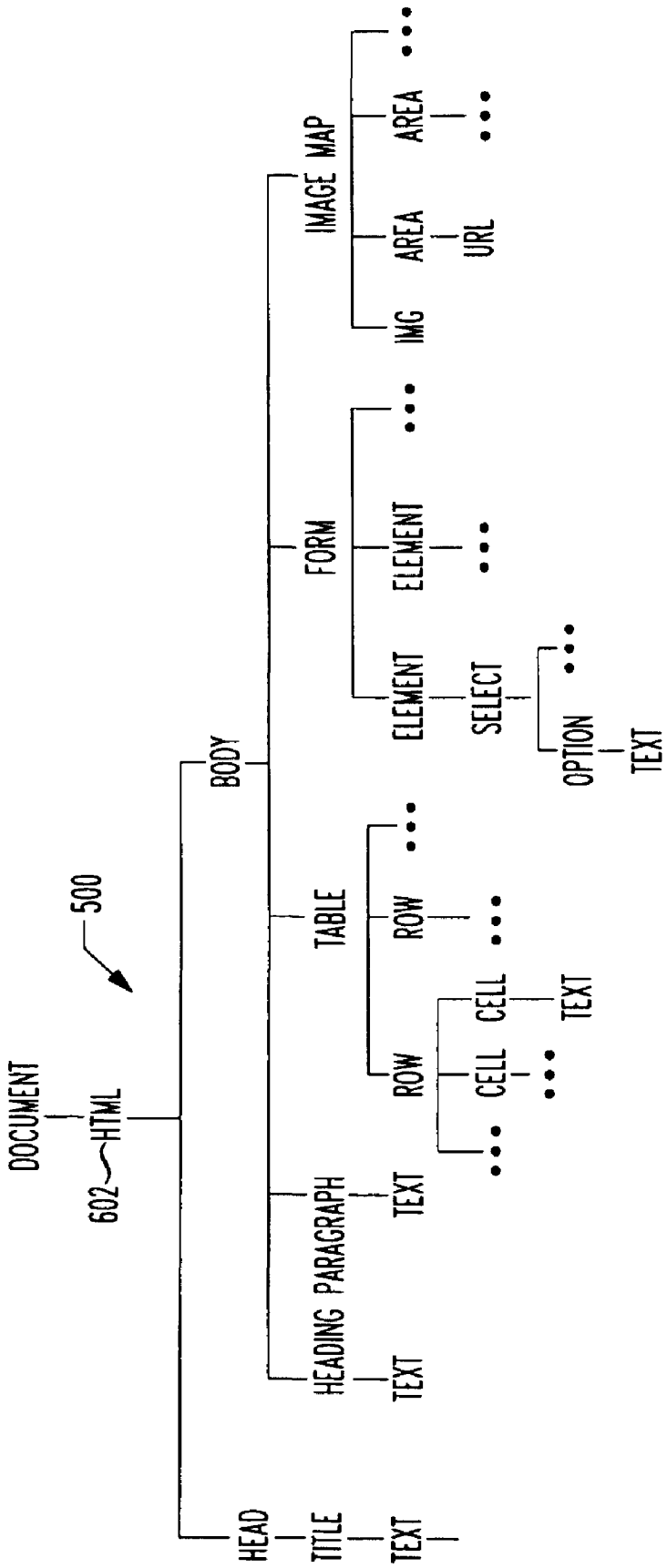

Create Device Profile Page

FIG. 4




SITE-MINING WORKFLOW DIAGRAM

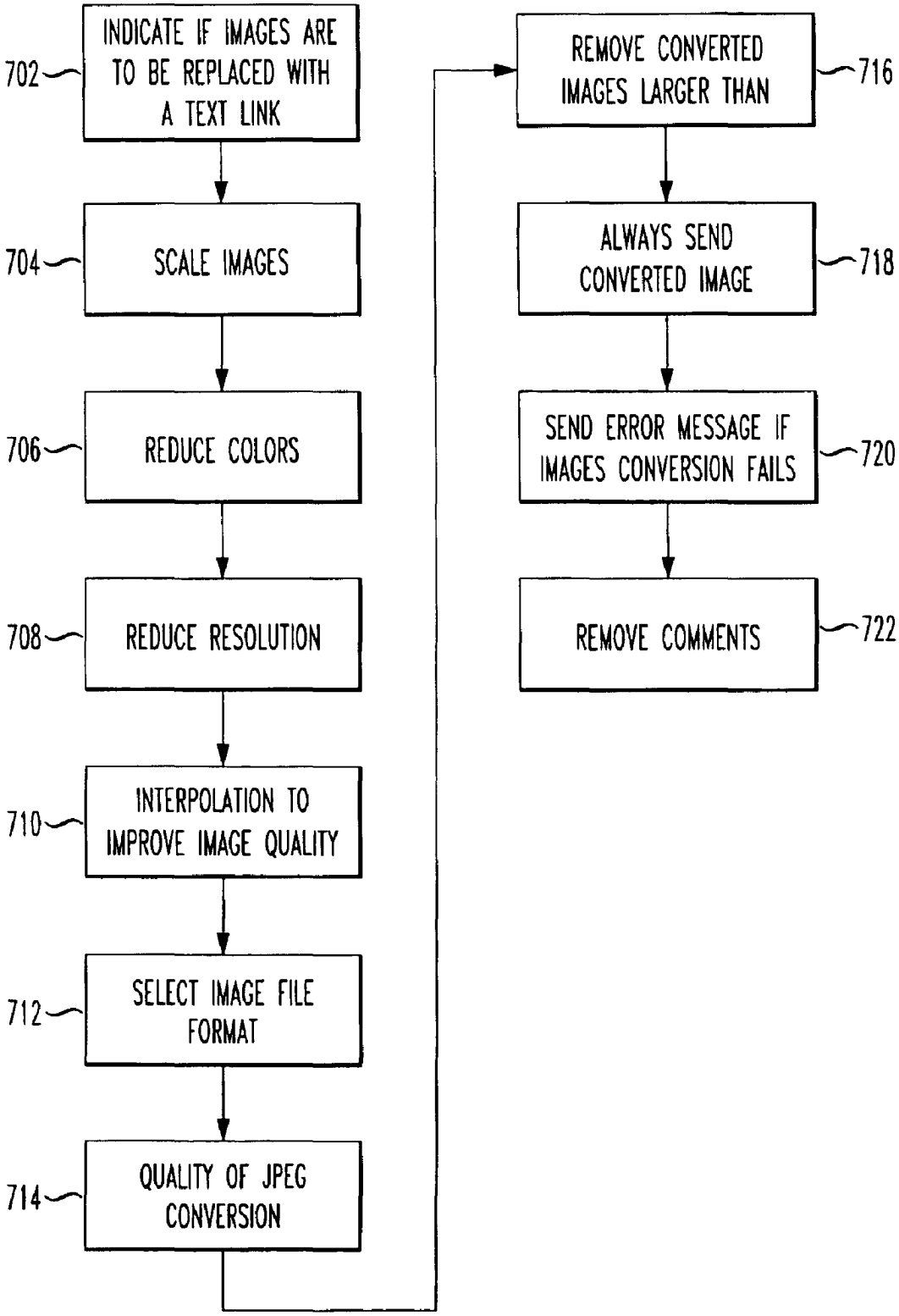
*FIG. 5*




DOCUMENT OBJECT MODEL (DOM)

*FIG. 6*

*FIG. 7*


702
INDICATE IF IMAGES ARE TO BE REPLACED WITH A TEXT LINK
704
SCALE IMAGES
706
REDUCE COLORS
708
REDUCE RESOLUTION
710
INTERPOLATION TO IMPROVE IMAGE QUALITY
712
SELECT IMAGE FILE FORMAT
714
QUALITY OF JPEG CONVERSION
716
REMOVE CONVERTED IMAGES LARGER THAN
718
ALWAYS SEND CONVERTED IMAGE
720
SEND ERROR MESSAGE IF IMAGES CONVERSION FAILS
722
REMOVE COMMENTS

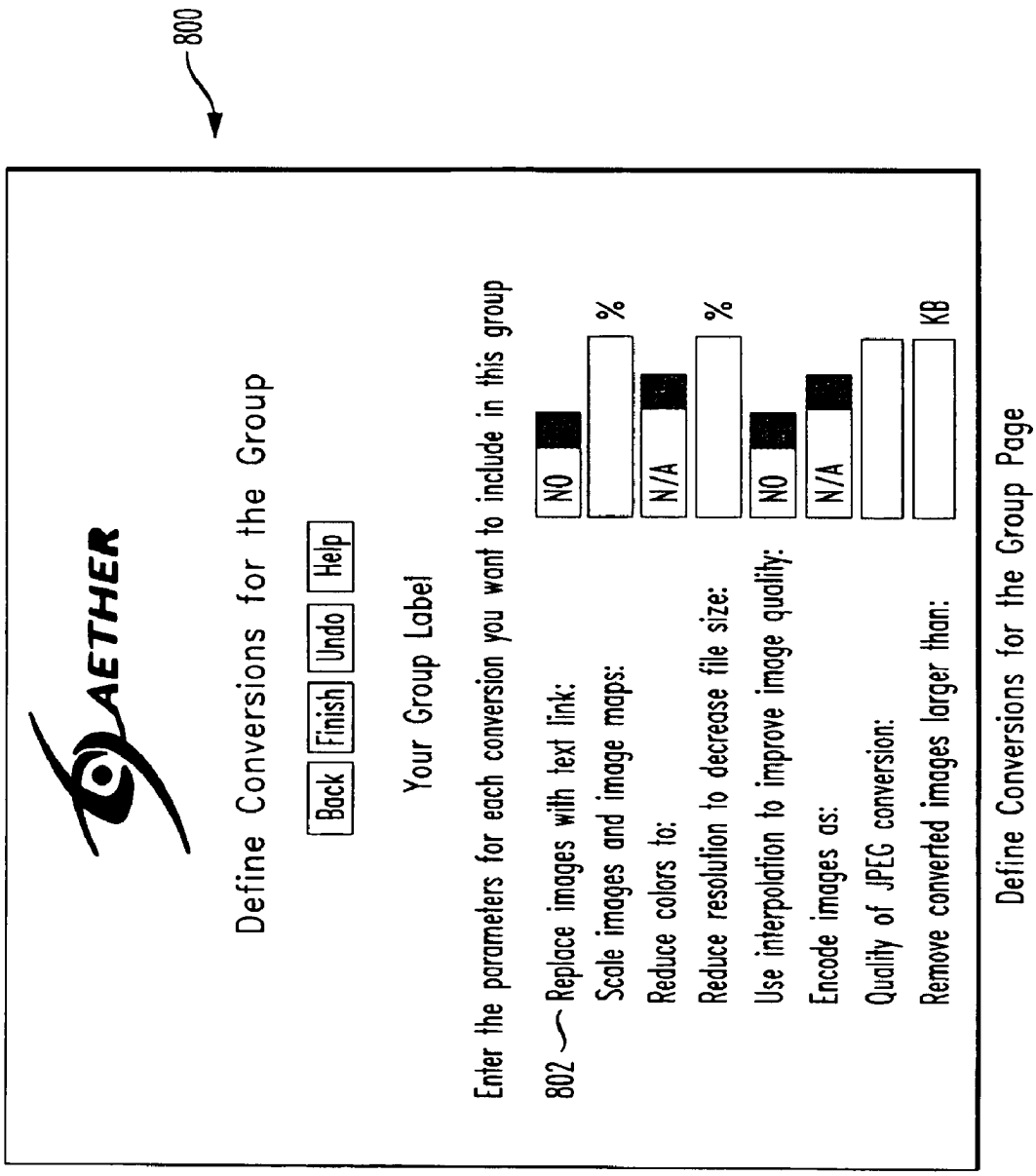

800
AETHER
Define Conversions for the Group
Back
Finish
Undo
Help
Your Group Label
Enter the parameters for each conversion you want to include in this group
802
Replace images with text link:
NO
Scale images and image maps:
%
Reduce colors to:
N/A
Reduce resolution to decrease file size:
%
Use interpolation to improve image quality:
NO
Encode images as:
N/A
Quality of JPEG conversion:
Remove converted images larger than:
KB
Define Conversions for the Group Page

FIG. 8

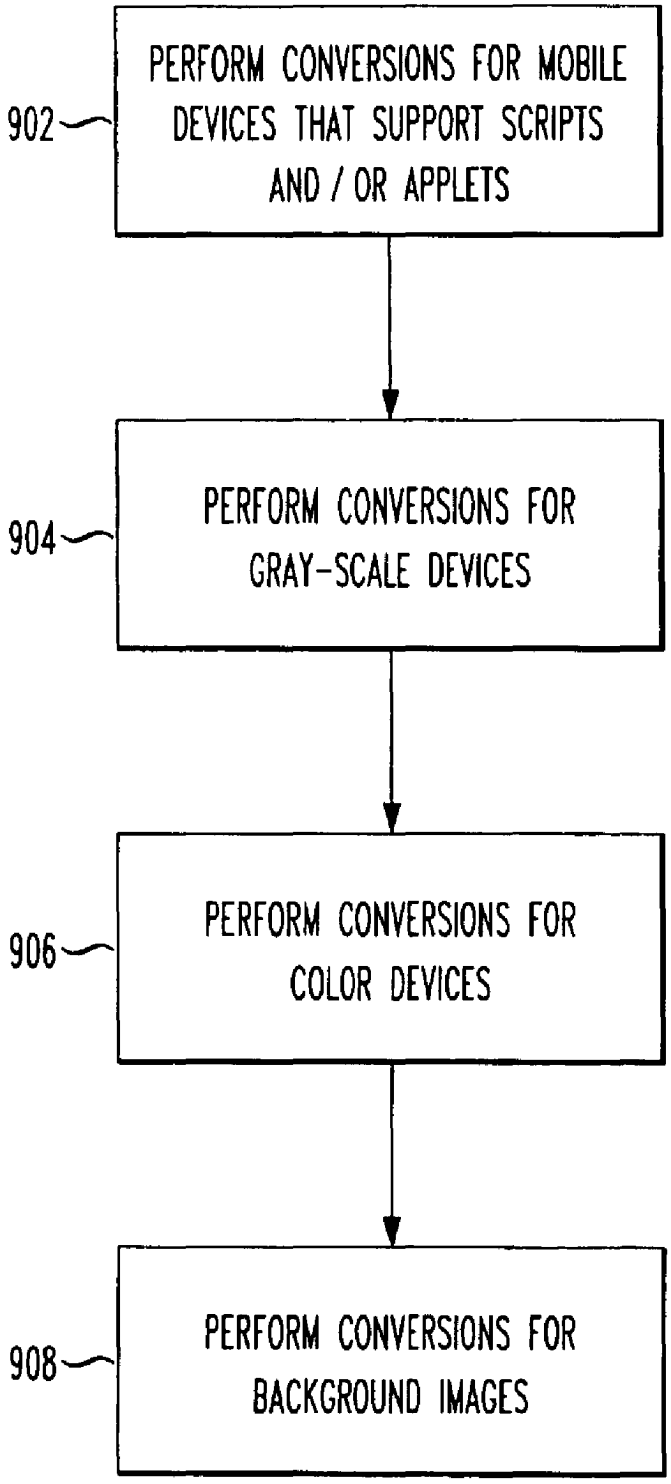

902
PERFORM CONVERSIONS FOR MOBILE DEVICES THAT SUPPORT SCRIPTS AND / OR APPLETS
904
PERFORM CONVERSIONS FOR GRAY-SCALE DEVICES
906
PERFORM CONVERSIONS FOR COLOR DEVICES
908
PERFORM CONVERSIONS FOR BACKGROUND IMAGES

*FIG. 9*

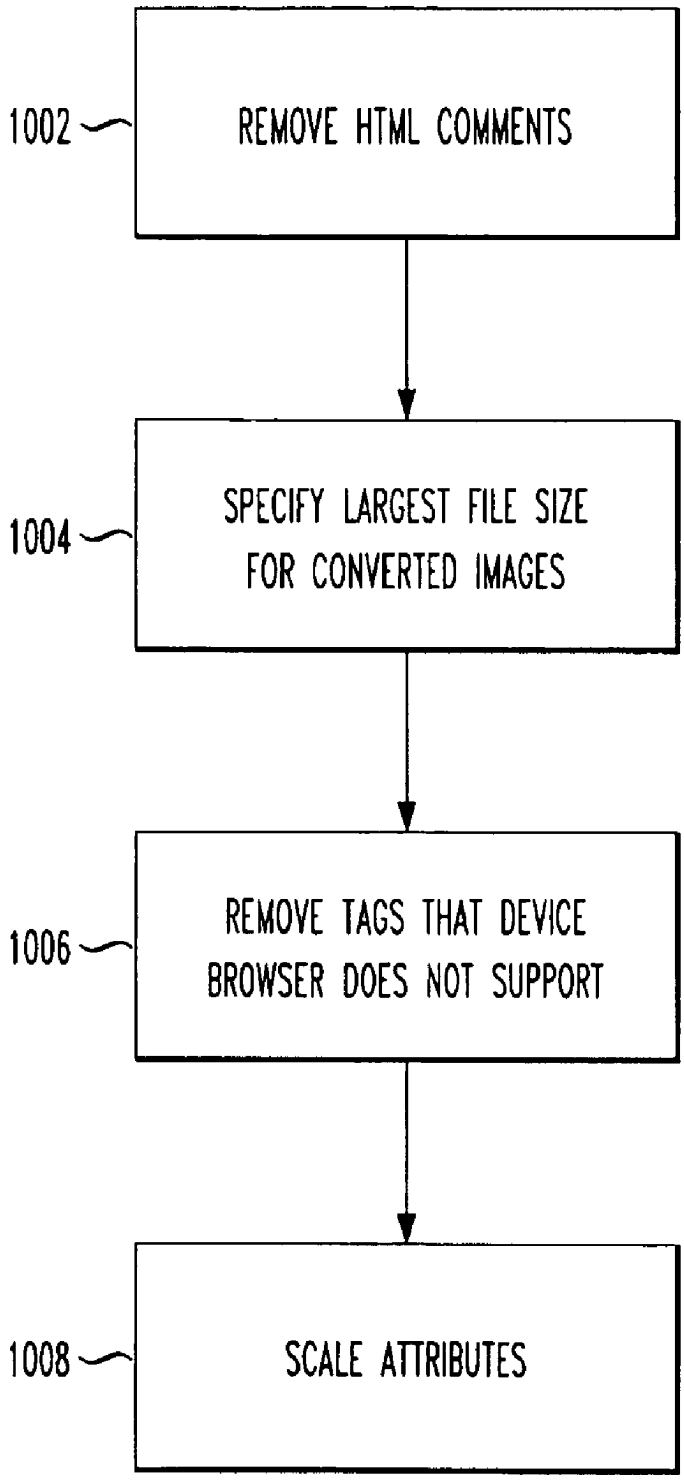

1002
REMOVE HTML COMMENTS
1004
SPECIFY LARGEST FILE SIZE FOR CONVERTED IMAGES
1006
REMOVE TAGS THAT DEVICE BROWSER DOES NOT SUPPORT
1008
SCALE ATTRIBUTES

*FIG. 10*

*FIG. 11*

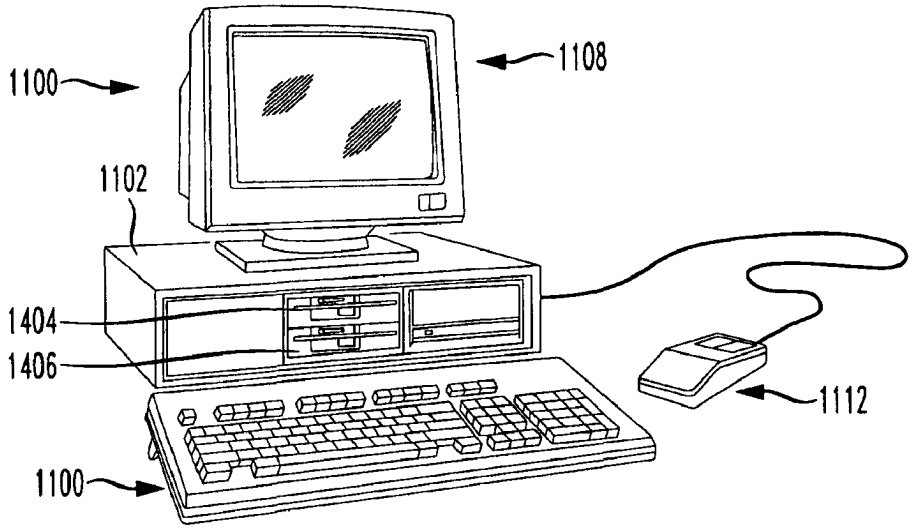
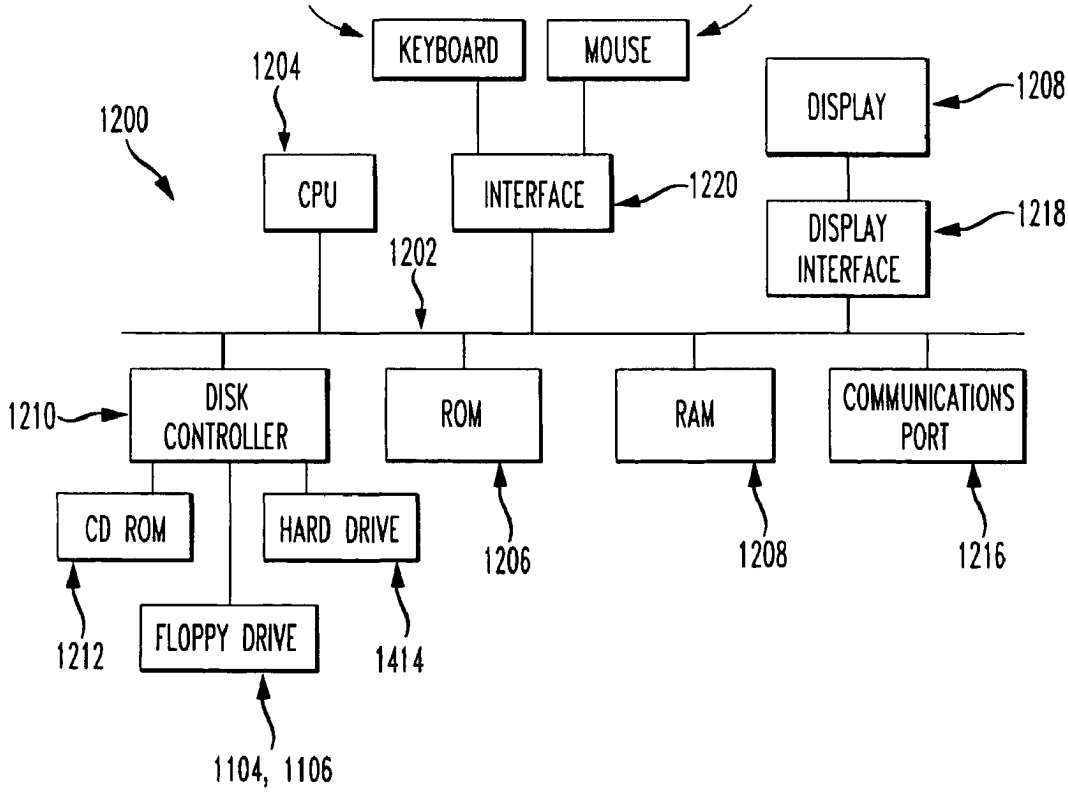

1100
1108
1102
1404
1406
1112
1100

*FIG. 12*


KEYBOARD
MOUSE
1204
1200
DISPLAY
1208
CPU
INTERFACE
1220
DISPLAY INTERFACE
1218
1202
1210
DISK CONTROLLER
ROM
RAM
COMMUNICATIONS PORT
CD ROM
HARD DRIVE
1206
1208
1216
1212
FLOPPY DRIVE
1414
1104, 1106

# WEB PAGE CONTENT TRANSLATOR

## RELATED APPLICATION

This application is related to and claims priority from U.S. Provisional Application No. 60/245,680, the entirety of which is expressly incorporated herein by reference.

## BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to dynamically extracting and reformatting existing web page content and, more particularly, to dynamically extracting a portion of content from a web page and reformatting the extracted content for viewing on a mobile device.

2. Background Description

Organizations of all sizes are reliant on the internet to conduct business. Because of the explosion of mobile enterprise solutions, users of wireless devices now demand that businesses deliver web content for viewing on desktop, or mobile/portable (e.g., handheld) devices. Whether organizations are creating new web applications, or extending existing infrastructure, the new Internet powered world demands that users have access to the applications and information they need when they need it to speed business, remain flexible and competitive, and drive stronger customer relationships.

Before now, the solutions available for delivering web content to mobile devices generally required organizations to develop and maintain multiple sets of content, one for viewing in a desktop environment, and others for viewing on each individual type of mobile device. Further, secure connections between mobile devices and web servers via a proxy server that reformats original web page content were generally unavailable via a decorated uniform resource locator (URL) connection. A need exists, therefore, for a standards based, create once, deliver everywhere approach to web enabling mobile devices.

## SUMMARY OF THE INVENTION

It is a feature and advantage of the present invention to provide a system and method that dynamically extracts a portion of web content for viewing on mobile devices;

It is another feature and advantage of the present invention to provide a system and method that reformats extracted web content for viewing on mobile devices using transforms that, for example, add meta tag information to the header of a page, add a specific attribute and attribute value to a specific tag, ignore previously specified global conversions, and/or insert text from a specified file;

It is yet another feature and advantage of the present invention to manage and maintain a single set of web content that can be used in both desktop and mobile device environments;

It is still another feature and advantage of the present invention to eliminate the need to maintain multiple sets of web content, one for each device type, for delivery to a plurality of mobile devices.

It is another feature and advantage of the present invention to optionally provide a secure connection via a decorated URL between a mobile device and/or a client (e.g., a Wireless Access Protocol (WAP) gateway) which forwards a secure request from the mobile device, a proxy server that reformats original web page content, and a web page server.

It is another feature and advantage of the present invention to provide a secure connection between, for example, a proxy server that reformats an original web page and an origin web page server by setting up the proxy server in a mobile device browser (i.e., enabling the mobile device to communicate with the origin web page server via the proxy server).

To achieve these features and advantages, the present invention provides a system, method, and medium that extracts a portion of web page content and reformats the extracted content for delivery to one or more wireless devices. Embodiments of the present invention contemplate that web-based content can be created one time, whereafter at least a portion thereof is extracted, reformatted, and transmitted to, for example, one or more handheld device browsers (e.g., the Palm Web Clipping Browser from Palm, Inc., Santa Clara, Calif., Pocket Internet Explorer from Microsoft Corp, Redmond, Wash., and Wireless Access Protocol (WAP) on smart phones, etc.). This create-once, deliver-everywhere approach eliminates the need to build and maintain separate web pages for different devices and browsers, as well as the need to install proprietary browser software on the handheld device(s). In one embodiment contemplated by the present invention, a user generates a request, from a mobile device to a proxy server. The proxy server then forwards the user request to an origin web server (having a first file format), whereafter the requested web page is returned to the proxy server. The appropriate components (e.g., tags, etc.) of, for example, the HTML or Wireless Markup Language (WML) source code, are extracted from the web page. The extracted web page contents are then reformatted to place the extracted web page contents in a format the is viewable by one or more mobile devices. The reformatted web page is then transmitted from the proxy server to the requesting mobile device. The may be done for at least one of groups of devices, individual devices, web site-specific conversions, or for all web sites. The method of the present invention also provides a secure connection via a decorated URL between a mobile device and/or client (e.g., a WAP gateway) which forwards a secure request from the mobile device , a proxy server that reformats original web page content, and a web page server.

Before explaining at least one embodiment of the invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and to the arrangements of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced and carried out in various ways. As such, those skilled in the art will appreciate that the conception, upon which this disclosure is based, may readily be utilized as a basis for the designing of other structures, methods and systems for carrying out the several purposes of the present invention. It is important, therefore, that the claims be regarded as including such equivalent constructions insofar as they do not depart from the spirit and scope of the present invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

The Detailed Description will be best understood when read in reference to the accompanying figures wherein:

FIG. **1** is a representative simplified block diagram of a mobile device, a proxy server, and a content server which also illustrates an overview of the method according to the present invention;

FIG. **2** is a schematically simplified flow diagram of the conversion workflow for HTML mobile devices;

FIG. **3** is a flow diagram illustrating a process of creating a device profile;

FIG. **4** is a representative screen display wherein a device profile can be created;

FIG. **5** is a site-mining workflow diagram;

FIG. **6** is a diagram of the Document Object Model (DOM);

FIG. **7** is a flow diagram illustrating a process of creating conversions for a group of mobile devices;

FIG. **8** is an exemplary screen display wherein conversions are defined for a group of mobile devices;

FIG. **9** is a flow diagram illustrating a process of creating conversions for particular mobile devices;

FIG. **10** is a flow diagram illustrating a process of creating conversions for all web sites;

FIG. **11** illustrates one example of a central processing unit for implementing a computer process in accordance with a computer implemented stand-alone embodiment of the present invention; and

FIG. **12** illustrates one example of a block diagram of internal hardware of the central processing unit of FIG. **11**.

## DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

FIG. **1** illustrates an architecture **100** as contemplated of the present invention (and environments thereof). Referring now to FIG. **1**, it is envisioned that a proxy server **110** reformats/converts web content **104** on an origin web server **102** into a format **122** readable on any mobile device **108** (which can be any number of different mobile device types). Details of the architecture of the present invention, the order in which conversions are processed, and how mobile devices **108** are connected to proxy server **110** through the present invention are explained herein.

The proxy server **110** of the present invention "sits" between the clients (e.g., the mobile device(s) **108**) and the origin web server(s) **102** that provide Web content **104**. If necessary, a gateway **109** may optionally be provided that interfaces between, for example, the mobile device **108** and the proxy server **110**. In this context, an origin web server **102** is a web server that contains the original web page **104**. It is different from, for example, the proxy server **110** because the original web server **102** is maintained and updated by the individual(s) and/or organization(s) that hosts the web site for the web page **104**. Unlike other proxy servers, however, the present invention obtains the code (e.g., HTML) of the user requested web page **104**, and modifies it at the proxy server **110** (once obtained) in accordance with at least one novel method described herein . Embodiments contemplated by the present invention also envision reformatting and/or converting an entire web site or request specific Web content that is needed from the origin web server **102**.

In general, embodiments of the present invention contemplate that architecture **100** comprises one or more servers **102** having web content (in the form of at least one web page **104**), a proxy server **110**, at least one mobile device **108**, and at least one network **114**. For simplicity, only one of each of the mobile device **108**, server **102**, and network **114** are shown in FIG. **1**, although in general the system **100** may comprise multiples of each. It is envisioned that each instance of web content **104** each have associated therewith a URL.

Upon a request **106** from a mobile device **108** for a given web page **104**, typically made through a HyperText Transport Protocol (HTTP) from the resident mobile device, or HyperText Transport Protocol Secure (HTTPS) request from the resident mobile device **108** browser, the process for providing a reformatted/converted and extracted web page **104** begins. It should be understood that the gateway **109** will receive such a HTTP or HTTPS request if a gateway **109** is used. Upon determining that the requested page **104** resides at the server **102**, the proxy server **110** makes a request **112** for the page. As shown, the proxy server **110** and the server **102** are connected via a network **114** such as the Internet. It should be understood that the present invention can be used with networks other than the Internet where visual content is involved. Therefore, depending on the network(s) being utilized in conjunction with the present invention, it should be apparent that the visual content from such network(s) may be other than "web" content. The server **102** responsively returns **116**, via the network **114**, the requested web page **104** to the proxy server **110**. The web page **104** is typically an HTML file with references to any component .wav, .mov, and/or Joint Photographic Experts Group (JPEG) files, which together comprise the web page **104**. It should also be understood that other file formats (e.g., .gif (graphics interchange format)) and web page components (e.g., Java applets) can also be accessed and returned to the proxy server **110**.

The conversion engine **118**, preferably residing within the proxy server **110**, retrieves and/or accesses the stored web page **104**, and accesses a predefined extraction and conversion file associated with the mobile device **108** and/or web page **104**, preferably via the extraction and conversion file database **120**. Extraction and conversion files may, for example, contain the following information:

Variables: These are variables that are defined when a site-mining expression is created. A variable is essentially a place holder for the information to "go" after the conversion engine **118** extracts it from a web page **104** preferably residing on server **102**. A site-mining expression is a command that tells the conversion engine **118** where to locate the desired web content (in, for example, the HTML code) in the web page **104**. One embodiment of the present invention uses software such as Spyglass Prism from OpenTV, Inc., Mountain View, Calif. to extract data from a designated web page **104**. Methods that can be used in site-mining expressions in accordance with the Spyglass Prism product are contained in, for example, the Exemplary Site Mining Methods section and other sections contained herein.

System variables: Embodiments of the present invention contemplate that there are preferably at least three system variables that can be added to extraction and conversion files, including:

a) &&Host;

Identifies the name of the server **102** that the proxy server **110** is connecting to for a particular request **106**.

b) &&User-Agent (UA);

Identifies the type of mobile device **108** and the web browser of the mobile device **108**.

c) &&URLLink;

Identifies the address of the server **102** that the proxy server **110** is connecting to.

It should be understood that the variables and delimiters are illustrative only and that different variables and/or delimiters can be used to achieve the same functionality

Transforms: Transforms are conversion tags that are used to re-format the content extracted from a web page **104**. These special tags (also called sw-transforms) provide the power to display the Web content in the desired format **122** for a mobile device(s) **108**. The present invention provides transforms that, for example: add meta tag information to the header of a page, add a specific attribute and attribute value to a specific tag, ignore previously specified global conversions, insert text from a specified file, remove a specific attribute from all tags, remove a specific attribute from a specific tag, remove the comments tag from a web site or specific

web content, remove a specific tag from a web site or web content, remove a specific tag and all the information that appears within the tag from a web site or web content, replace one tag with another, set a specific value of a specific attribute of a specific tag, stop processing of all subsequent reformatting commands, substitute one sequence of text for another sequence of text, and remove table formatting. The sw-transforms used to reformat the extracted web content are contained in the SW-Transforms section contained herein.

Mobile devices **108** generally come in a variety of different sizes and have a variety of different screen interfaces. As will be discussed in further detail herein, the present invention provides the ability to uniquely tailor web page **104** content for specific mobile devices **108**. A particular organization may know that its users will always be retrieving web pages using, for example, Palm operating system devices (e.g., Palm III, X, VIIs, etc.). Formatting rules may be set up that apply to the group of Palm operating system devices generally, as well as, for example, the Palm VII in particular. To create a device profile, both the specific version of a mobile device **108** and its web browser (e.g., a Palm V with browser A, etc.) are needed. In one embodiment, device profiles are registered with the proxy server **110** by using HTTP request headers, as will be explained in detail herein.

It should also be understood that in addition to providing a device profile for an individual mobile device **108**, device profiles can also be created for a group of mobile devices **108**, as well as all mobile devices **108**. In the latter case, suppose, for example, an organization's mobile device **108** users will often be visiting graphic-intensive web sites, and that the users will be viewing these sites on, say, smart phones (i.e., a cellular telephone that provides voice, limited Internet access, e-mail, pager and/or facsimile service, and typically has a small screen and little memory). A global extraction and conversion file can be created that, for example, instructs the conversion engine **118** to replace all graphics with text links. This conversion would affect all web content that is delivered to all mobile device **108** users. Users can therefore access web sites they need without the inconvenience of waiting online for graphics to download onto their mobile devices **108**.

Thus, using an extraction and conversion file within the storage **120** corresponding to the particular mobile device(s) **108**, the conversion engine **118** uses the expressions defined therein, and performs the designated operations upon, for example, the HTML code contained in the web page **104**. The designated HTML content of the retrieved web page **104** is extracted, subsequently and/or converted, and transmitted as a reformatted web page **122** to the mobile device **108**.

To improve performance (e.g., speed), web page **104** can optionally be cached in a local cache **124** on the proxy server **110**. Caching enables web pages **104** to be processed faster, thereby reducing the time mobile device **108** users spend online. When the proxy server **110** receives a web page **104** over, say, the Internet **114**, the conversion engine **118** can convert and store the web page **122** in a web page **122** specific cache. When a user of a mobile device **108** wants to access the web page **122**, the conversion engine **118** retrieves it from the cache **124**, which reduces online time.

It should also be understood that the proxy server **110** can also cache unconverted web page **104** content. Unconverted web page **104** content is content received from the server **102**, which has not yet been converted and/or extracted by the conversion engine **118**. Cache settings can therefore be configured to meet specific needs (e.g., when caching will begin, the length of time pages will be kept in cache, and the amount of disk space and memory that will be allocated to caching).

Security Features

The proxy server **110** according to the present invention envisions the use of various types of security to ensure that the transmission of information is secure (e.g., that unauthorized parties cannot intercept and/or access the information ). An example envisioned by embodiments of the present invention provides the ability to support the secure socket layer (SSL) protocol developed by Netscape Corp. (now merged with America Online, Inc., Dulles, Va.). When this feature is utilized, users can make secure connections (from, for example, a mobile device **108** to the proxy server **108** and from the proxy server **108** to the origin web server **102** and back), as well as partially secure connections. In embodiments contemplated by the present invention, the proxy server will the proxy server will load an SSL library, which includes, for example, SSL 2.0 and SSL 3.X protocol specification modules.

If the SSL feature of the present invention is utilized, a digital certificate from a certificate authority (e.g., VeriSign) must be obtained. The digital certificate is sent to a client (e.g., a mobile device **108** or a gateway **109**) to authenticate the proxy server **110**, in order to establish a secure connection between the client and the proxy server **110**).

Embodiments of the present invention contemplate that there are at least four types of SSL settings that can be configured for the proxy server **110**, including, for example:

SSLON: This setting determines whether SSL is turned on and off. The default setting is on (as indicated by, for example, SSLON=1).

SSL port: This setting determines which secure port the server listens on.

SSL Certificate Settings: SSL certificate request settings are located in the proxy server .ini file. Changes to the default public certificate file name or the password for the certificate key (e.g., password), are made via the proxy server **110** .ini file.

SSLOutboundPort: This port is a listening port the proxy server **110** uses for outbound SSL requests.

It is envisioned that if the defaults are accepted for each of the above four SSL settings, the SSL settings in, for example, the proxy server **110** .ini file do not have to be configured.

Embodiments of the present invention contemplate that in the event that a particular mobile device **108** does not enable a proxy server **110** to be used, the present invention enables mobile devices to be redirected to proxy through the proxy server **110** by typing (or in some way, entering or implementing) the proxy server **110** address (location) and the URL of the desired web site **104** in, for example, an address field of the mobile device **108** browser. This type of address is commonly referred to as a "decorated URL". A decorated URL contains, for example, the proxy server **110** host name and port number, and the web address of the web site **104** that is to be accessed.

With the present invention, the above-identified URL decoration can be used to make an un-secure (http://) request or a secure (https://) request. Regardless of what type of connection is made, after an initial decorated URL is typed in, the proxy server retrieves the desired web page **104**. For example, the proxy server automatically re-writes all of the other links within the site that are initially proxied to via the decorated URL. That is, if one or more links are embedded within a first web site, and a user clicks on one of the links, the link that the user clicks on will also be "rewritten" in decorated form in accordance with the invention. Also, if a connection is made to an un-secure site, and a user subsequently clicks a secure link within that web site, the proxy server **110** automatically

re-decorates the URL, to provide the secure connection. Therefore, a user only has to type the decorated URL once each time a new Web site is accessed.

As indicated above, embodiments of the present invention contemplate that a decorated URL contains the proxy server **110** host name and port number, and the web address of the site that is to be accessed. For example, a decorated URL for the Aether Software Web (www.aethersystems.com) site may look like:

http://yourscoutweb_domain_name:port_number/?url=http://www.aethersystems.com.

Secure requests made either to and/or from the proxy server **110** can be done by using a decorated URL. If a decorated URL is being used, there are three options. First, a completely secure connection can be made from the mobile device **108**, and optionally forwarded by the gateway **109** (if one is used), to proxy server **110**, and from the proxy server **110** to the origin web server **102** (i.e., the user makes a secure request to the proxy server **110** and a secure request to the web page **104**. The origin server **102** then encrypts the user request and the web page **104** that is returned to the mobile device.). This type of connection provides end-to-end security and is useful, for example, for e-commerce sites or for secure Web-based applications. This type of decorated URL may look as follows:

https://yourscoutweb_domain_name:port_number/?url=https://www.aethersystems.com.

Second, a secure connection can be made between the mobile device **108**, including the gateway **109** (if one is used), and the proxy server **110**. A business or content provider, for example, that uses the proxy server at the bridge of a firewall may want users to make a secure connection to the proxy server **110**. This is a partially secure connection. This embodiment contemplates a secure connection between, for example, at least a gateway to which the mobile device **108** interfaces, and the proxy server **110**. This type of decorated URL may look, for example, as follows:

https://yourscoutweb_domain_name:port_number/?url=http://www.aethersystems.com.

Finally, a secure connection can be made between the proxy server **110** and the origin web server **102**. For example, a wireless ISP may want to have users make a regular unsecure request in order to access the proxy server **110**, and then make a secure connection between the proxy server **110** and the origin server **102**. In this case, the decorated URL may look, for example, as follows:

http://yourscoutweb_domain_name:port_number/?url=https://www.aethersystems.com.

It will be understood that, depending on the mobile device, the menus that a user will need to access on the mobile device to set up the decorated URL will vary. For example, on a PALM V device, the HandWeb icon in the applications launcher can be tapped to display the last page accessed. Then, the menu button can be tapped to display the Options menu, in which the Open Location menu item may be tapped. The decorated URL may then be typed in the URL field, and the web site corresponding to the URL is then accessed.

FIG. **2** is a simplified flow diagram of a conversion workflow for HTML-based mobile devices, as contemplated by the present invention. In step **201**, a device profile is created for each type mobile device **108** in accordance with the HTTP. It is envisioned that each mobile device **108** is registered with the proxy server **110** to indicate which conversions for the device **108** are desired. Then, when conversion engine **110** receives a request **106**, it compares the headers in the request **106** with the headers in an extraction and conversion file associated with the requesting mobile device **108** to determine which conversions to perform.

One method of performing step **201** as contemplated by embodiments of the present invention is shown in FIG. **3**. In step **302**, user-agent (UA) information (i.e., mobile device **108** information) is provided to the proxy server **110** that uniquely identifies a type of mobile device **108** (e.g., by make and/or model) and the Web browser used on that device. The user-agent information is stored in either the device profile information on the proxy server **110** or, for example, in a global file that stores such information for all devices **108**.

In step **304**, in accordance with the HTTP (and HTTPS) specification, UA-color information is provided via a header that specifies, for example, the screen color of the mobile device **108**. In various embodiments if a mobile device **108** sends this header, the conversion engine **110** performs color reduction automatically taking into consideration, for example, the screen color of the mobile device **108**. If the mobile device does not send the UA-color header, a color reduction conversion for the mobile device **108** can be configured. If the mobile device **108** does send a UA-color header, the value sent in the header can optionally be overridden to improve device performance by, for example, reducing colors to a level lower than the device's maximum capability.

The UA-connection type (e.g., HTTP or HTTPS) between the mobile device **108** and the proxy server **110**, and/or the proxy server **110** and the origin web server **102** is specified in step **306**. The UA-connection is used to specify the type of connection that the mobile device **108** connects to. In step **308**, the UA-CPU is specified. This information is used to specify the CPU (e.g., the manufacturer, model, and/or clock speed) of the mobile device **108**. In step **310**, the UA display field is used to specify the display type of the user agent. In step **312**, the UA-HTML field is used to specify the version of HTML of the mobile device **108**. In step **314**, The UA-input field **414** is used to specify the types of input fields (e.g., password field, text box, image, file, etc.) of the mobile device **108** screen display. In step **316**, the UA-language field is used to specify the language of the mobile device **108** (e.g., English, Spanish, etc.). In step **316**, other fields, such as UA-operating system can be used to specify, e.g., the operating system of the mobile device **108**, as well as other items of information. It will be recognized that not all of the above-identified steps will be applicable to every type of mobile device **108**.

FIG. **4** shows a representative screen display that may be used to enter the data of FIG. **3**. The UA field **402**, UA-color field **404** field, UA-connection field **406**, UA-CPU field **408**, UA-display field **410**, UA-HTML field **412**, UA-input field **414**, and UA-language field **416** are shown. As indicated in step **316**, other input fields, such as, for example, the UA operating system, may also be provided.

Mobile device **108** profiles, as previously noted, can comprise a series of device headers based on fields **402**, **402**, **406**, **408**, **410**, **414**, **416** (e.g., HTTP request headers). When a user requests a web page **104** using a mobile device **108**, the mobile device **108** sends associated HTTP request headers, which uniquely identify the mobile device **108** to the proxy server **110**. A mobile device **108** is generally defined by both the hardware and browser. The device headers thus serve to identify the mobile device **108** to the proxy server **110**.

In step **202**, site-mining is performed, where web page content is extracted from a web page **104**. The site-mining **202** process as contemplated by embodiments of the present invention is shown in FIG. **5**. In step **502**, the desired web page **104** is retrieved by the proxy server **110**. The retrieved

document is envisioned to be a HTML-based or similar document (e.g., a WML document). In step **504**, a Document Object Model (DOM) (shown at **600** in FIG. **6**) corresponding to the retrieved web page **104** is created. The DOM **600**, as proposed by the World Wide Web Consortium (W3C), is a standard internal representation of the document structure and attempts to make it easier for programmers to access components and delete, add or edit their content, attributes and style. In essence, the DOM **600** makes it possible for programmers to write applications which work properly on all browsers and servers, and on all platforms. While programmers may need to use different programming languages, they do not need to change their programming model. The W3C's DOM **600** thus offers programmers a platform- and language-neutral program interface which will enable programming across platforms with languages such as, for example, Java and ECMAScript.

Referring to FIG. **6**, the DOM **600** shown therein is an exemplary representation of an HTML document in which all elements are treated as objects. The DOM is a platform-neutral and language neutral interface allowing dynamic access and updating of content, structure, and style of documents. A single DOM object can represent an element (e.g., the text in an element or an attribute value), the entire document (e.g., web page **104**) or a collection of objects. The DOM **600** object hierarchy is a series of nested objects, where each object contains either data or additional objects. The topmost object is the HTML document **602** (e.g., web page **104**) itself. For further reference, see the W3C's DOM Level 1 Specification, dated Oct. 1, 1998, which is incorporated herein by reference.

In step **506**, objects are extracted from the web page **104** in accordance with the DOM **600**. For example, the name of the tag the content resides in must be determined (e.g., table), as well as the tag number (e.g., is it the first table? Second?). Also, whether the content is in a sub-tag or child of a parent tag should be determined. If so, what number is it? (e.g., if it is a table row that is desired, then what number is it?)

In step **508**, the site-mining expressions, contained in an extraction and conversion file **512**, are performed on the extracted object(s) of step **506**. Embodiments of the present invention contemplate that one or more methods having the functionality of the methods provided in, for example, the Exemplary Site Mining Methods section will be used to extract the desired content. In accordance with the present invention, one or more of the conversion methods shown in the Site-Mining Expressions Examples section is used to convert/reformat one or more of the extracted objects to facilitate display on one or more mobile devices **108**. Then, in step **510**, after applying the operations contained in the extraction and conversion file **512** to the web page **104**, the transformed web page **122** is provided and transmitted to one or more mobile devices **108**. (However, prior to the transmission to one or more mobile devices, other types of conversions can also be performed, as indicated in FIG. **2**).

The following three examples of site-mining expressions are provided. The expressions utilize methods defined in, for example, the Exemplary Site-Mining Methods section. As shown by the following examples, a site-mining expression specifies a path to an object (HTML element) from the DOM (e.g., web page **104**) using methods defined in the site-mining expression language as shown in the Exemplary Site-Mining Methods section. Each of the methods contained in the Exemplary Site-Mining Methods section performs an action on a collection of objects in the object hierarchy. Each method returns a list of one or more objects. It should be understood the following examples are illustrative only, and that the potential number of HTML source code and expression combinations are virtually infinite.

Site-Mining Expression Examples

Original HTML code

```
<HTML>
<HEAD> <TITLE> Title of the Page </TITLE> </HEAD>
<BODY>
<TABLE WIDTH="600" ID="ScoutWeb">
  <TR><TD> table 1, row 1</TD></TR>
  <TR><TD> table 1, row 2</TD></TR>
  <TR><TD>
    <TABLE WIDTH="300">
      <TR><TD ID="ScoutWeb"> table 2, row 1</TD></TR>
      <TR><TD> table 2, row 2</TD></TR>
    </TABLE>
  </TD></TR>
</TABLE>
</BODY>
</HTML>
```

Site mining expression #1:

titleEx1=document.all.tags("TITLE").item(0).html; produces:

```
<TITLE> Title of the Page </TITLE>
```

Site mining expression #2:

titleEx2=document.all.tags("TITLE").item(0).text; produces

```
Title of the Page
```

Site mining expression #3:

tableEx1=document.all.tags("TABLE").item(1).html; produces

```
<TABLE WIDTH="600" ID="ScoutWeb">
<TR><TD> table 1, row 1</TD></TR>
<TR><TD> table 1, row 2</TD></TR>
<TR><TD>
  <TABLE WIDTH="300">
    <TR><TD ID="ScoutWeb"> table 2, row 1</TD></
      TR>
    <TR><TD> table 2, row 2</TD></TR>
  </TABLE>
</TD></TR>
</TABLE>
```

In step **204**, group conversions can be optionally performed. Group conversions are conversion rules that are applied to a group of similar mobile devices. For example, a group conversion can be applied to all Palm operating system devices. After such group conversion rules have been created, these rules can be applied to every new version of a Palm operating system device that is added to the system. Using group conversions saves time, for example, because it saves from having to keep re-entering the same conversion rule(s) for all versions of a device (e.g., Palm 3x, Palm VII, etc.). Thus, e.g., one or more predefined conversions can be applied to any device(s) using a given operating system (e.g., Palm OS).

A method (as contemplated by embodiments of the present invention) of performing step **204** is shown in FIG. **7**. In step **702**, an individual can define whether images are to be replaced with, for example, a text link field **602**. In step **704**, an individual can optionally scale images and image maps. In general, the user can type the percentage as an integer between, for example, 1 and 100. In step **706**, an individual can reduce the colors of the graphics in the web page **104**

contents being converted. For example, the mono number or color number (#=1, 2, 4, 8, 16, or 24, etc.) can be provided as input.

In step **708**, the resolution of the graphics in the web page **104** being converted can be reduced. In general, the percentage can be entered as an integer between 1 and 100. In step **710**, interpolation can optionally be used to improve image quality. This feature allows tuning of the quality of the scaled images. For example, an individual can select "yes" if he or she is scaling images and wants to improve quality. In step **712**, the file format of images can be selected (e.g., .gif or JPEG).

In step **714**, the quality of JPEG conversion is specified. Here, an individual can enter, for example, an integer between 0 and 100, where 100 indicates the highest quality. In step **716**, images larger than a prespecified size can optionally be removed (i.e., from being sent to a mobile device **108**). An individual can, for example, enter the number of the maximum file size to be sent to a mobile device **108** in kilobytes.

In step **718**, an "always send converted image" feature can optionally be invoked. This will send a converted image even, for example, if the file size is larger than that specified in step **716**. In step **720**, the conversion engine **110** can be directed to send an error message to the corresponding mobile device **108** if an image conversion fails. In step **722**, the conversion engine can be directed to remove comments (e.g., either in <COMMENT> tags or in <!--comment--> format) from the content. An individual can select "Yes", for example, to remove all comments, or "No", for example, to leave them in the content.

It should also be understood that additional settings regarding group conversions can optionally be provided in accordance with the present invention that allow users to, for example, translate tables, remove a tag, remove tag and content, replace tag, remove an attribute from a tag, add an attribute to a tag, set an attribute value, scale an attribute value, and/or set an attribute minimum and/or maximum. Illustrative examples of these features are provided in the Site-Mining Expression Examples section.

A representative screen display corresponding to the method shown in FIG. **7** is provided in FIG. **8**. As shown, field **802** enables images to be replaced with text links. Other fields are also shown corresponding to the steps shown in and discussed with regard to FIG. **7**.

Returning to FIG. **2**, in step **206**, device conversions can be optionally performed. Device conversions are rules that change or format Web content according to, for example, the specific version of a device and its web browser. As previously discussed with regard to step **204**, a group conversion can be set up that is applicable to, say, Palm operating system devices. Using device conversions, it is possible to, for example, specify more specific formatting rules that apply to individual device types within, for example, the Palm OS family (e.g., Palm III, Palm X, Palm VII, etc. devices). As shown in FIG. **9**, the method of performing a number of recommended conversions for specific mobile devices **108** is provided. In step **902**, conversions are performed for mobile devices **108** that, for example, support Java scripts or applets. In step **904**, conversions for gray-scale devices are made. Potential conversions include, for example, removing the <U> tag, encoding images as GIF, and converting any color header images to gray scale.

In step **906**, conversions can be created for color devices. Such conversions for color devices will depend, for example, on goals. If the goal is to optimize the performance of the server **102**, then either reducing images to gray scale by specifying a color depth (e.g., mono8 or lower), or reducing the resolution to decrease file size (e.g., enter 90 percent or lower) is generally recommended. In step **908**, the effect of removing background images can be considered. Many web pages **104** use light text and a dark background. If the background images or color are removed, the light text becomes unreadable. Therefore, a conversion to remove the color attribute of the <FONT> tag can be provided. However, in one embodiment, it is not recommended that the width and height attributes of the <IMG> tag be removed. These attributes enable the mobile device **108** browser to format the display faster. Finally, it should also be understood that image conversions will slow down the performance of the proxy server **110**. If the mobile device **108** web browser converts images fairly well (e.g., work as a clipper), it may be preferable to let the browser handle image conversions. It should be understood that in one embodiment a device specific conversion will override, for example, corresponding parameters and/or values specified in group conversions.

Of course, it should be understood that various other conversion types in addition to, and/or in lieu of, those mentioned in FIG. **9** are also contemplated by embodiments of the present invention.

Returning to FIG. **2**, in step **208**, site-specific conversions can be optionally performed. Site-specific conversions are rules that change or format web page **104** content for a specific web page **104**, or for those web pages within a given directory, or site (or portion thereof). The number of possible conversions is virtually infinite, and may include any of the appropriate combinations of methods and transforms.

In step **210** of FIG. **2**, global conversions can be optionally performed. Global conversions are rules that change or format web content on all web pages **104** for either one type of device or all devices. One possible method of performing global conversions is indicated in FIG. **10**. In this exemplary embodiment, the conversion does not have an effect on the content the user sees, but decreases the amount of data sent, thus providing a faster download experience for any user. It should be understood that FIG. **10** is illustrative only, and that the invention enables numerous other operations to be performed on web pages depending on, for example, the needs and/or types of mobile devices **108** that a particular organization may utilize.

Referring now to FIG. **10**, in step **1002** HTML comments are first removed. In step **1004**, the largest file size for converted images is specified. That is, the largest amount of image data that is to be transmitted to a mobile device **108** is specified. The amount can be based at least on the type of Internet connection the mobile device **108** uses. For example, if the mobile device **108** has a slow connection, the conversion engine **118** can be configured to omit images over a specified size. If the mobile device **108** has a faster connection, larger file size value can be specified. In step **1006**, HTML tags that the browser does not support are removed. A list of unsupported HTML tags can be obtained from, for example, the manufacturer of the browser on the mobile device **108**. The conversion engine **118** can then be configured to remove and/or replace them. In general, it is typically more efficient, and therefore preferable, for the conversion engine **118** to remove such tags rather than sending information to the mobile device **108** which cannot be used. Finally, in step **1008**, attributes should be scaled. In many instances, the size of an item is specified in HTML as a percentage, to which the browser automatically scales the item. For cases

where the size of an item is specified in HTML as pixels, however, the size can be reduced to ensure that it fits in the display area for the device.

## Exemplary Site-Mining Methods

This section contains a list of all of the site-mining methods. Each method reference contains the following information:

Method name

Description: A brief description of the method including a list of all objects the method can extract from an HTML page.

Preceded by: For methods that have to come after a particular method.

Followed by: A list of other methods that you can use in the site-mining expression following the object specified by this method. Because a site-mining expression drills down to a specific object in the DOM hierarchy, these methods must be provided in a specific order.

Example: Excerpts from an examplesite-mining expression used to extract content from a web site.

### all

| | |
|---|---|
| Description: | This method returns all elements contained in the proceeding object. |
| Followed by: | tags, item, grep, attributeMatch, text, getAttribute, html |
| Example: | document.all.html; |
| Note: | Allsite-mining expressions start with document.all. |

### areas(n) or areas

| | |
|---|---|
| Description: | Returns one or all areas defined in an image map |
| Preceded by: | Map |
| Followed by: | all, grep, attributeMatch, text, getAttribute, html |
| Example: | document.all.tags("MAP").item(0) .areas(2).getAttribute("HREF"); Results: This returns the HREF attribute from the 3rd area of the first image map in the document. |

### attributeMatch

| | |
|---|---|
| Returns: | Returns the object(s). Elements that contain these attribute name/value pairs. |
| Followed by: | all, grep, attributeMatch, text, getAttribute, html |
| Example: | document.all.tags("TABLE").attributeMatch (WIDTH="300").html; Results: This returns the html of the table(s) that have a WIDTH attribute set to 300. |

### c lls(n) or cells

| | |
|---|---|
| Returns: | One or all cells in a table row. |
| Preceded by: | Table row. (TR) |
| Followed by: | all, grep, attributeMatch, text, getAttribute, html |

-continued

| | |
|---|---|
| Example: | document.all.tags("TABLE").item( 0).tags("TR").item(4).cells.html; Results: This will give you the HTML for all of the cells (TD tags) in the 5th row of the 1st table in the HTML document. |

### children(n) or children

| | |
|---|---|
| Returns: | This returns children(n) or children. One or all children of form or list. |
| Preceded by: | This element will return one or all children |
| Followed by: | all, grep, attributeMatch, text, getAttribute, html |
| Example: | document.all.tags("FORM").item(0 ).children.html; Results: This returns the html of all children objects of the 1st form. document.all.tags("UL").item(3). children(2).text; Results: Returns the text of the 3rd list item in the 4th unordered list in the document. |

### document

| | |
|---|---|
| Returns: | An HTML document. |
| Preceded by: | |
| Followed by: | all |
| Example: | document.all.html |

### elements(n) or elements

| | |
|---|---|
| Returns: | One or all elements in a form. |
| Preceded by: | FORM |
| Followed by: | all, grep, attributeMatch, text, getAttribute, html |

### getAttribute

| | |
|---|---|
| Description: | The value of the specified attribute from the proceeding tag. |
| Preceded by: | Any tag that has the specified attribute. |
| Followed by: | Nothing. You can not have another method follow this method. |
| Example: | document.all.tags("FRAME").attri buteMatch(NAME="main"). Returns: The SRC attribute from the FRAME tag that is named "main". |

### grep

| | |
|---|---|
| Returned: | This method returns elements containing text that matches the regular expression. |
| Preceded by: | Any method returning an object that contains text to match the regular expression. |
| Followed by: | all, grep, attributeMatch, text, getAttribute, html |

-continued

| | |
|---|---|
| Example: | document.all.tags("TABLE").grep( "Table of Contents").html; Results: Returns all tables that contain the text "Table of Contents" anywhere inside the <TABLE>tags. |

HTML

| | |
|---|---|
| Description: | This method returns the HTML tags and the text in an element. |
| Followed by: | Nothing. You can not have another method follow this method. |
| Example: | document.all.html; |
| Results: | All of the HTML in the document (the original HTML page). |

item(n) or item ("name")

| | |
|---|---|
| Description: | The nth+1 element in a collection of elements, or elements with name specified as an ID or name attribute value. |
| Followed by: | all, grep, attributeMatch, areas, elements, options, rows, children, text, getAttribute, html |
| Example: | document.all.item("sw-Main"). html; Results: Returns the HTML of all elements that contain a NAME-"sw-Main" attribute or an ID-" SW-Main" attribute. |

options(n) or options

| | |
|---|---|
| Description: | Returns one or all options in a form's select list. |
| Preceded by: | Select tag in a form. |
| Followed by: | all, grep, attributeMatch, text, getAttribute, html |
| Example: | document.all.tags("FORM").item(0 ).tags("SELECT").options.html;.i tem(0) Results: Returns the HTML for the options in the 1st Select element in the 1st form of the HTML document. |

rows

| | |
|---|---|
| Description: | Returns one or all rows in a table. |
| Preceded by: | Table. |
| Followed by: | all, cells, grep, attributeMatch, text, getAttribute, html |
| Example: | document.all.tags("TABLE").item( 0).rows(2).cells(0).text; |
| Results: | Returns the text in the 1st cell of the 3rd row in the 1st table of the HTML document. |

tags

| | |
|---|---|
| Description: | Returns all "tag" tags. |
| Followed by: | all, item, grep, attributeMatch, areas, elements, options, rows, children, text, getAttribute, html |
| Example: | document.all.tags("P").html; |

-continued

| | |
|---|---|
| Results: | Returns the HTML for all Paragraph <P> tags in the HTML document. |

text

| | |
|---|---|
| Description: | This element gets the text contained in a list of objects |
| Followed: by | Nothing. You cannot have another method follow this method |
| Example: | document.all.tags("TITLE").item( 0).text |

All Site-Mining Expressions

The following table summarizes all of the site-mining methods that can be used to build site-mining expressions.

| Method | Object Returned by This Method |
|---|---|
| all | All elements contained in an object |
| areas(n) or areas | One or all areas defined in an image map |
| atiributeMatch (name=value[, name=value]) | Elements that contain these attribute name/value pairs |
| cells(n) or cells | One or all cells in a table row |
| children(n) or children | One or all children of an object |
| document | HTML document |
| elements(n) or elements | One or all elements in a form |
| getAttribute("attribute_id") | Value of the attribute |
| grep("regular expression") | Elements containing text that matches the regular expression |
| html | HTML representation of an element |
| item(n)or item ("name") | The nth+1 element in a collection of elements, or elements with name specified as an ID or name attribute value |
| options(n) or options | One or more. |

Methods Used to Get Objects

| Object Needed | Method |
|---|---|
| An HTML document | document |
| All elements contained in an object | all |
| nth+1 element in a list of elements | item(n) |
| Elements with name specified as an ID or name attribute value | item("name") |
| Elements with this HTML tag | tags("tag") |
| Elements with this attribute name and value | attributeMatch(name=value[, name=value]) |
| Elements containing text that matches this regular_expression | grep("regular_expression") |

SW-Transforms

Transform name

Description: a brief description of the method

Syntax: how the transform would appear in your template (either a site-specific template or the globals template)

Example: an example of the sw-transforms

AddHeader

| | |
|---|---|
| Description: | This rule tells the conversion engine to add the meta tag information to the header of a page. |
| Syntax: | sw-transform "Nokia-WAP-Toolkit/ 1.2"<br>AddHeader:META TAG NAME:META TAG VALUE |
| Example: | To add the header, <META name="PalmComputingPlatform" content="true"> to all Web content, you would enter the following text in the globals.txt file:<br>sw-transform "Mozilla/2.0 (compatible;Elaine/1.0)"<br>AddHeader:PalmComputingPlatform: True. |

AddAttributteToTag

| | |
|---|---|
| Description: | This rule tells the conversion engine to add a specific attribute and attribute value to a specific tag. The rule includes the tag name, the attribute and the attribute value, each separated by a colon. |
| Syntax: | sw-transform "Mozilla/2.0 (compatible;Elaine/1.0)"<br>AddAttributeToTag:TAG NAME: ATTRIBUTE NAME "ATTRIBUTE VALUE" |
| Example: | To center heading 2, you would enter:<br>sw-transform "Mozilla/2.0 (compatible;Elaine/1.0)"<br>AddAttributeToTag H2:ALIGN:"CENTER". |

IgnoreGlobalTransformations

| | |
|---|---|
| Description: | This rule tells the conversion engine to ignore theglobal conversions. |
| Syntax: | sw-transform "Nokia-WAP-Toolkit/ 1.2"<br>IgnoreGlobalTransformations |
| Example: | For example, say you applied the sw-transform RemoveAttributeFromTag rule to your Global Rules File so that you could remove all SRC attributes from the IMG tag from all Web sites. Then, you decide you need to display the images for a particular site. You could use the sw-transform IgnoreGlobalTransformations rule in the template forthe site tooverridethe global rule contained in the globals.txt file.<br>sw-transform "Mozilla/2.0 (compatible;Elaine/1.0)" |

IgnoreGlobalTransformations

InsertTextFromFile

| | |
|---|---|
| Description: | This rule tells the conversion engine to insert text from the specified file into the template. |

-continued

| | |
|---|---|
| Syntax: | sw-transform "Mozilla/2.0 (compatible;Elaine/1.0)"<br>InsertTextFromFile:path to file and filename. |
| Example #1: | sw-transform" Mozilla/3.0 (compatible; HandHTTP 1.1 "InsertTextFromFile:c:\ScoutWeb\ CommonTransforms<br>Note: This can be used to create "functions of commonly used sw-transforms by putting common sw-transforms in a file and then referencing that file in a site-specific or globals template using the InsertTextFromFile command. |
| Example #2: | For this HTML code:<br><FRAMESET><br><FRAME SRC=http://main.com" NAME="main"><br><FRAME SRC=http://nav.com" NAME="nav"><br><FRAME SRC=http://banner.com" NAME="banner"><br></FRAMESET><br>If some of the content is desired, the site mining expression would look like this:<br>main=document.all.tags("FRAME"). attributeMatch(NAME="main"). getAttribute("SRC").text;<br>The sw-transform would look like this:<br>sw-transform "Mozilla/3.0 (compatible; HandHTTP 1.1 " InsertTextFromFile:&%main;<br>or<br>If it is desired that the call to http://main.com to go through the conversion engine, then the following code may be provided:<br>sw-transform "Mozilla/3.0 (compatible; HandHTTP 1.1" InsertTextFromFile:http://scoutw eb_server:81/&%main; |

RemoveAttributeFromAllTags

| | |
|---|---|
| Description: | This rule tells the conversion engine to remove a specific attribute (such as the width) from all tags. |
| Syntax: | sw-transform "Mozilla/3.0 (compatible; HandHTTP 1.1" RemoveAttributeFromAllTags: ATTRIBUTE NAME |
| Example: | To remove the WIDTH from all tags, you would enter:<br>sw-transform "Mozilla/3.0 (compatible; HandHTTP 1.1" RemoveAttributeFromAllTags:WIDTH |

RemoveAttributeFromTag

| | |
|---|---|
| Description: | This rule tells the conversion engine to remove a specific attribute from a specific tag. |
| Syntax: | sw-transform "Mozilla/3.0 (compatible; HandHTTP 1.1 RemoveAttributeFromTag:TAG NAME:ATTRIBUTE NAME |
| Example: | To remove the width from a table, the following may be entered:<br>sw-transform "Mozilla/3.0 (compatible; HandHTTP 1.1 " RemoveAttributeFromTag: TABLE:WIDTH |

-continued

| | |
|---|---|
| | To remove the Background attribute from the Body tag, the following may be entered: sw-transform "Mozilla/3.0 (compatible; HandHTTP 1.1" RemoveAttributeFromTag:BODY:BACKGROUND. |

## RemoveComments

| | |
|---|---|
| Description: | This rule tells the conversion engine to remove the comments tag from a Web site or specific Web content. (Comments include both general information on the page (such as: <!...text...>) and information actually within the <COMMENT> tag.) |
| Syntax: | sw-transform "Mozilla/3.0 (compatible; HandHTTP 1.1 " RemoveComments |
| Example: | To remove comments, the following may be entered: sw-transform "Mozilla/3.0 (compatible; HandHTTP 1.1 " RemoveComments |

## RemoveTag

| | |
|---|---|
| Description: | This rule tells the conversion engine to remove a specific tag from a Web site or Web content, but leave the text or other HTML that lies within the tag. |
| Syntax: | sw-transform "Mozilla/3.0 (compatible; HandHTTP 1.1 " RemoveTag:TAG NAME |
| Example: | To remove all images from a site the following may be entered: sw-transform "Mozilla/3.0 (compatible; HandHTTP 1.1 " RemoveTag:IMG |

Note:
This tag will always work, even if the Web content you are transforming generally contains poorly formatted HTML.

## RemoveTagAndContent

| | |
|---|---|
| Description: | This rule tells the conversion engine to remove a specific tag, and the information that appears within the tags, from a Web site or Web content. |
| Syntax: | sw-transform "Mozilla/3.0 (compatible; HandHTTP 1.1 " RemoveTagAndContent:TAG |
| Example: | To remove the SCRIPT tag so that all of the client-side script on a specific Web site or page is removed, the following may be entered: sw-transform "Mozilla/3.0 (compatible; HandHTTP 1.1 "SCRIPT |

Note:
The RemoveTagandContent tag will not be completely effective if the Web content being transformed is poorly formatted (e.g., there is an open tag without a close tag). The conversion engine will attempt to clean up the HTML, but may not be completely effective. Also, this tag does not have any meaning for empty tags.

## ReplaceTag

| | |
|---|---|
| Description: | This rule tells the conversion engine to replace one tag with another. |

-continued

| | |
|---|---|
| Syntax: | sw-transform "Mozilla/3.0 (compatible; HandHTTP 1.1 " ReplaceTag:ORIGINAL TAG:NEW TAG |
| Example: | To remove all of the I tags and replace them with B, so that all of the text that appears italicized on a Web page appears bold on the mobile device screen, the following may be entered: sw-transform "Mozilla/3.0 (compatible; HandHTTP 1.1 " ReplaceTag:I:B. |

## SetAttributeValue

| | |
|---|---|
| Description: | This rule tells the conversion engine to set a specific value for a specific attribute of a specific tag. The attribute must already be present in the tag for this to work. This rule includes the tag name, attribute name, and value, all separated by colons. |
| Syntax: | sw-transform "Nokia-WAP-Toolkit/ 1.2" SetAttributeValue:TAG:ATTRIBUTE: ATTRIBUTE VALUE |
| Example: | To give all tables a width of 150, the following may be entered: sw-transform "Nokia-WAP-Toolkitl 1.2" SetAttributeValue:TABLE:WIDTH:"1 50" To make the font 2 pt, you would enter: sw-transform " Nokia-WAP-Toolkit/ 1.2" SetAttributeValue:FONT:SIZE:"2" |

## Stop

| | |
|---|---|
| Description: | This rule tells the conversion engine to stop processing all sw-transforms that follow in a template. This can be used at the end of a site-specific template file to keep the conversion engine from performing Global transforms. |
| Syntax: | sw-transform "Nokia-WAP-Toolkit/ 1.2" STOP |
| Example: | sw-transform "Nokia-WAP-Toolkit/ 1.2"RemoveComments sw-transform "Nokia-WAP-Toolkit/ 1.2"RemoveTag:B sw-transform "Nokia-WAP-Toolkit/ 1.2" STOP sw-transform "Nokia-WAP-Toolkit/ 1.2" RemoveTag:I (Not performed because the stop is above this last transform.). |

## Substitute

| | |
|---|---|
| Description: | This rule tells the conversion engine to substitute one sequence of text for another sequence of text. You can substitute anything within or outside tags. This conversion works like a find and replace function. This transform is a regular expression. You can make substitutions in one of four ways: 1. Add "i" to the end of the conversion if you want to substitute the first instance of the text regardless of case. |

-continued

| | |
|---|---|
| | 2. Add "g" to the end of the conversion if you want to do a case-sensitive global substitution. |
| | 3. Add "i" and "g" to the end of the tag if you want to perform a global, case insensitive substitution. |
| | 4. Don't add anything to the end of the tag if you want to perform case sensitive substitution of the first instance of the text. |
| Syntax: | sw-transform "Nokia-WAP-Toolkit/ 1.2" Substitute:ORIGINAL TEXT:NEW TEXT:(i,g) parameters, or none of the above. |
| | Note: ORIGINAL TEXT is a regular expression |
| Example: | To remove text such as, "<Title>Aether Softwares' Daily Product Update</Title>" and replace it with <Title>ScoutWeb Update<Title>, you would enter: |
| | sw-transform "Nokia-WAP-Toolkit/ 1.2" Substitute:Aether Softwares' Daily Product Update:ScoutWeb Update:ig |

TranslateTables

| | |
|---|---|
| Description: | This rule tells the conversion engine to remove the table formatting and make the table contents appear as straight text. |
| Syntax: | sw-transform "Nokia-WAP-Toolkit/ 1.2" TranslateTables |
| Example: | <TABLE BORDER=0 CELLPADDING="0" CELLSPACING="0"> |

```
done using rows
<tr>
<td><input type="text" value=
"one" size=7 maxlength=10
name="symbol"></td>
<td><input type="text"
value="two" size=7 maxlength=10
name="symbol"></td>
<td><input type="text"
value="three" size=7
maxlength=10 name="symbol"></td>
<td><input type="text"
value="four" size=7 maxlength=10
name="symbol"></td>
<td><input type="text"
value="five" size=7 maxlength=10
name="symbol"></td>    </tr>
<tr>
<td><input type="text"
value="six" size=7 maxlength=10
name="symbol"></td>
<td><input type="text"
value="seven" size=7
maxlength=10 name="symbol"></td>
<td><input type="text"
value="eight" size=7
maxlength=10 name="symbol"></td>
<td><input type="text"
value="nine" size=7 maxlength=10
name="symbol"></td>
<td><input type="text"
value="ten" size=7 maxlength=10
name="symbol"></td>
</tr>
</TABLE>
<BR>
After TranslateTables
iinput type="text" value ="one"
size=7 maxlength=10
name="symbol">   
  
<input type="text" value="two"
size=7 maxlength=10
name="symbol">   
  
<input type="text" value="three"
size=7 maxlength=10
name="symbol">   
  
<input type="text" value="four"
size=7 maxlength=10
name="symbol">   
  
<input type="text" value="five"
size=7 maxlength=10
name="symbol">   
  
<input type="text" value="six"
size=7 maxlength=10
name="symbol">   
  
<input type="text" value="seven"
size=7 maxlength=10
name="symbol">   &
nbsp; 
<input type="text" value="eight"
size=7 maxlength=10 name="sym
bol">    &nb
sp;.
<input type="text" value="nine"
size=7 maxlength=10 name="sym
bol">    &ns
p;
<input type="text" value="ten"
size=7 maxlength=10
name="symbol">   
  
```

## Computer Implementation

The techniques of the present invention may be implemented on a computing unit such as that depicted in FIG. **11**. In this regard, FIG. **11** is an illustration of a computer system which is also capable of implementing some or all of the computer processing in accordance with computer implemented embodiments of the present invention. The procedures described herein are presented in terms of program procedures executed on, for example, a computer or network of computers.

Viewed externally in FIG. **11**, a computer system designated by reference numeral **1100** has a computer portion **1102** having disk drives **1104** and **1106**. Disk drive indications **1104** and **1106** are merely symbolic of a number of disk drives which might be accommodated by the computer system. Typically, these would include a floppy disk drive **1104**, a hard disk drive (not shown externally) and a CD ROM indicated by slot **1106**. The number and type of drives vary, typically with different computer configurations. Disk drives **1104** and **1106** are in fact optional, and for space considerations, are easily omitted from the computer system used in conjunction with the production process/apparatus described herein.

The computer system also has an optional display **1108** upon which information, such as the screens illustrated in FIGS. **4** and/or **8** may be displayed. In some situations, a keyboard **1110** and a mouse **1112** are provided as input devices through which input may be provided, thus allowing input to interface with the central processing unit **1102**. Then again, for enhanced portability, the keyboard **1110** is either a limited function keyboard or omitted in its entirety. In addition, mouse **1112** optionally is a touch pad control device, or a track ball device, or even omitted in its entirety as well, and similarly may be used as an input device. In addition, the computer system **1100** may also optionally include at least one infrared (or radio) transmitter and/or infrared (or radio) receiver for either transmitting and/or receiving infrared signals.

Although computer system **1100** is illustrated having a single processor, a single hard disk drive and a single local memory, the system **1100** is optionally suitably equipped with any multitude or combination of processors or storage devices. Computer system **1100** is, in point of fact, able to be replaced by, or combined with, any suitable processing system operative in accordance with the principles of the present invention, including hand-held, laptop/notebook, mini, mainframe and super computers, as well as processing system network combinations of the same.

FIG. **12** illustrates a block diagram of the internal hardware of the computer system **1100** of FIG. **11**. A bus **1202** serves as the main information highway interconnecting the other components of the computer system **1100**. CPU **1204** is the central processing unit of the system, performing calculations and logic operations required to execute a program. Read only memory (ROM) **1206** and random access memory (RAM) **1208** constitute the main memory of the computer **1102**. Disk controller **1210** interfaces one or more disk drives to the system bus **1202**. These disk drives are, for example, floppy disk drives such as **1104** or **1106**, or CD ROM or DVD (digital video disks) drive such as **1212**, or internal or external hard drives **1214**. As indicated previously, these various disk drives and disk controllers are optional devices.

A display interface **1218** interfaces display **1208** and permits information from the bus **1202** to be displayed on the display **1108**. Again as indicated, display **1108** is also an optional accessory. For example, display **1108** could be substituted or omitted. Communications with external devices, for example, the other components of the system described herein, occur utilizing communication port **1516**. For example, optical fibers and/or electrical cables and/or conductors and/or optical communication (e.g., infrared, and the like) and/or wireless communication (e.g., radio frequency (RF), and the like) can be used as the transport medium between the external devices and communication port **1516**. Peripheral interface **1520** interfaces the keyboard **1410** and the mouse **1412**, permitting input data to be transmitted to the bus **1502**.

In alternate embodiments, the above-identified CPU **1204**, may be replaced by or combined with any other suitable processing circuits, including programmable logic devices, such as PALs (programmable array logic) and PLAs (programmable logic arrays). DSPs (digital signal processors), FPGAs (field programmable gate arrays), ASICs (application specific integrated circuits), VLSIs (very large scale integrated circuits) or the like.

One of the implementations of the invention is as sets of instructions resident in the random access memory **1208** of one or more computer systems **1100** configured generally as described above. Until required by the computer system, the set of instructions may be stored in another computer readable memory, for example, in the hard disk drive **1214**, or in a removable memory such as an optical disk for eventual use in the CD-ROM **1212** or in a floppy disk for eventual use in a floppy disk drive **1104**, **1106**. Further, the set of instructions (such as those written in the Java programming language) can be stored in the memory of another computer and transmitted in a transmission means such as a local area network or a wide area network such as the Internet **114** when desired by the user. One skilled in the art knows that storage or transmission of the computer program product changes the medium electrically, magnetically, or chemically so that the medium carries computer readable information.

The many features and advantages of the invention are apparent from the detailed specification, and thus, it is intended by the appended claims to cover all such features and advantages of the invention which fall within the true spirit and scope of the invention. Further, since numerous modifications and variations will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation illustrated and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention. While the foregoing invention has been described in detail by way of illustration and example of preferred embodiments, numerous modifications, substitutions, and alterations are possible without departing from the scope of the invention defined in the following claims.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is as follows:

**1**. A system for extracting and reformatting web page content into a format readable on a mobile device, comprising:

a receiving module to receive a secure user request from said mobile device for a web page having a first format;

a physical proxy server that receives said user request from said mobile device, forwards said request to a physical origin web server, receives said requested web page having said first format from said physical origin web server, site-mines said web page to extract content from said web page according to a predefined criteria, and reformats at least a portion of said site-mined content from said web page having said first format, for transmission to said mobile device, in accordance with at least one of a type of content viewer and a type of operating system associated with said mobile device said content is viewable on.

**2**. The system according to claim **1**, wherein said physical proxy server comprises:

a storage repository that contains at least one data file associated with each of said mobile device; and

a conversion engine that receives said requested web page and site-mines and reformats at least a portion of said content from said web page having said first format, for transmission to said mobile device, in accordance with one or more predetermined instructions in each of said at least one data file associated with each of said mobile device.

**3**. The system according to claim **2**, further comprising:

a cache that stores said requested web page prior to transmitting said extracted and reformatted web content to said mobile device.

**4**. The system according to claim **1**, wherein:

at least one of said data files is defined for at least two mobile devices having a predefined common characteristic.

5. The system according to claim 4, wherein said predefined characteristic is at least one of:

a type of operating system,

a type of browser, and

a manufacturer.

6. The system according to claim 1, wherein:

at least one of said data files is defined for a particular type of said mobile device.

7. The system according to claim 6, wherein:

said particular type of said mobile device is defined by said manufacturer and model.

8. The system according to claim 1, wherein:

said secure connection is provided by using a secure socket layer connection.

9. The system according to claim 1, wherein:

a secure connection is provided between said physical proxy server and said physical origin web server.

10. The system according to claim 9, wherein:

said secure connection is a secure socket layer connection.

11. A method for extracting, filtering and reformatting web page content into a format readable on a mobile device at a physical proxy server, comprising:

site-mining to extract content from a web page according to a predefined criteria at said physical proxy server;

reformatting, at said physical proxy server, said site-mined web page content in accordance with a limitation associated with said mobile device said web page site-mined desired content is viewable on, said limitation comprising at least one of a type of content viewer and a type of operating system provided by said mobile device; and

transmitting said filtered and reformatted web page content to said mobile device.

12. A system for reformatting content into a format readable on a mobile device, comprising:

a site-miner, at a physical proxy server, said site-miner to extract content from a web page according to a predefined criteria;

a reformatter, at said physical proxy server, to reformat said site-mined desired content in accordance with a limitation associated with said mobile device said site-mined desired content is viewable on, said limitation comprising at least one of a type of content viewer and a type of operating system provided by said mobile device; and

a transmitter to transmit said filtered and reformatted content to said mobile device.

13. A system for reformatting web page content into a format readable on a mobile device, comprising:

a site-mining module, at a physical proxy server, to extract content from a web page according to a predefined criteria;

a reformatting module, at said physical proxy server, to reformat said site-mined desired content in accordance with said limitation associated with said mobile device said site-mined desired content is viewable on, said reformatting module comprising at least one of a type of content viewer and a type of operating system associated with said mobile device; and

a transmitting module to transmit said filtered and reformatted web page content to said mobile device.

14. A method for extracting and reformatting web page content into a format tailored for a mobile device, comprising:

providing a connection between said mobile device and a physical proxy server;

providing mobile device related information to said physical proxy server from said mobile device, said mobile device related information comprising at least one of a type of content viewer and a type of operating system associated with said mobile device;

receiving a web page from a physical origin web server;

site-mining, at said physical proxy server, to extract content from said web page according to a predefined criteria;

conversion, at said physical proxy server, of said site-mined content based on said mobile device related information; and

forwarding said converted content to said mobile device.

15. The method for extracting and reformatting web page content into a format readable on a mobile device according to claim 14, wherein:

said mobile device related information is provided to said proxy physical server from said mobile device in a header.

16. The method for extracting and reformatting web page content into a format readable on a mobile device according to claim 14, further comprising:

comparing said mobile device related information to a client value stored in said physical proxy server for said mobile device.

17. The method for extracting and reformatting web page content into a format readable on a mobile device according to claim 14, wherein said mobile device related information is at least one of:

a make;

a model;

a Web browser type; and

an operating system.

18. A physical proxy server for extracting and reformatting web page content into a format tailored for a mobile device, comprising:

a first communication channel to establish communications between said mobile device and said physical proxy server and to provide mobile device related information to said physical proxy server from said mobile device, said mobile device related information comprising at least one of a type of content viewer and a type of operating system associated with said mobile device;

a second communication channel to establish communications between said physical proxy server and a physical origin web server;

a site-miner to extract content from a web page according to a predefined criteria;

a converter to convert said site-mined content based on mobile device related information received over said first communications channel; and

a forwarder to forward said converted site-mined subset of content to said mobile device.

19. The physical proxy server according to claim 18, wherein:

said mobile device related information is provided in a header.

20. The physical proxy server according to claim 18, further comprising:

a comparator to compare said client device related information to a mobile value stored in said physical proxy server for said mobile device.

21. The physical proxy server according to claim 18, wherein said mobile device related information is at least one of:

a make;

a model;

a Web browser type; and

an operating system.

**22**. Apparatus for extracting and reformatting web page content into a format tailored for a mobile device, comprising:

a connection module to provide a connection between said mobile device and a physical proxy server;

an information module to provide mobile device related information to said physical proxy server from said mobile device, said mobile device related information comprising at least one of a type of content viewer and a type of operating system associated with said mobile device;

a site-mining module to extract content from a web page according to a predefined criteria;

a conversion module, at said physical proxy server, to convert said site-mined content based on said mobile device related information; and

a forwarding module to forward said converted content to said mobile device.

**23**. The apparatus for extracting and reformatting web page content into a format readable on a mobile device according to claim **22**, wherein:

said information module provides said mobile device related information to said physical proxy server from said mobile device in a header.

**24**. The apparatus for extracting and reformatting web page content into a format readable on a mobile device according to claim **22**, further comprising:

a comparison module to compare said mobile device related information to a client value stored in said physical proxy server for said mobile device.

**25**. The apparatus for extracting and reformatting web page content into a format readable on a mobile device according to claim **22**, wherein said client device related information is at least one of:

a make;

a model;

a Web browser type; and

an operating system.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

# CERTIFICATE OF CORRECTION



PATENT NO. : 7,574,486 B1
APPLICATION NO. : 09/707770
DATED : August 11, 2009
INVENTOR(S) : Cheng et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Title Page:

The first or sole Notice should read --

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 970 days.

Signed and Sealed this

Seventh Day of September, 2010

David J. Kappos

David J. Kappos
*Director of the United States Patent and Trademark Office*