CUSTOMISATION OF WEBPAGE CONTENTS ON MOBILE INTERNET PORTALS

MOHD KHAIRUL HUSAINI BIN HARUN AND DANIEL KUEN SEONG SU
The University of Nottingham, Jalan Broga, 43500 Semenyih, Selangor Darul Ehsan, Malaysia
{pulsdriver101x@hotmail.com, daniel.su@nottingham.edu.my}

Abstract. The aim of this paper is investigating the undergoing webpage contents inherent from a small screen display. We proposed customisation of webpage contents by partitioning and grouping them into cohesive logical blocks. Additionally, the foldable page mechanism automates and reorganises the web layout structures dynamically in order to display what the users' interest in a limited screen dimension. The customisation of webpage contents intends to ease the navigation activity, and increases the browsing experience in satisfying the mobile users' requirements.

1. Introduction

Mobile Internet is primarily an outcome generated from the combination of two major demand drivers; the Internet and mobile communications (Kim, 2001; Srivastava, 2002). Mobile Internet has now grown into the mainstreams of the global e-business, functions as a "universal marketplace" that provides organisations a new approach to how they operate their businesses (Andersson and Svensson, 1999). Mobile Internet has also introduced a new trend to human lifestyles and simplified many daily activities such as news, local events, sports, politics, hobbies, and education (Andersson and Svensson, 1999). Virtually all of the mobile phones today are equipped with WAP (Wireless Application Protocol) that enables direct and wireless access to the Internet. The Internet is abstracted to the mobile phones and other handheld devices via mobile browsers with the presence of content adaptation applications. Hence, the need of having customised webpage is very important, considering the fact that mobile Internet rely heavily upon the applications to customise its contents. Several negative scenarios can be simulated when customisation of the webpage contents is not being

implemented on mobile Internet. The obvious problem is the webpage contents are left unstructured which the navigation menus, text, images, videos and audios are crumpled together into the limited screen display. This may cause severe delays when users browse the Internet to achieve their goals. Apart from that, loading of webpage becomes significantly slow since images, videos and audios are not filtered to a suitable quality with respect to the bandwidth allocated for browsing Internet on mobile devices. Research statistics typified that several major usability problems suffer from poor navigation control and the occurrence percentages indicated that navigation system (28.7%), finding contents (37.2%), presentation (19.7%) and structure of the webpage (14.6%) occur on typical mobile Internet portals (Kim, Kim, Lee, Chae, and Choi, 2002). Furthermore, a comprehensive research study exemplified that it is merely impossible to place a normal navigational system used by larger screen where the usability rule has been proposed to 7 (+/- 2) items in a menu (Chae and Kim, 2004; Stensgaard, 2003). In addition, there are insufficient navigational aids such as hyperlinks, and forward/backward navigation reported very inconsistent on the user interfaces of mobile phones (Kaikkonen, 2005). Unstructured webpages relatively showed that error rates increase from 4.0% to 34.0% as depth increase from one to 6th levels of hierarchy, thus increasing the chances of users may be choosing an incorrect pathway to achieve their goals or to complete their tasks (Chae and Kim, 2004). Therefore, the aim of this paper is to customise webpage contents that serve as an intelligent mechanism to partition and group the contents into logical cohesive blocks according to its categories. Additionally, we proposed foldable page as to supplement the customised webpages' contents in automating and organising the contents dynamically to provide a better browsing experience for mobile users.

2. Literature Review

Customisation of webpage is defined as content adaptation i.e., compressing and transforming text, images, and the layout of an original webpage to the users' computing environment in mobile devices (Sonera, 2004). Numerous research work and experiments have been conducted to improve the webpages contents such as (Cai, 2006; Gu, Chen, Ma, and Chen; 2002; Mohomed, Cai, Chavoshi, and Lara, 2006). Customisation of webpage elements encompasses navigational system, finding contents, presentation and structure layout of the webpages to convert full traditional webpages into mobile devices (Cai, 2006). The functionalities of customised webpage is only limited to transforming the available web contents using several methods such as abstracting the web contents from the Internet into mobile browsers. This allowed the full-webpages transformed to a new web layout

structure dedicated to mobile browsers. It is important to understand how these web contents are translated from an initial HTML (Hyper Text Markup Language) form to WML (Wireless Markup Language) form. The method used for translating HTML to WML is called format conversion. Contents from the initial HTML webpage are translated to WML where they are being split into several decks of card so that all of the contents are able to fit into the small screen devices. Links are also placed between those cards for efficient browsing experience. Customised the web layout enhances the navigation system in mobile screen devices (Stensgaard, 2003). Majority of the mobile users are encountering difficulties in navigating around the webpages, and some of them claimed that they have been lost in the webpages while browsing. Foldable of webpages allow the entire contents in a full-web scale to be folded into several sections without deliberately breaking the contents into several pages or deep hierarchy levels. Research outcomes exemplified that the average link selection, backtrack selection, and page navigation activities inherent from small screen interfaces significantly enforce users to scroll more than twice the amount of up/down and make use of right/left scrolling frequently (Stensgaard, 2003). Hence, customisation of webpage contents enables narrow layout with an additional foldable display to maximise the navigation activities on small screen interfaces. It is feasible for customisation of webpage contents implemented using block partitioning method in which it partitions the webpage contents into several logical and cohesive blocks, and folds the webpage contents in order to minimise the amount of vertical scrolling and hierarchy levels when browsing the mobile Internet portals. Implicitly, the block partitioning is a process where a full-webpage is divided into several logical blocks allowing users to zoom and enlarge the parts or portions of the webpages as to increase the visualisation when browsing the webpages' contents on limited screen dimension (Gu, Chen, Ma, and Chen, 2002).

3. Research Design Rationale

Customisation of webpage contents deal with restructuring the contents that have been extracted by the content adaptation services. Upon retrieval of webpage contents, the customised webpage mechanism automates the intelligent agent to structure and organise the relevant webpage contents into logical cohesive blocks, partitions and categories the blocks into logical units. This process involves the extraction of specific rules and conditions from the metadata stored in the main repository in the knowledge base. The extracted contents are then being abstracted and partitioned into blocks, following by the filtering of web elements (spaces, images, and text). The mechanism of foldable webpage is then fired to reorganise the customised webpage contents

into a new narrow layout structure before displaying on the layout application. Buchanan, Farrant, Jones, Thimbleby, Marsden, and Pazzani (2001) significantly reported that vertical scrolling reasonably promotes navigation scrolling as compared to the horizontal scrolling. Thus, we proposed vertically scrolling as a mechanism to work around on small screen display. We safely believe that vertical scrolling mechanism is favorable to promote and ease the navigation activity, and indirectly increase the browsing experience. The partitioning of web contents into several blocks consists of several functions as illustrated in Figure 1. The partitioning mechanism fires the intelligent agent to search for repetitive layout patterns such as common sub-topics or common objects in retrieving the layout pattern repetitions. The mechanism divides the contents of the webpages into their respective similar group named as blocks thus forming the web components. The repetitive layout patterns can be determined by producing an automate string tree construction for the webpage contents as shown in Figures 2 and 3. Consecutively, the webpages' contents are grouped to their respective blocks in order to decide which element in the group is collapsed to hyperlinks, and which element is hidden behind the text blocks. Mobile users may view all of the web hidden contents (contents that have been collapsed) by clicking on the hyperlinks. Foldable page basically folds the webpage contents just like an A4 paper being folded into several sections. The foldable page intelligent agent triggers the narrow layout structure to fold and organise the webpage contents into several multiple chunks according to its categorisation. This effort aims to reduce the amount of vertical scrolling in a narrow layout required by the mobile users to ease the navigation, and thus improving the usability of browsing the webpage contents on small screen display as illustrated in Figures 4 and 5.

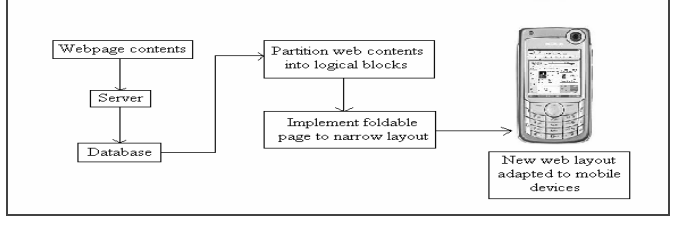


Figure 1. Framework for customization of webpage contents.

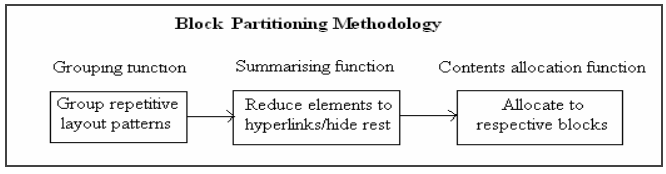


Figure 2. Block partitioning method.

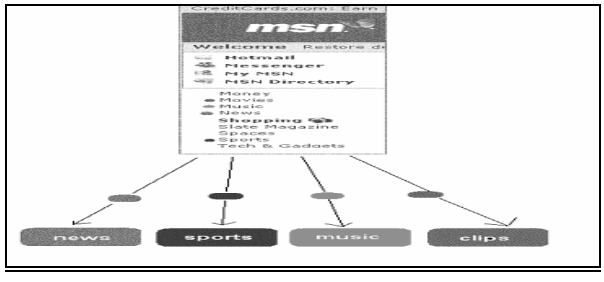


Figure 3. Block partitioning method in physical layout.

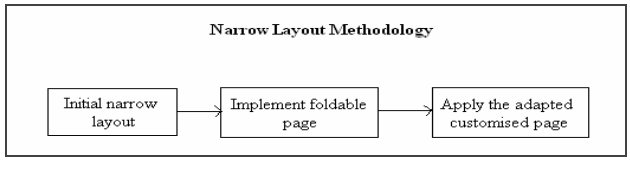


Figure 4. Foldable Page – Narrow layout method.

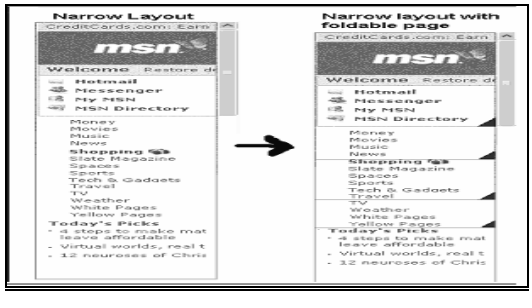
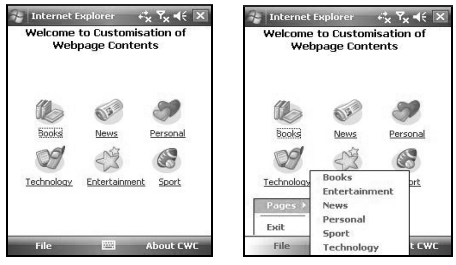


Figure 5. Foldable Page – Narrow layout methodology in physical layout.

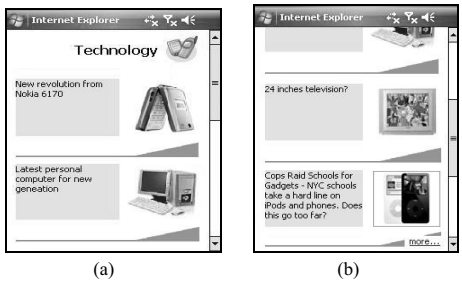
4. Results and Discussions

The webpage contents are partitioned and organised according to their categories. Each of the items is iconised in a graphical representation as shown in Figure 6(a). We provide an alternative text-based menu for mobile users who prefer text representation as illustrated in Figure 6(b). The graphical- and text-based menu representations are consistent to ease the navigation activity. Mobile users can either make use of the icons to select their preferred contents' category or simply select the entries from the list to accomplish their tasks. The intelligent agent is invoked to customise the webpage contents that have been abstracted and simplified from the knowledge base before organising them into cohesive logical blocks. Figures 7(a) and 7(b) demonstrates the possible selection that the mobile users have made. For instance, when the users have selected the "Technology" block, the customised webpage mechanism directs the mobile users to a variety of relevant contents that is relevant to the topics or sub-topics of the selection made. The webpage contents are displayed in a thumbnail fashion with short description about the relevant topics. This attempt facilitates in reducing the amount of screen display, so that more relevant topics can be partitioned and placed on the limited screen dimension. The vertical scrolling aims to work hand in hand with the narrow layout structure to create webpage contents that are foldable. The foldable page provides mobile users an alternative way to browse the webpage contents more efficiently rather than reading the entire contents as illustrated in Figures 7(a) and (b). This effort significantly prevents mobile users from getting lost in the heap of information when browsing the contents in a small screen interface. Once the mobile users have made the right selection (clicking at the triangular button – Figure 7 (b)), the foldable page mechanism submits the users' requests to the specific metadata stored in the customisation repository before expanding the full contents and displaying on the layout interface. The level of interaction has been significantly eliminated without the need of browsing multiple hierarchical levels, and thus allowing mobile users to navigate freely by using the vertical scroll bar embedded on the user interface. The intelligent mechanism programmed in the foldable page offers broader flexibility that enables mobile users to browse other topics or sub-topics by clicking the "Back" option displayed on the user interface. The "Home" option is designed with the intention to decrease the possibilities by selecting the "Back" option repetitively which may create difficult scenario for novice mobile users from getting lost easily.



(a) (b)

Figure 6. (a) Block icon and (b) block text-list.



(a) (b)

Figure 7. (a) "Technology" option and (b) "Technology" option is being scrolled down.

5. Conclusion

The customisation of webpage contents relatively enhances the navigation activity by meeting specific users' requirements as to increase the users' satisfaction. The need of having customisation mechanism for webpage contents on mobile Internet portals has become very essential due to the lack of screen space, and the poorly Internet browsing capabilities offered by typical mobile devices such as cellular phones. The block partitioning mechanism and the narrow layout structure enable the webpage contents to be made foldable. The foldable page folds the webpage contents dynamically to present the abstract and detail contents by restructuring the logical block units in the layout structure. The proposed methodology has eliminated the hassle of browsing the contents horizontally that may create tendency in getting lost in the overwhelming of information on mobile Internet portals. In short, customisation of webpage contents, block partitioning and foldable

page offer greater browsing experience especially when interacting with the mobile Internet portals in a mobility environment.

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