SEPANG: ADVANCES IN MOBILE MESSAGING

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Abstract. We present SEPANG, SEquential dial and PAge zoomiNG, a navigation-based technique for mobile messaging which designed to extend the navigation-based interaction. Instead of dragging the scroll bar, or using repetitive clicks and key presses to scroll down, SEPANG offers users to use free gesture input on the messages' surface in order to read and interact with the messages freely. Additionally, SEPANG provides eyes-free tracking as users unnecessary to keep track of the scrolling control but focusing on the reading task alone. The zooming mechanism designed to increase the readability and visibility on the mobile messages.

1. Introduction

Navigation controls are difficult to design correctly particularly when transferring from the desktop navigation scheme to a mobility environment. Some considerations have been taken greatly such as placement of focus on the screen, small size of the screen and the limited control capabilities. Users of mobile devices often need to focus on more than one task (Kristoffersen and Ljungberg, 1999). Navigation technique that demands too much attention may distract the users. According to Gorienko and Merrick (2003) eye-free interaction provides the greatest freedom of movement during interaction as visual attention may limit the body movement. Scrolling is one of the most fundamental activities for reading activities. In an analysis of five-hour web used, users spent 40 minutes for scrolling (Wallace, Savage, and Cockburn, 2004). The research results eventually showed that users spent lots of time for navigation and interaction and therefore, a good interaction design and navigation technique should be the essential aspect to improve users' performance.

Scroll bar is used as control mechanism for document larger than the screen. When reading a column of text, users usually prefer to have continuous scrolls which do not have to keep their hand to hold the button down at all time. In mobility environment, users are required clicking at the arrow at the end of the scrollbar in order to read a document or message. This situation obviously decreases the performance when a longer document is scrolled. Users are allowed clicking in the middle of the scroll bar to jump to the desired point of the screen. Nonetheless, this action is unorganised and cumbersome. The interaction design to support navigation becomes more challenging and the complexity of an application increases from time to time especially for the mobile users who may be reading messages when they are walking, sitting or standing (Spence, 1999). Hence, the aim of this paper is to propose an appropriate scrolling technique which advances the navigation and interaction design on mobile messaging.

2. Literature Review

Mobile users are encountering the smaller viewing areas and limited input mechanism (Brewster, 2002). Consequently, the visualisations of human eyes are potentially restricted on various scrolling activities when viewing the longer messages on small screen display. According to Savage (2004), an optimal image that can be tolerated by retinal is around 2 degrees per second and up to 3 degrees for a person with good sight without an effect of blurring. Scrolling activities are likely to impact speed and execution of time for tasks performed on Personal Digital Assistants (PDAs) (Kim and Albers, 2001). The conventional scroll bar used in handheld devices is designed as a miniaturised version of Personal Computers (PCs) scrollbar. As a result, this affects significantly the speed of scrolling activities for mobile phones (Myers, Kin, and Bo, 2000). The effort to reduce difficulties on mobile messaging is to provide navigation techniques that match users' needs. Jones, Marsden, Nasir, Boone, and Buchanan (1999) commented that most scrolling direction on small screen is to scroll downward and to the right. It is important to ensure that users are familiar with their devices, and the navigation technique should be clear for the users to associate activity on the display movement within the navigation system.

2.1. MOBILITY CONDITION

The conditions and gestures of mobile users varied widely. In terms of human perception, reading is a continuous activity in which information is viewed and processed (Kim and Albers, 2001). This involves the interaction in visualising, monitoring and inferring between the mobile phones and the

users. Specifically, mobile users are required to continue be in motion while at the same time interacting with the mobile messaging. Sitting allows a position on the lower part of the body to rest on a seat or other types of support as illustrated in Figure 1(a). In this condition, users' performances are more manageable compares to other conditions. This advantage does not indicate that users can navigate the reading task without any difficulties. Lightness navigation or scrolling technique is preferred to increase the users' satisfaction. The walking then stop (stand) usually occurs when mobile users find difficulties in navigating the reading task. Thus, they stop to complete the reading task as shown in Figure 1(b). Constant speed of scrolling technique may be a positive contribution for this constraint. Continuous walking often occurs on mobile users and therefore requires users to afford extra concentration in order to walk and interact with the mobile messaging. Navigation technique that supports less concentration such as eyes-free tracking control plays an important role to assist this group of users (see Figure 1(c)).

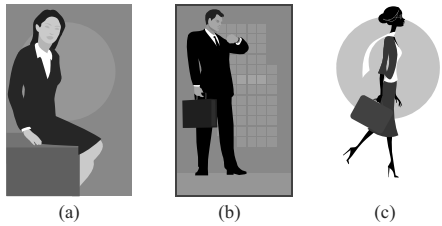


Figure 1. (a) Sitting condition, (b) standing condition, and (c) walking condition.

2.2. SCROLLING TECHNIQUE

Radial scrolling is one of navigation techniques used for documents scrolling (Smith and Schraefel, 2004). This technique does not depend on the documents length but allow users to scroll quickly and accurately. It is considered an effective technique on scrolling for touch-based devices. Users move the stylus in a circular motion over the radial line. In a short documents, radial scroll performs better than traditional techniques, but in long documents, scroll bar performs better (MacKay, Dearman, Inkpen, and Watters, 2005; Smith and Schraefel, 2004). When users are focusing on the documents rather than the control tool, they often slipped off from the center and paused them from scrolling until they go back to the circle (Wang, Zhang, and Dai, 2007). Moreover, it is difficult to track a perfect curving

successfully, and the documents appeared tend to be bounced up and down. Curve Dial is another technique that following curvature of the path created by pen (Smith, Schraefel, and Baudisch, 2005). It provides eyes-free technique since it does not require users to keep track of the menu center. Curve dial is location independent which does not depend on the length of the documents, unlike the scroll bar. The informal users' evaluation indicated that curve dial performs better than conventional scrolling and radial scrolling (Smith, Schraefel, and Baudisch, 2005). Virtual scroll ring maps the circular motion by pointing the device into vertical scrolling motion. This provides users a continuous motion and precise control with clockwise motion scroll to view down and counter clockwise motion to scroll up (Moscovich and Hughes, 2004). This technique uses position relative to an adaptive center of revolution, so that users focus more on the documents rather than the widget. Unfortunately, this method can be confusing for rapid scrolling, as it provides no kinetic feedback of the scrolling rate. In short, extensive study on various scrolling techniques typified that neither the curve dials nor virtual scroll increase the ease of navigation and interaction especially to be applied on mobile applications. The summary of various scrolling techniques is compared and documented in Table 1. In mobility environment, a constant speed to control the scrolling is needed. Particularly, this often produces accidental rapid movement and somehow affects the scrolling gestures when the body motion is moving and reading at the same time. Users may not be able to produce a perfect curve or circle motion every time. When the scrolling speed is too fast, users may skip on several pages or the information may become blurred. Hence, we proposed SEPANG (SEquential dial + PAge zoomiNG) as to provide consistent speed and eyes-free tracking of any gestures to perform the scrolling on the small screen display. Additionally, zooming functionality supplements the longer messages to ease the navigation and interaction, and indirectly promotes users' satisfaction on mobile messaging.

TABLE 1. Summary of comparison on scrolling techniques.

Criteria	RS	CD	VSR	SG
Independent of length of document	Yes	Yes	Yes	**Yes**
Fixed Scrolling Speed	No	No	No	**Yes**
Specific Controlling Motion Required	Yes	Yes	Yes	**No**
Eyes-free technique	No	Yes	Yes	**Yes**

*RS: Radial Scroll, CD: Curve Dial, VSR: Virtual Scroll Ring, SG: SEPANG.

3. Research Design and Methodology

The research framework proposed for SEPANG modified from (Spence, 1999). The model of navigation is initiated by retrieving moGbile message associated with the input recognition (stylus or hand). The users' recognition is then processed automatically with the logic and algorithm stored in the main repository loaded from the intelligent agent in order to generalise the input mechanism. The intelligent agent, SEPANG automates the relevant heuristics to specify the logic to be loaded and executes the appropriate mechanism of the relevant scrolling and zooming on mobile messages, as illustrated in Figure 2.

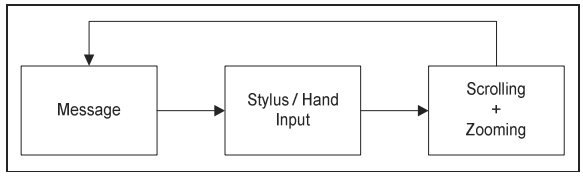


Figure 2. Framework of SEPANG.

4. Results and Discussions

The intelligent agent programmed in SEPANG eases the navigation and interaction on either MMS (Multimedia Messaging Service) or SMS (Short Messaging Service). However, this mechanism performs better for MMS messages that are significantly larger or longer in size. SEPANG offers several advantages over the most common scrolling techniques. In comparison, scroll bar scrolls rapidly to any points of the messages' content which may interrupt rather than assist the users' workflow while navigating on the mobile messages. Conversely, SEPANG is location independent and allowed users to drag anywhere to any points of the screen with eyes-free gestures to ease the navigation and increase users' satisfaction. SEPANG offers significantly less restriction especially when the mobile users are in mobility conditions (walking, standing, and sitting) as compared to the other scrolling techniques. Furthermore, SEPANG prevents users from extreme rapid scrolling and provides consistent navigation and visualisation predominantly for longer messages. Since it provides a continuous motion, users can focus more on the messages rather than the widget, as illustrated in Figure 3. Appropriate page zooming mechanism improves the visualisation

and visibility of the messages display on limited screen dimension (Carmelo, Paolo, Costabile, and Lanzilotti, 2006). Thus, we automate another sub-intelligent agent named, page zooming mechanism to supplement for longer messages. Page zooming reduces the needs of vertical and horizontal scrolling and provides users with visual context; users are free to zoom in or out or even to reset the scale of the entire messages as shown in Figure 4 (a) and (b). Additionally, zooming mechanism automates the scales at which the messages are viewed to fulfil specific users' requirements. For instance, elderly people may encounter difficulties in reading smaller characters on limited screen dimension. Thus, page zooming resolves the limitation by automating the zoom in and zoom out functionalities, and resetting the messages to fulfil specific users' needs.

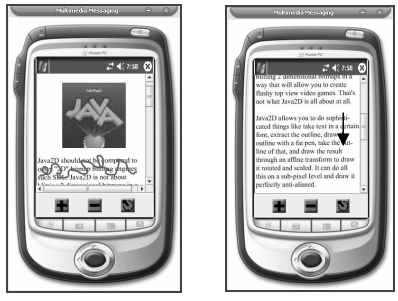
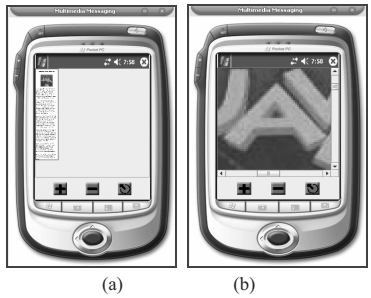


Figure 3. SEPANG is executed on MMS message.



(a) (b)

Figure 4. (a) Zoon out and (b) zoon in.

5. Conclusion and Future Work

We suggested that Sequential Dial enhances the scrolling activities especially for longer messages and provides free gestures to navigate the scrolling with the implementation of eyes-free technique. Page zooming provides alternative ways to navigate and interact with the messages automatically. Concisely, SEPANG is a navigation-based technique to replace or as an alternative way for the existing scrolling technique on mobile messaging. We suggest future work of SEPANG includes automation of text wrapping for mobile messages that have been zoomed in significantly. The proposed intelligent agent in SEPANG offers advance mechanism to capture the users' experience and react automatically the desire functionalities with less specification initiated by the mobile users.

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