Text Input on Multitouch Tabletop Displays

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1 Introduction

Tabletops offer great opportunities for information visualization and visual analytics. Users benefit from possibilities like collaborative analysis and direct touch interaction. Providing interaction techniques that support users in accomplishing tasks is especially important, since “interaction is the fuel for analytic discourse” [Thomas and Cook 2005]. Tasks frequently needed in visual analytics are dynamic querying and query refinement. Text input is of particular relevance for these tasks because the specification of a query is often conducted via textual input. Since tabletops are commonly operated by direct multitouch input, users have to be supplied with text input techniques specifically designed for this domain. However, little research has been done to determine adequate text input techniques for tabletop users. Existing soft keyboard designs are limited to a key map, providing no additional feedback like tactile affordances or visual clues, to the user. However, soft keyboards offer no tactile guidance like physical keyboards do. Hence, typing error detection gets demanding and slow. In order to overcome this obstacle, we have designed two novel text input techniques. Both techniques aim at simplifying error detection by several explicit visual feedback components. We have evaluated both designs in a preliminary user study with six participants. Results show that users benefit from our feedback components when checking for errors. Moreover, we supply a short demo video.

2 Our Approach

Fig. 1: The Qwerty soft keyboard.

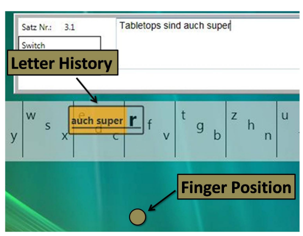

Fig. 2: The Column Typing design.

We have designed two novel on-screen text input techniques operated by direct touch interaction. Both designs ground on the following typing behavior we observed on standard Qwerty soft keyboards: A user searches a letter on the key map, moves her finger to the letter and, at the same time, already searches for the next letter. Error checking takes place at the end of a phrase. In contrast, a physical keyboard offers a frame of reference on which the hands can rest while the eye checks the phrase. Moreover, if the user types in between of two keys on a physical keyboard, this error is immediately noticed through the tactile feedback. Hence, if a letter is entered incorrectly on a soft keyboard, the user doesn’t notice until she checks the complete phrase.

In our first design we supply visual feedback that is recognizable in the peripheral field of view and is thus visible even if the visual focus no longer rests on the relevant letter. In detail, we display a letter in large format (height of approx. 12 cm) over the key map after its triggering (see Fig. 1). When entering text with a physical keyboard, frequent alteration of both hands is a “key factor in rapid touch-typing” [Zhai et al. 2005]. Thus, we made our keyboard approx. 43 cm wide, allowing comfortable bimanual interaction. To allow ergonomic arm placement and reliable touch-typing, the keyboard is displayed at the lower border of the tabletop and one key has a size of 2 x 2 cm. We used a german Qwerty layout.

The intention behind our second design, Column Typing, is to ease error detection by minimizing the distance between the key map and text cursor. This way only small eye movements are required to check a phrase. With Column Typing, the key map is displayed closely below the text cursor (see Fig. 2). To make error detection even less intricate, a history of the last ten letters is displayed next to the active letter. This way users can check a part of the phrase while selecting the next letter. Since we want users to keep their hands ergonomically close to the body, each letter has its own column that reaches over the whole display. In order to allow corrective finger movements, a key is triggered with the release of a finger. Column Typing also exploits the users’ familiarity with a Qwerty design by altering the standard Qwerty layout only by horizontal stretching.

We conducted a preliminary evaluation study with six participants in order to appraise our novel designs. We used a within subjects design. Independent variable was the text input technique. Dependent variables were the participants’ subjective ratings, typing speed and error rates. Results show that participants overall prefer the strict Qwerty layout of the first design. However, participants reported that they had benefited from Column Typing’s letter history. Yet only measured informally, we found that Column Typing (7 words-per-minute) performed slower than the strict Qwerty design (21 words-per-minute). This is reasoned by the users’ unfamiliarity with the novel layout and inaccuracy of column selection. Solutions could be broader columns or clearer highlighting. Furthermore, the large letter displayed over the key map in the first design was perceived helpful yet also distracting. An alternative could be to supply a letter history similar to Column Typing.

In our future work, we will focus on improving the Qwerty design with respect to error correction and detection. Furthermore, issues such as multi-user interaction and rotatability have to be thought of. Moreover, we will integrate our designs into our information visualization application MedioVis (see http://hci.uni-konstanz.de/index.php?a=research&b=projects&c=16314278&lang=en) and evaluate them in situ.

References

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Zhai, S., Kristensson, P., and Smith, B. 2005. In search of effective text input interfaces for off the desktop computing. *Interacting with Computers 17*, 3, 229–250.

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