

DESIGN EVALUATION OF QWERTY SOFT KEYBOARDS ON 3,5" TO 6" TOUCHSCREEN SMARTPHONES BEING USED ON PORTUGUESE TEXT ENTRY TASKS

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1 Context

Keyboards as interfaces for text input were first developed to be components of typewriters over a century ago. The first patent in a series that led to the keyboard's letter arrangement known as QWERTY, according to David (1985), was issued in 1867 by Christopher Latham Sholes, a Milwaukee printer by trade, Carlos Glidden and Samuel W. Soule. This letter arrangement, a result of its inventors' efforts to reduce the frequency of type bar clashes in the first mechanical typewriters, eventually became a standard and is present, nowadays, in virtual representations of keyboards on smartphones equipped with touch-sensitive screens. In such devices, keyboards present smaller keys and lack tactile feedback, which causes users to easily mistakenly hit unintended neighboring keys.

According to Kristensson (2009), in such context, "since errors are unavoidable, users need support to correct them". This way, as observed by Al Faraj, Mojahid and Vigouroux (2009), "an efficient text entry method for mobile devices is becoming one of the most prominent challenges in the world of mobile computing".

Since mobile text entry occurs in different scenarios, according to Gong and Tarasevic (2005), "sometimes mobile users will find themselves wanting to enter text with one hand, or even no hands, and may not be able to look at the device itself while doing so". This way is expected that different users under diverse circumstances would manipulate their devices differently, so the text results produced could vary.

In such context, this paper addresses text entry in small touchscreen devices and soft keyboards, but focusing on Portuguese language. Since there are some features on Portuguese texts that appear more frequently than on texts produced in English, such as the elevated use of accented characters and a more frequent use of vowels¹, the aim of this study is to evaluate error occurrence and users' overall performance in Portuguese text entry on smartphones equipped with virtual QWERTY keyboards.

2 Method

Portuguese text entry tests were carried out with different users using smartphones equipped with touch-sensitive screens and virtual keyboards. In these tests, users with different profiles were asked to type predefined holoalphabetic sentences (pangrams), being accented, punctuated or not, in several devices with keyboards configured in different ways, using or not different kinds of text entry assistant technologies, depending on the phrase to be typed.

Eight participants' interaction with the keyboard were captured in video in order to make possible the visual analysis of the different ways the devices were manipulated, users' preferences regarding the use of text entry assistant technologies, the methods used to manually correct errors in any given configuration, as well as fingers movements during the typing task.

By crossing all data accounted in the analysis of the videos with the characteristics of the phrase typed and the configuration of the device used in each phase of the experiment, it was possible to establish relationships to be studied, such as the type of errors made and letter arrangement and also the way the devices were held and its influence in Portuguese text entry.

Although the type of task presented in these tests could mask users preferences such as the use of abbreviations and acronyms, given the fact that the phrases used would hardly be found in real conversations, other factors considered more important to the study were privileged: by making users touch the majority of the letters in the keyboard, the analysis of letter mapping and how it influences Portuguese text entry was made easier; by using less common words in Portuguese daily conversations, such as "whisky" or "Nova York", it was possible to simulate situations where users type words of different idioms in the same sentence, cases when text entry assistant technologies based on word lists tend to fail.

¹ Fukushiro (2014) observed that, in Portuguese, the variety of vowels is greater than in any language, even if compared to French.

3 Results

The analysis of the type of errors made and letter mapping showed that there were two main kinds of errors, motor errors and cognitive errors, the first ones being hits in neighboring keys and the latter being the omission of letters in less common words or touches made in distant letters. The most common errors noticed were motor errors and they occurred more frequently in the letters E, R, O and B. It was also noticed that all motor errors occurred in the same row, thus in the horizontal axis, but never in the vertical axis.

By analyzing how users hold the devices in text entry tasks and how it influences Portuguese text insertion, it was possible to count the touches made by each finger and also how many times each key was pressed. The results showed that, in two-thumb text entry, the same percentage of touches made by each thumb is kept almost constant no matter what phrase to be typed, even considering that there were cases when the same thumb was responsible for up to seven consecutive touches. In a further step, the same data was plotted in a graphical representation of the keyboard and it was possible to notice two main areas, one for the right and another for the left thumb, and an intersection area that allows touches made by both thumbs. In the same way, these areas tend to be kept almost constant in any given phrase.

4 Conclusions

The results showed that assistant technologies have great influence on how users manipulate the device and how they type, withal considering singularities of Portuguese (such as the frequent use of accented words and common letter pairs). A preliminary analysis of the letter mapping and finger movement during the typing task showed that, in the devices used in the experiment, the dimensions of the keys and the spaces between them should be adequate for an efficient text entry task if considered the vertical axis, but inadequate if considered the horizontal axis. It also showed that, considering two-thumb text entry, the division of the loads between the two thumbs are arbitrarily made by each user and kept almost constant no matter what phrase to be typed, suggesting ways to analyze the QWERTY arrangement and its influence in Portuguese text entry.

Considering the characteristics of the tests carried out, where users were observed in copy tasks, it was possible to focus on specific aspects of the QWERTY soft keyboard present on smartphones regarding Portuguese text entry. Although the results found revealed important facts, it lacks information about user's preferences on real conversations, such as what types of words they choose to abbreviate and why or what they use soft keyboards features (such as emoticons) for. It suggests, though, that new and different tests should be carried out in order for such aspects to be analyzed in greater detail.

5 References

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