Chapter XXVI
Improving Stroke–Based Input of Chinese Characters

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ABSTRACT

This chapter presents a case study of the redesign of the mobile phone keypad graphics that support the Motorola iTap™ stroke-based Chinese input solution. Six studies were conducted to address problem identification, proof of concept evaluation, usability testing in both US and China, and design simplification to support business objectives. Study results confirmed that a new abstract-with-examples design helped users to develop more accurate knowledge regarding stroke-to-key mappings and lead to significant improvements in both text-entry speed and accuracy. The data also showed that, when using the new keypad graphics, the stroke-based input method could outperform the popular Pinyin technique after about 1 hour of casual usage, making the stroke method a competitive alternative for Chinese entry on mobile phones.
INTRODUCTION

The capabilities of modern mobile phones are far beyond the literal combination of “mobile” and “phone.” Rapid improvements in both hardware and software have turned mobile phones into personal multichannel communication centers. Mobile phones now serve many roles including music player, camera, camcorder, voice recorder, game player, calendar, notepad for short notes, and text, e-mail, and IM messaging device. As a result, the global mobile phone market is growing rapidly. According to iSuppli, over 800 million mobile phones were shipped in 2005, a 14% increase compared to 2004. China is the largest mobile phone market in the world. Due to the growing popularity of short message service (SMS), increased support for personal information management (PIM), and Internet browsing capabilities, effective text-entry techniques are becoming more and more important. Researchers have investigated a variety of alternatives for entering English text using the limited number of keys available on mobile phones, confirming that existing solutions can be awkward and slow (James and Reischel, 2001; MacKenzie, Kober, Smith, Johns, & Skepner, 2001; Silfverberg, MacKenzie, & Korhonen, 2000). While entering English text can be challenging, entering Chinese characters using mobile phone keypad is much more difficult. Instead of a relatively modest 26 letters plus numbers and a few symbols, Chinese entry requires the user to learn how to enter thousands of characters, a task for which professionals may use a keyboard with as many as 4,000 keys (Archer, Chan, Huang, & Liu, 1988).

In this chapter, we present the redesign of the keypad graphics (the symbols printed on the keys as the legends for Chinese strokes) for the Motorola iTap™ stroke-based input solution as a case study. This chapter expands significantly on an abbreviated version published earlier (Lin & Sears, 2005b). This chapter includes more detail and covers the entire process, from problem identification to solution development, proof of concept evaluation, and a series of user studies. This collaborative effort involved UMBC faculty and students, as well as Motorola employees in both the US and China.

The underlying problem was defined collaboratively, with input from Motorola and UMBC personnel. Motorola provided financial support, allowing UMBC faculty and students to conduct the initial studies that lead to the design of the new keypad graphics. Once the efficacy of the graphics was confirmed through US-based studies, Motorola provided resources and personnel to replicate the UMBC studies in Beijing, China. Raw data from the Beijing studies was sent to UMBC for analysis. UMBC and Motorola personnel subsequently collaborated to develop presentations describing the results of these studies, which ultimately resulted in the new keypad graphics being formally adopted as the preferred solution for future Motorola mobile phones for the Chinese market. These graphics have already been used in several new phones.

This chapter starts by presenting a brief introduction to Chinese characters and various text techniques for entering Chinese text on mobile platforms. Next, a case study is presented that describes the redesign of the keypad graphics that support Motorola’s iTap™ software. The case study involved (1) a comparison of the original iTap™ solution and the popular Pinyin method; (2) a test of an alternative design that was developed based on observations from the initial study; (3) a 6-day, longitudinal hands-on study of the proposed design; (4) a duplication of the longitudinal test that was conducted in China; (5) a study designed to simplify the proposed design to allow it to fit on smaller keypads; and (6) a final evaluation of the simplified design. For each study, we present the experimental design, data analysis, and a discussion of the results. We conclude by summarizing the experience presented in this case study.

CHINESE CHARACTERS

Chinese differs significantly from western languages such as English. Chinese is an ideographic language, with the shape of each character playing a critical role in presenting the meaning of the