Chinese Phonetic Handwritten Text Input for Mobile Phones

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ABSTRACT
We present a novel user-friendly Chinese text input method for mobile phones and other small form-factor-devices. Our technique is based on handwritten phonetic input rather than handwritten ideogram input. Using our system, the user is able to write any Chinese characters (Traditional or Simplified) using finger movements on the touch sensitive surface mounted under a standard cell phone keymat. To write a Chinese word via its phonetic representation, users need to enter a sequence of phonetic symbols followed by the selection of the desired ideogram. The handwriting recognizer generates ideogram candidate list.

ACM Classification: H5.2 [User Interfaces]: Input Devices
Keywords: Chinese text input, pinyin input, bopomofo input, mobile phones, text messaging, on-line handwriting recognition, neural networks, TouchPad.

INTRODUCTION
As computer technology improves and becomes more widespread, writers of ideographic characters need more friendly text input systems to support one of the most frequent human computer interaction tasks.

Chinese text input represents a particularly challenging task. On PCs text input is usually accomplished using either a QWERTY typewriter-style keyboard with phonetic input method like pinyin and bopomofo or using handwriting input on TouchPads or other types of writing pads where the user can trace Chinese ideograms using a finger or stylus. Handwriting systems have to be coupled with ideogram handwriting recognition software [2].

The small writing area available on mobile phones vs. the size of the writing instrument (finger) prohibits accurate input and recognition of the many strokes of a typical ideogram. The limited size of mobile phones cannot accommodate a QWERTY style of keyboard. Mapping bopomofo and pinyin symbols to the standard 12-key mobile phone keypad forces mapping of more than one character per key.

CHINESE TEXT INPUT SOLUTION
We designed and developed an efficient and user-friendly text input system for the Chinese alphabet on mobile phones. It is based on handwritten input, where the user enters phonetic symbols on a touch sensitive surface [4] mounted under the standard phone keymat using a finger (see Fig. 1).

Using our system, the user is able to input any combination of Chinese characters (Traditional or Simplified), Latin alphabet, numbers and punctuation marks. In contrast to standard Chinese handwriting based text input systems [2], where the user needs to enter many strokes of the ideograms, we designed a phonetic based handwritten input method: pinyin for Simplified Chinese and bopomofo for Traditional Chinese.

The pinyin phonetic based method uses the English alphabet to enter standard Mandarin pronunciations of Chinese characters (see Fig 2.), while the bopomofo phonetic based alphabet uses another set of 37 phonetic symbols to document the same standard Mandarin pronunciation. There is a straight one-to one correspondence between Bopomofo and Pinyin symbols.

To enter Chinese ideogram via its phonetic representation a user enters a sequence of English or bopomofo symbols followed by an “end of word” gesture or button press. Within the English/bopomofo symbol sequence, a system has to rely on timeout to differentiate individual symbols. Small form-factor devices like mobile phones are likely to have space available for writing only a single alphabet symbol, forcing all the alphabet symbols to be written on top of one another. Recognition software displays multiple candidate characters [Fig. 2] with the same pronunciation. The user then selects the desired ideogram using the phone’s joystick. In addition, a whole phrase that starts with a particular ideogram can be selected from the list of phrases in the phrase dictionary. If the desired ideogram (or phrase) is not among those displayed, the user needs to scroll through the complete list.

IMPLEMENTATION
We developed and ported our recognizers [2,4] for the pinyin and bopomofo input method to the Nokia 7650 smart phone that has been retrofitted with an integrated capacitive touch-sensitive input device (MobileTouch). The soft-
ware is running under the English version of the Symbian V6.1 Operating System. For more information about the Synaptics Mobile Touch hardware capacitive technology see [3].

Synaptics Chinese handwriting input technology should work on conventional mobile phones with touch sensitive hardware or on resistive transparent displays capable of capturing x and y coordinates of the pen or finger movement.

Our accurate and robust recognizer technology is neural network based [2,4]. Neural networks are often used to design systems for human interfaces. For example, recognition systems for speech, handwriting and visual gestures all process human interface inputs. Example of on-line neural based recognition system can be found in [1].

The timeout was set to 0.3 seconds. This amount of time was selected as a reasonable compromise between speed of entry and accuracy. Decreasing the time interval leads to segmentation errors. Individual users can set the timeout interval to match their speed of writing.

**FUTURE WORK**

We need to conduct controlled experiments that will compare our handwritten phonetic text input technique to the commonly used key-based input techniques. Due to the homophonic nature of Chinese the ideogram selection process can be slow. We plan to optimize the selection process by introducing intonation symbols, Chinese language model and context.

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**REFERENCES**


3. MobileTouch:  
