ShapeWriter on the iPhone – From the Laboratory to the Real World

Shumin Zhai
IBM Almaden Research Center
650 Harry Road
San Jose, CA 95120, USA
zhai@almaden.ibm.com

Michael Greiner
ShapeWriter Inc.
505A Bldg 106, Li Ze Zhong Yuan,
Chaoyang District, Beijing, China
mike.greiner@shapewriter.com

Per Ola Kristensson
ShapeWriter Inc.
62 Elitsley Avenue
CB3 9JQ Cambridge, UK
perola.kristensson@shapewriter.com

Shilei 'Allen' Peng
ShapeWriter Inc.
505A Bldg 106, Li Ze Zhong Yuan,
Chaoyang District, Beijing, China
allen.peng@shapewriter.com

Pengjun 'Frank' Gong
ShapeWriter Inc.
505A Bldg 106,
Li Ze Zhong Yuan, Chaoyang
District, Beijing, China
frank.gong@shapewriter.com

Liang 'Mico' Liu
ShapeWriter Inc.
505A Bldg 106, Li Ze Zhong Yuan,
Chaoyang District, Beijing, China
liang.liu@shapewriter.com

Anthony Dunnigan
2819 Ramona St
Palo Alto, CA 94306, USA
tony@dunnigan.net

CHI 2009, April 4–9, 2009, Boston, Massachusetts, USA.
ACM 978-1-60558-247-4/09/04.

Abstract
We present our experience in bringing ShapeWriter, a novel HCI research product, from the laboratory to real world users through iPhone's App Store.

Keywords
mobile, iPhone, ShapeWriter, text input, touch screen

ACM Classification Keywords
H5.m. Information interfaces and presentation

Introduction
Direct transfer of user interface research to end-user practice is admittedly relatively rare. One possible reason is that the desktop paradigm, once established, repels further innovation. The rise of truly mobile and yet powerful devices brings a new opportunity (and many challenges) to the field.

Using a completely touch screen-based UI, Apple's iPhone is a phenomenal success. From the onset its criticisms have centered around text entry. This provided an excellent opportunity to conduct a large scale real world experiment with shape writing, a technology developed from many years research in the HCI field [4] [2] [1] .

Shape writing is a stroke gesture-based text and command input method. Instead of tapping each individual letter, the user traces over all letters in a word sequentially on the touch screen keyboard (Fig. 1). For example, to write the word "the" the user lands in proximity (not necessarily on) the *t* key, slides towards the *h* and *e* keys, and lifts up the finger on the *e* key. The *shape* formed by this gesture is then recognized by the ShapeWriter recognition engine [2]. The system is error tolerant and it is not necessary to cross all letters in a word for the system to correctly output the intended word

figure 1. ShapeWriter uses gesture on touch keyboard to enter words.

The design rationale and technical solutions to shape writing have been published in the HCI literature [4] [2] [1] and reported in the media (shapewriter.com/history.html). The main expected advantages of shape writing are: 1. Easy to begin using, since tracing letters is a visually guided process. 2. Efficient – one word per stroke, which means 4-5 folds of motor efficiency increase over letter-based longhand writing. 3. Error tolerant because of the underlining dictionary-based statistical pattern recognizer. 4. Gradual progression from ease to efficiency. Over time the shapes of common words or common word fragments will be memorized so the shape writing process shifts from visually guided tracing to faster recall driven gesturing.

The iPhone, together with its unprecedented deployment channel, the iTunes App Store, gave rise a great opportunity to explore on how ShapeWriter would be perceived by the general user population.

Design and development process

One major obstacle is that iPhone's SDK does not allow a third party system-wide input method. As a design solution to circumvent the obstacle, we developed a narrow application, a WritingPad, which allows the user to take notes with ShapeWriter, and store them and email them. Our initial WritingPad design followed the metaphor of a paper notebook, with many novel UI features. Design sketches were made into paper mockups (Fig. 2) as a study tool. Subjects were asked to perform various tasks and the designer flipped the pages according to the subjects' action. This process eliminated many novel but nonessential features.

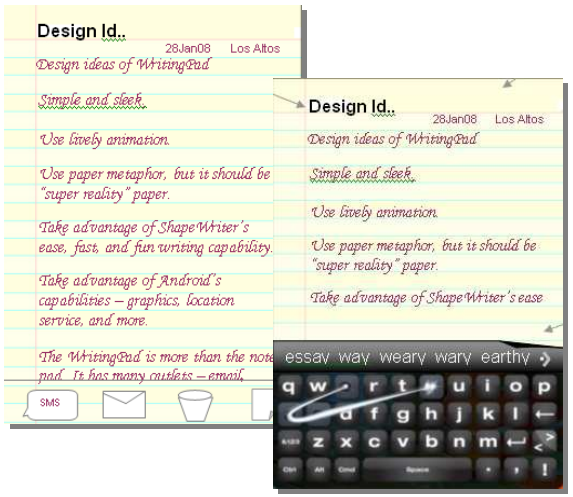

figure 2. Samples of printed paper-mockup designs.

An important user experience consideration is to enable easy editing and correction. There are many ways to present alternative word choices from the recognizer to the user. We decided to explicitly display them in a constant location above the keyboard, instead of a varied location, or using a pull-down list (Fig. 3). We allowed the user to edit and correct previously written words after finishing a sentence or a paragraph. When the user moved the caret the word choices above the keyboard were updated accordingly.

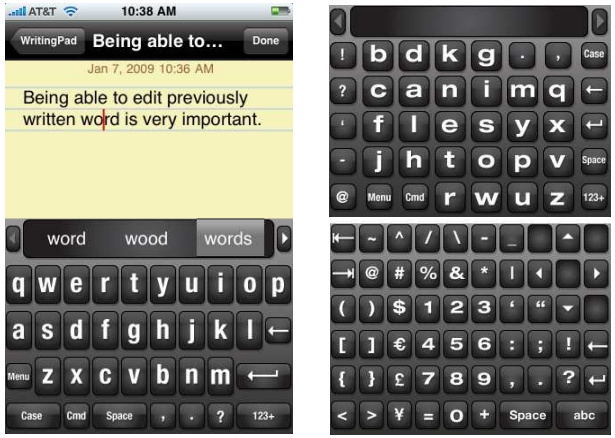

figure 3. The user can go back and edit previous written words (left). ATOMIK (top right) keyboard and secondary key panel (bottom left).

We made many conscious trade-off decisions, particularly on the keyboard design. We leaned towards the conservative (familiarity) side and made the Qwerty the default (Fig. 3 left) and the optimized ATOMIK [3] an option. For Qwerty we used a vertically aligned design for the cleaner look and more space, and added as many punctuation and functional keys around it as possible. The design of the Case key leaned towards the novel side. It is a "reverse Polish notation operator" in that it changes the case of the word or letter entered after the fact, giving the user much more flexibility. Repeatedly pressing the Case key will cycle through, for example, iPhone, iphone, IPHONE, Iphone and back to iPhone.

We initially decided against a landscape keyboard option because it leaves very little space for text editing and reviewing. However, in the end we included it in version 2.0.0 Pro due to popular demand. Overall, development speed, simplicity and quality in user experience were given priority.

The team members were required to use ShapeWriter on the iPhone that was still in development as much as possible. Stress tests were also part of the process, and later a beta tester pool was recruited. Suggestions from everyone were encouraged, but final design decisions were dictated by a vision of the shape writing paradigm.

ShapeWriter WritingPad 1.0.0 was submitted on July 7, 2008 just before Apple's deadline, and approved by Apple and became available on July 14, 2008. Since then, we have made 7 more releases (1.0.2, 1.0.3, 1.0.4, 1.0.5, 1.0.6, 1.0.7 and 2.0.0 Pro. 1.0.8 Free is currently in the submission process).

Findings and impact

Within 24 hours, 50 reviews were written about ShapeWriter WritingPad. To date 556 reviews were written for Version 1.0.0 through 1.0.7 (shapewriter.com/reviews.html). The software was also

reviewed by many bloggers and the media and named one of the Top 11 iPhone must-have Apps by Time.com. Its download rate peaked at about 30,000 per day. We tagged and analyzed the 556 reviews and drew the following findings.

F1. 454 (81.6%) reviews were "Completely Positive" , some with great excitement. For example, "*Game changing app by jhudge05: Typing on the iPhone used to tedious and frustrating for me, but now that I use WritingPad I am actually writing faster on the iPhone than I was on my Blackberry.*" "*Holy $41t by Corso123: 'revolutionized typing' is the understatement of the year. This technology should be part of every keyboard on all touchscreens. Someone nominate these software developers for a Nobel. No Joke. Thank you so much for this software... –brian".* **F2***.* 12.5% of the reviews were "somewhat positive, ambivalent or no indication",.**F3**. 33 (5.9%) reviews, on the other hand, were "Complete negative". For example "*Lame by Joerj11 Really hard to use. iPhone keyboard is much better. Don't waist your time.*" **F4**. Many users wished ShapeWriter works system-wide or at least do SMS: "*i'd love to have this input method as an option for the entire system. i can go 10 times as fast in this application as i can on the standard keyboard.great job folks!/guy*" " *If only touch always worked this way. by Kennymccune Excellent and time saving. If I could use this style of typing in other apps my life would be bliss.*" **F5**. Some users want more features to be implemented, including folder, formatting, copy and paste, landscape mode, and other languages. For example, "*More languages please))) 4 example: Russian".* Many of these feature requests have been or will be implemented. **F6**. There is a great deal of individual difference. Compare "*It's super accurate and super easy to use and I'm still in awe of how genius it is.*" with " *It took me a few days of use to get used to it".* The individual difference is particularly acute with the "fat finger problem". For example: "*ShapeWriter's on screen key pad, when used with a stylus, works great. But with my big fat finger, its more like sewing on a button while wearing boxing gloves*." In contrast "*I have 'fat finger symdrome' and cannot type on the Iphone. Thank goodness for this program! Now, I can actually write emails!*" and "*Works great for people with large fingers like myself. Very liquid and intuitive. Brilliant Application*" **F7**. Many users did not understand the concept. An example: "*Am I missing something? by GeorgeW6 You have to somehow drag your finger over each letter in a word in correct order and not hit any other letters on the keypad.*" **F8**. Many bugs and deficiencies were picked by the reviewers including slow start-up and crash bugs. Many of these comments have helped us and continue to help us improve ShapeWriter. **F9**. ShapeWriter evoked affectionate responses in many reviews with words like *love, omg, fun, great, rocks, awesome, amazing, exciting, pleasant, cool, addictive, stunning, astounding,* and *fantastic*.

References

1. Kristensson, P.O. and Zhai, S., Command Strokes with and without Preview: Using Pen Gestures on Keyboard for Command Selection. *Proc. CHI 2007*. 1137-1146.
2. Kristensson, P.O. and Zhai, S., SHARK^2: A Large Vocabulary Shorthand Writing System for Pen-based Computers. *Proc. UIST 2004*, 43-52.
3. Zhai, S., Hunter, M. and Smith, B.A. Performance optimization of virtual keyboards. *Human-Computer Interaction*, *17*, 2,3 (2002). 89-129.
4. Zhai, S. and Kristensson, P.O., Shorthand Writing on Stylus Keyboard. *Proc. CHI 2003,* 97-104.