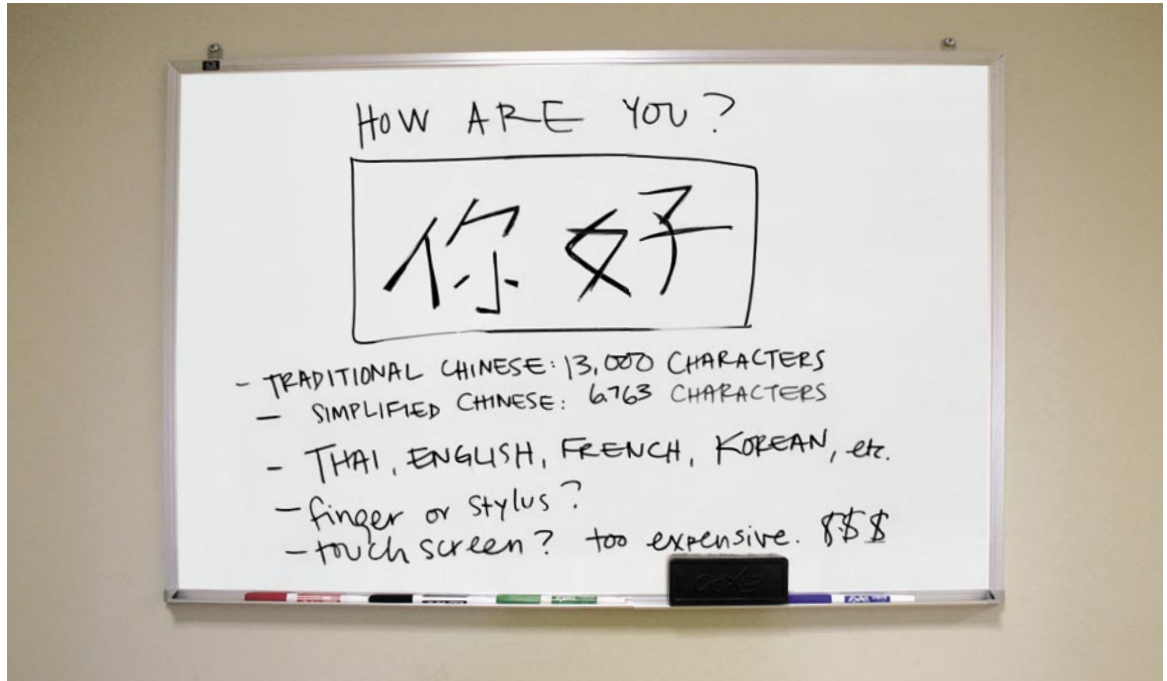


Finger writing

"We can't afford a touch screen. We can't make a 13,000 character keypad phone. What now?"

- MICHAEL TATELMAN, CVP, MDB/GO-TO-MARKET, N. ASIA



As spatial boundaries and modes of communication converge, Motorola is creating disruptive new technologies to give people the experience of being connected from anywhere, at any time. Finger writing is one such example. A text input method based on finger writing over a traditional handset keypad.

GENESIS

19,763 Characters?

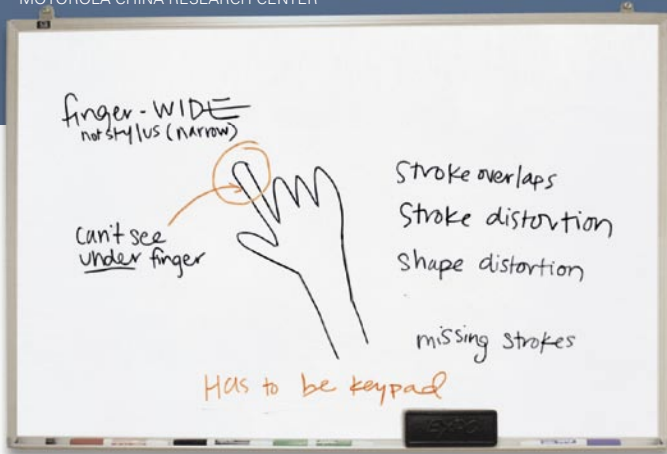
The Chinese written language consists of a writing system stretching back nearly 4000 years. Because of its complexity, nobody in China had really cracked the problem of how to add simple text messaging to a mobile phone. Existing text-input systems relied on mapping key presses to characters or words. With mathematical permutations potentially running into the billions, mapping solutions were just not practical. The necessary handwriting recognition software, developed by Motorola Labs, already existed and a stylus with a touch screen could have been a solution. But, for a mass-market hand-held mobile phone, the stylus-touch screen technology was simply far too expensive.

Eliminating the Touch Screen Would Eliminate the Stylus

The beginning of an answer started to formulate when the existing, and very sophisticated handwriting recognition software was combined with a fresh approach to the input problem. An approach that did not require an expensive touch screen, and did not displace the familiar keyboard accustomed for normal phone dialing.

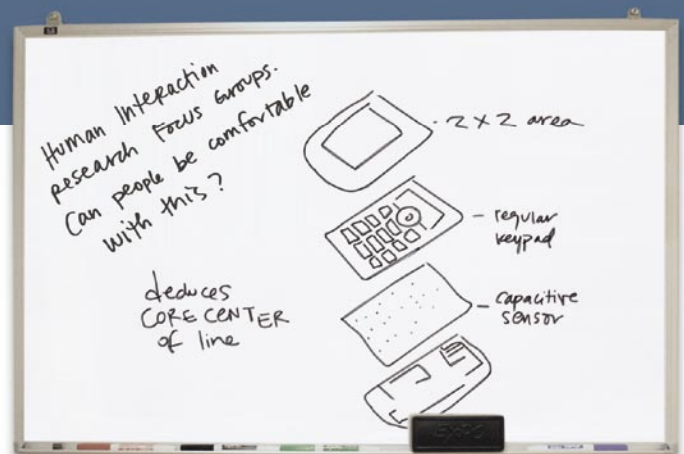
"1,306,313,812 PEOPLE — 13,000 CHARACTERS.
AND EVERYONE WRITES EVERY CHARACTER
A LITTLE DIFFERENT."

—JIAN-CHENG HUANG, SHANGHAI, CHINA, HUMAN INTERACTION RESEARCH,
MOTOROLA CHINA RESEARCH CENTER



"NICE IDEA. WILL IT WORK?"

—BILL ZANCHO, DIRECTOR, HUMAN INTERACTION RESEARCH



REQUIREMENTS

Where is the Center of a Finger?

The size of the human finger, the limited writing space of the writing area, and the inability to see underneath your finger when writing on a cell phone caused many challenges for Motorola's Shanghai research team. It required solving the problems of stroke overlap, stroke distortion, shape distortion and missing strokes. In other words, they had to create a way to pinpoint the very center of a user's finger. And track it perfectly.

A New Kind of Keypad

The first challenge was to design a new kind of keypad. A keypad without moving parts and one that had the ability to identify the center of a finger. The buttons would need to be flush to the surface of the phone and smooth to allow a finger to move over it comfortably. The team discovered that through the use of a "capacitive sensor" deployed underneath the keypad, similar to the technology used in touch-sensitive elevator buttons, it would be possible for traditional buttons to register presses, and the capacitive sensor to capture the center of a finger.

Not Just Handwriting Recognition Finger Writing Recognition

The second challenge was to develop writing recognition software. It would require unprecedented power and the capability of combining the required finger-center detection, handwriting recognition, and word prediction complexities within the available memory and processing power of a handheld mobile phone. The solution was now clearly identified. New software had to be developed that could be integrated with a new keypad and deployed within a relatively small area of a clamshell mobile phone.

TECHNOLOGY

Unprecedented Power for Unprecedented Demands

The success of the finger writing recognition software Motorola Labs Shanghai ultimately developed produced six real capability breakthroughs:

1. Connective Strokes – the ability to finger write whole characters with strokes in a connective way. In other words, users can write in their natural style.
2. Disordered Strokes – the ability to obtain correct results even if a character is written in a different stroke order. Providing users flexibility and no restrictions on stroke sequence to create a character.
3. Cursive Writing – the ability to recognize frequently used cursive characters. Chinese cursive writing, also called Xing Shu, can be very different from writing manuscript characters.
4. Syllable Assistance – the ability to use the Pin Yin equivalent of a character to assist with character input.
5. Writer Adaptation – the ability of the finger writing engine to learn the key characteristics of the user's writing style and adapt to them over time.
6. Word Prediction – the ability of the finger writing engine to combine a static dictionary and a dynamic user-dictionary to achieve word prediction. To speed input for the user, when a character is entered, a group of associated characters will be shown to form a word or text sequence in conjunction with the inputted character from which the user can choose.

Now That it Works, Will People Accept it?

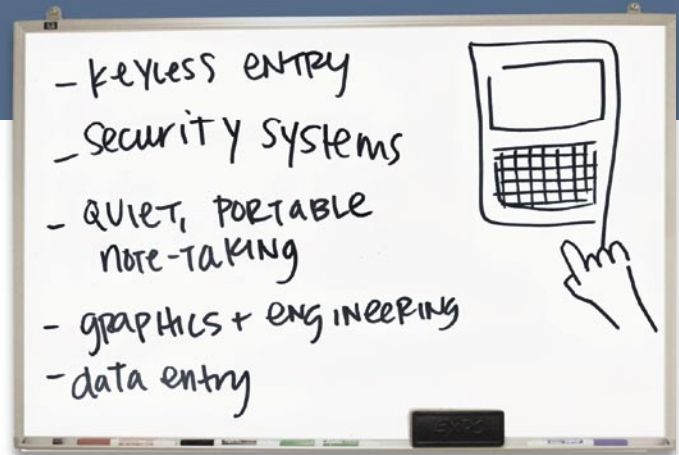
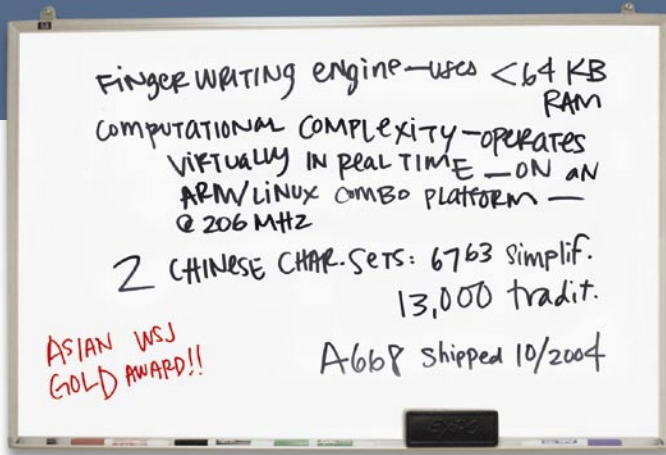
Motorola Labs Human Interaction Research created several prototypes and conducted extensive focus groups to understand the unarticulated needs of users, and points of frustration. In April 2004, the testing was complete, and this new technology was ready for market.

"SAW A GUY TODAY USING IT ON A BUS.
UNBELIEVABLE."

- SIMON LEUNG, REGIONAL PRESIDENT, ASIA PACIFIC

"WHAT IF YOU HAD ONE OF THESE OUTSIDE YOUR
DOOR SO PEOPLE COULD LEAVE A NOTE FOR YOU?"

- TOM MACTAVISH, VICE PRESIDENT, HUMAN INTERACTION RESEARCH



FINGER WRITING TODAY

It's Working Every Day on the Street - In China

The first mobile phone with finger writing capability, the Motorola A668 shipped in October of 2004. The finger writing technology provides unparalleled ease of character entry, fast text messaging, and a compact, portable note-taking device for use on the go, and in meetings.

New models, New Uses

Since the Motorola A668 was introduced, finger writing recognition has been designed into new mobile devices like the Motorola A732, and the sleek V321. The enthusiastic adoption of this technology suggests future uses far beyond China, and the application outside the world of mobile phones and character input.

Gold Winner at the Asian Innovation Awards

Motorola finger writing technology has been recognized as a breakthrough in the technology community across Asia. Chinese Text Input, first adopted by SMS Singapore, recently won a Gold Award at the 8th Asian Innovation Awards organized by the Asian Wall Street Journal and the Singapore Economic Development Board.

POTENTIAL

A Solution With Immense Potential From a Simple, Regional Challenge

With facilities all over the world, the Motorola Technology Organization is uniquely positioned to address local problems and turn them into global solutions. The finger writing case began as a way to create an interface for a tremendously complex language in one specific region of the world. This new technology and capability will certainly surface again and again in new places with expanding functionality.

A New Interface Between People and Things

Keyless entry, security systems, note taking, and note leaving are only one set of capabilities enabled by finger writing. Imagine a new computer keyboard. Graphic design on the go, without the burden of desks, screens, paper and pencil. Friendly control panels for everything from cars to airliners. The range of potential applications is practically unlimited. All from the efforts of the researchers and software architects of Motorola's Shanghai Human Interaction Research.

About Motorola's Technology Organization

Motorola's Technology Organization is researching and developing the disruptive technologies and innovations that will enhance easy, uninterrupted access to what people value most – communication, information, entertainment, monitoring and control. To make this world of seamless mobility a reality, the organization is based on a fluid, functional model focused on delivering solutions that span eight critical technology areas: Intelligent Interaction, Content Handling, Sensing and Control, Real-Time Communications, Session Continuity, Heterogeneous Networks, Security and Manageability. Motorola Technology includes Motorola Labs, Standards, Early Stage Accelerator and the Global Software Group (GSG).



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