Vorlesung
Advanced Topics in HCI
(Mensch-Maschine-Interaktion 2)

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Chapter 3: Mobile HCI

Table of Content

- Input & Output Devices
- Input & Output Techniques
- Guidelines
- System Architectures for Mobile UIs
- Example: Applications for Mobile Phones

Itsy
Pocket Computer

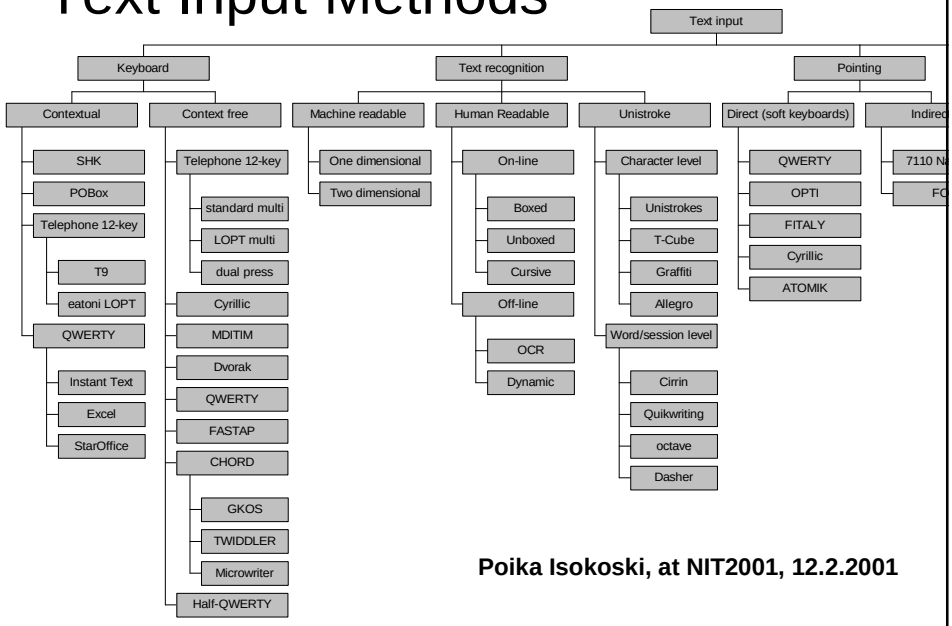
- Research platform
- Gesture and speech interaction
- *tilt-to-scroll* and *Rock 'n' Scroll* to include the use of gestures to issue commands.

VIDEO

Text input on mobile device - Why does it matter?

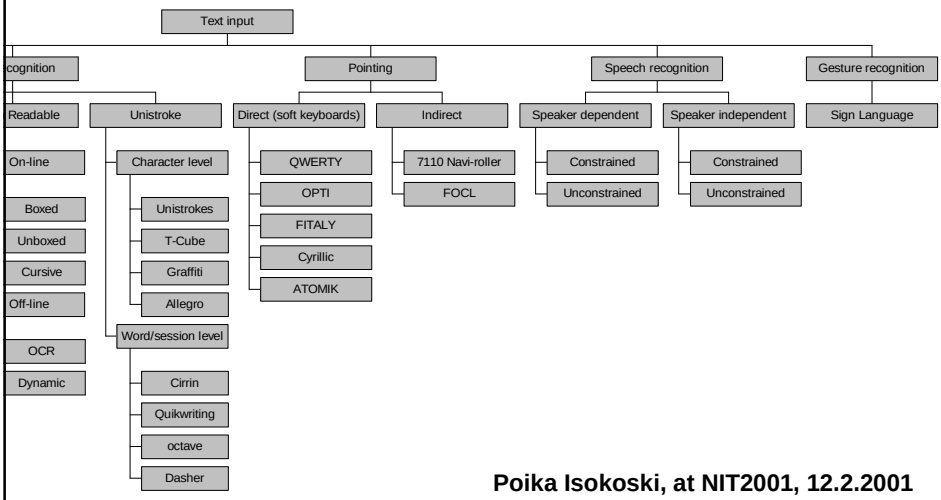
- In 2003 there have been 16 billion SMS per month in Europe.
- Mobile internet is on the rise – with new technologies (UMTS) it may become one important way to access the internet

Text Input Methods



Poika Isokoski, at NIT2001, 12.2.2001

Text Input Methods

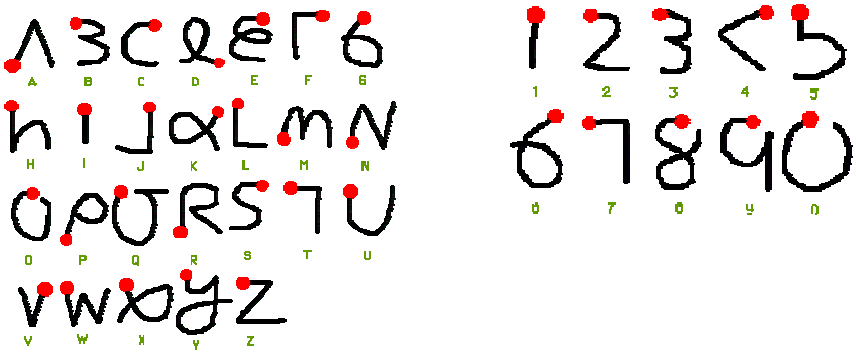


Poika Isokoski, at NIT2001, 12.2.2001

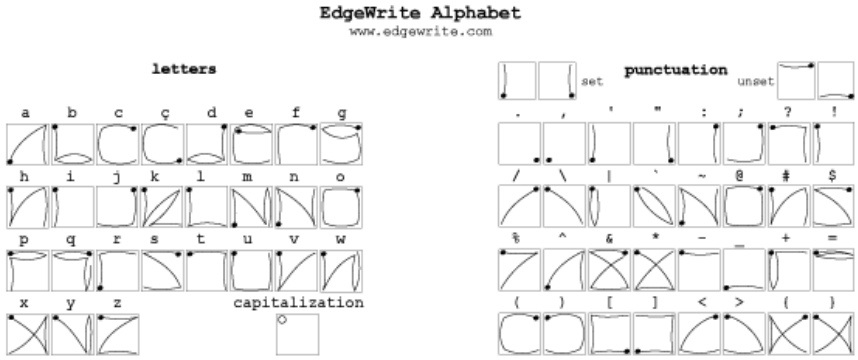
Unistroke

- Explored in the PARCTab Experiement
- Each letter is written in a single stroke
- Lifting the pen indicates a new letter
- Solves the separation problem
- http://sandbox.parc.com/parctab/csl9501/paper.html

Graffiti
Unistroke used in PalmOS



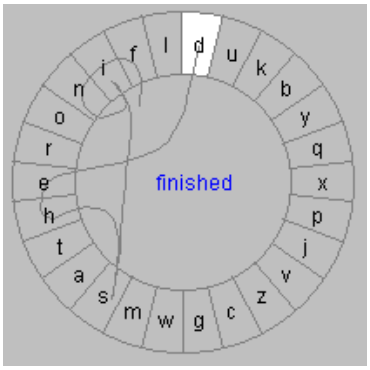
EdgeWrite



- VIDEO
- http://www.cs.cmu.edu/~edgewrite/

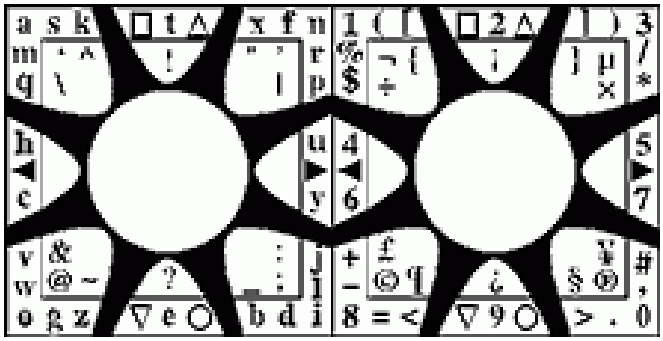
Cirrin - (the CIRculaR INput device)

- A word-level unistroke keyboard is a soft keyboard allowing a user to go from any key to any other key without lifting the pen or entering unwanted keys
- Jennifer Mankoff and Gregory D. Abowd.
  Cirrin: A word-level unistroke keyboard for pen input.
  In *Proceedings of UIST '98*.
  Technical note. pp.213-214

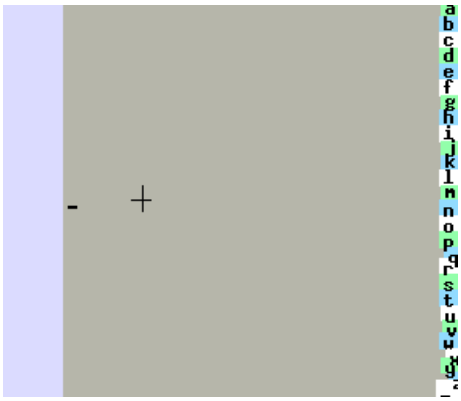


Quikwriting

- http://mrl.nyu.edu/projects/quikwriting/
- Authors claim “Quikwriting is significantly faster and less stressful to use than Graffiti”



Dasher



- Dasher is a data entry interface incorporating language modelling and driven by continuous two-dimensional gestures.
- “Tests have shown that, after an hour of practice, novice users reach a writing speed of about 20 words per minute while taking dictation. Experienced users achieve writing speeds of about 34 words per minute, compared with typical ten-finger keyboard typing of 40-60 words per minute.”
- http://www.inference.phy.cam.ac.uk/djw30/dasher/

Mobile Phone Text Input

- fewer keys than letters!
- Approaches
  - Multitap
  - Dictionary based disambiguation
  - Prefix-based disambiguation
  - multiple simultaneous key presses
- Metrics
  - Complexity
  - Visibility
  - Keystrokes per character (KSPC)

Multi-Tap

- A key has more than one letter assigned
- Pressing the key once gives the first, twice the second, and so on
- After a period of time or when changing to another button the letter is selected
- Advantage
  - You can see what you write
  - Easy to understand
- Problem
  - High number of average key presses per letter
- About 2 KSPC

Predictive Text Input
Dictionary based disambiguation

- Example T9
- Input is compared to a dictionary
- Input is matched to existing words
- If non-ambiguous a single word is offered
- If multiple words are possible the one with the highest probability is offered and a mechanism to select the others
- Advantage
  - Very fast input mechanism for words in the dictionary
- Problems
  - Slow for words that are not in the dictionary
  - The word that is actually typed is not always visible
- For words in the dictionary KSPC is close to 1

Basis for predictive input

- Word frequency
- Letter frequency
- Frequency of letter groups
- Frequency of word groups

- http://deafandblind.com/word_frequency.htm
- http://www.fortunecity.com/skyscraper/coding/379/lesson1.htm

(show examples)

Prefix-based disambiguation

- EATONI
  - LetterWise
  - WordWise
  - http://www.eatoni.com/

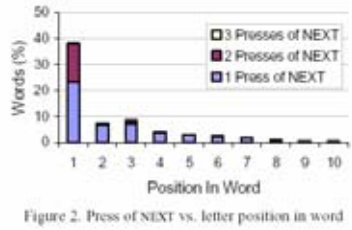


Figure 2. Press of NEXT vs. letter position in word

- Language is analyses and probabilities for letter sequences is calculated
  - P(“a“)=… P(“b“)=… P(“y“)=… P(“z“)=…
  - P(“aa“)=… P(“ab“)=… P(“zy“)=… P(“zz“)=…
  - P(“aaa“)=… P(“aab“)=… P(“zzy“)=… P(“zzz“)=…
- Probabilities are used to chose next character that is displayed

I. Scott MacKenzie, Hedy Kober, Derek Smith, Terry Jones and Eugene Skepner LetterWise: Prefix-based Disambiguation for Mobile Text Input in the proceedings of the 14th Annual ACM Symposium on User Interface Software and Technology (UIST), November 2001, Orlando, Florida.

multiple simultaneous key presses

- Frogpad
  - Mini-keyboard
  - Static arrangement of letters based on frequency in the language text corpus
  - Pressing two keys provides the second option
  - http://www.frogpad.com/
- Cord keyboard
  - Twiddler

Fasttap

http://www.ideal-group.org/demonstrations/fasttap.htm

Fastap's keypad may look small, but the buttons work and feel a lot like the keys on your computer keyboard.

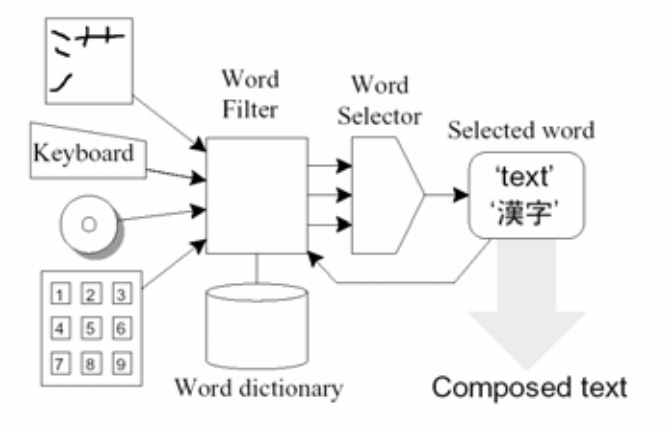
Letters are raised and number keys are lowered so that your finger will probably touch letter keys when you strike a number - but that's okay.

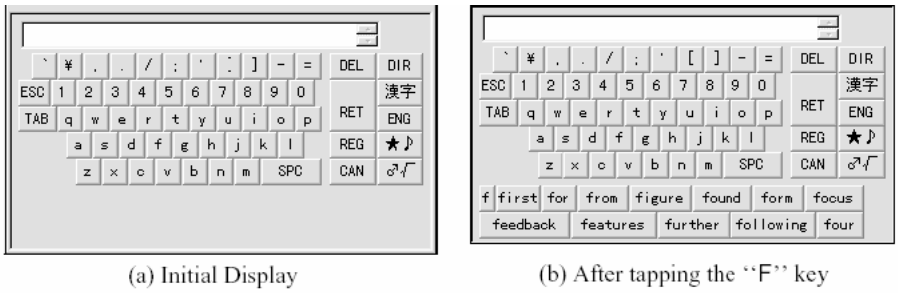
That's how Fastap technology works, you don't need to be careful!

- Different keys for numbers and letters
- Different hight

Predictive Input

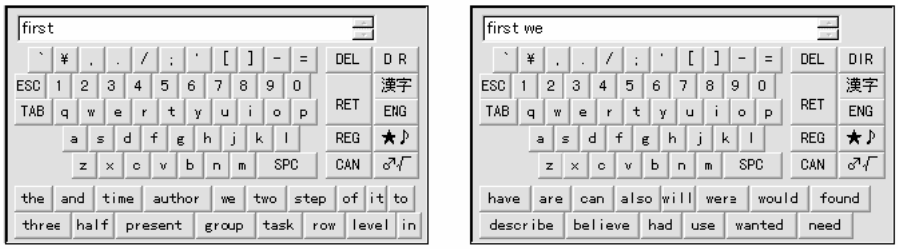
- Example: POBox - An Efficient Text Input Method for Handheld and Ubiquitous Computers. Toshiyuki Masui. HUC99 http://www.csl.sony.co.jp/person/masui/papers/HUC99/HUC99.pdf





(a) Initial Display (b) After tapping the ''F'' key

Fig. 4. Pen-based POBox.



(a) After selecting '**first**' (b) After selecting '**we**'

Fig. 5. After selecting "**first**" and "**we**".

Output
What to present?

- Text
- Non-speech Audio
- Music
- Speech
- Images
- Video

- Tactile feedback (e.g. vibra alarm)

Screens

- Resolution
- Color/Monochrome
- Touch sensitive
- Size

Head-up Displays

- Images in from of the eye
- Appears free floating
- See through

- http://www.microopticalcorp.com

Haptic feedback
Application in Pedestrian guidance

Fig. 1. (a) GentleGuide control unit and wrist devices (b) GentleGuide worn by a participant

- **GentleGuide: An exploration of haptic output for indoors pedestrian guidance** S.Bosman, B.Groenendaal, J.W.Findlater, T.Visser, M.de Graaf & P.Markopoulos. Mobile HCI 2003. Udine

References

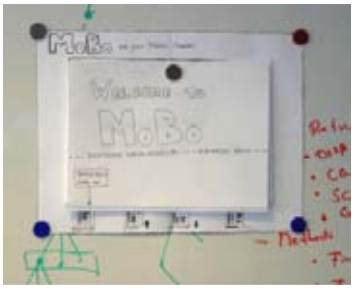
- Poika Isokoski, at NIT2001, 12.2.2001 http://www.cs.uta.fi/kurssit/Interact/NIT2001_PI.ppt
- The Dynabook Revisited - A Conversation with Alan Kay http://www.honco.net/os/kay.html
- Unistroke http://sandbox.parc.com/parctab/csl9501/paper.html
- Quikwriting http://mrl.nyu.edu/projects/quikwriting/
- Dasher http://www.inference.phy.cam.ac.uk/djw30/dasher/
- POBox - An Efficient Text Input Method for Handheld and Ubiquitous Computers. Toshiyuki Masui. HUC99 http://www.csl.sony.co.jp/person/masui/papers/HUC99/HUC99.pdf

Prototyping mobile UIs

- Paper prototyping
- HTML
- Flash lite
- Python

Paper prototyping

- Example: Mobile interaction with public displays
- Early and cheap (time, money) evaluation of ideas / UIs



Paper prototyping




HTML – prototype / mock-up

- Prototype: static HTML pages stored on the mobile phone
  - Prototype looks like a real application
  - Easy to develop
  - Just predefined aspects can be tested (static HTML pages)
- Example: automatic form filling on mobile phones
  - A pre-filled HTML form (with errors)
  - An empty HTML form
  - User study

Table 4. Average input times over all users, user were ask to perform several runs

	Empty forms	Pre-filled forms
1. run	240 seconds	60 seconds
2. run	170 seconds	37 seconds
3. run	115 seconds	33 seconds

Python for Series 60 Phones

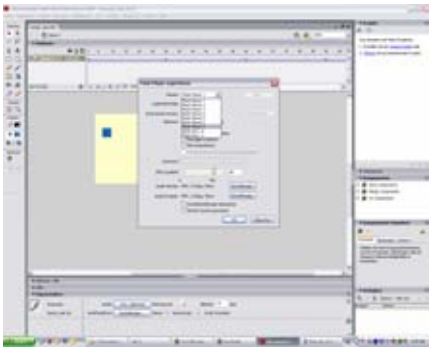
Demo

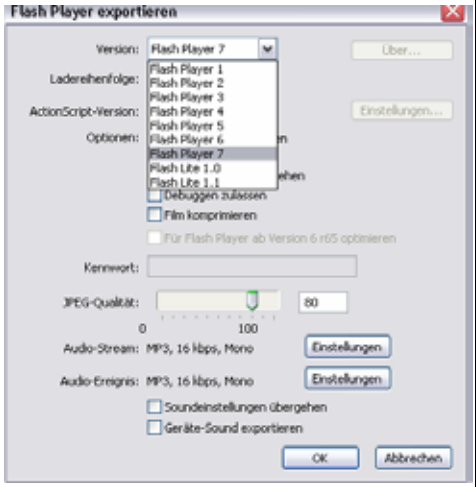
- 1. Python for Series 60 Platform API Reference
  http://www.forum.nokia.com/
- 2. Programming with Python for Series 60 Platform
  http://www.forum.nokia.com/
- 3. Python Web site
  http://www.python.org/
- 4. Series 60 SDK documentation and Python for Series 60 developer discussion board
  http://discussion.forum.nokia.com/

Flash - Lite

- Player Flash Lite 2
  - Based on Flash Player 7
  - pre-installed (Asia, Flash for i-mode) / download (e.g. Nokia Series 60)
- Features:
  - Loading and parsing of XML
  - Persistent data
  - Media handling (images, sound, video, SWF, etc.)
  - Action Script 2.0 Support
- Authoring tool: Flash Professional 8
- Used for: games, graphics, ring tones

Flash – Lite: Flash Professional 8





Flash – lite: Architecture