

# 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



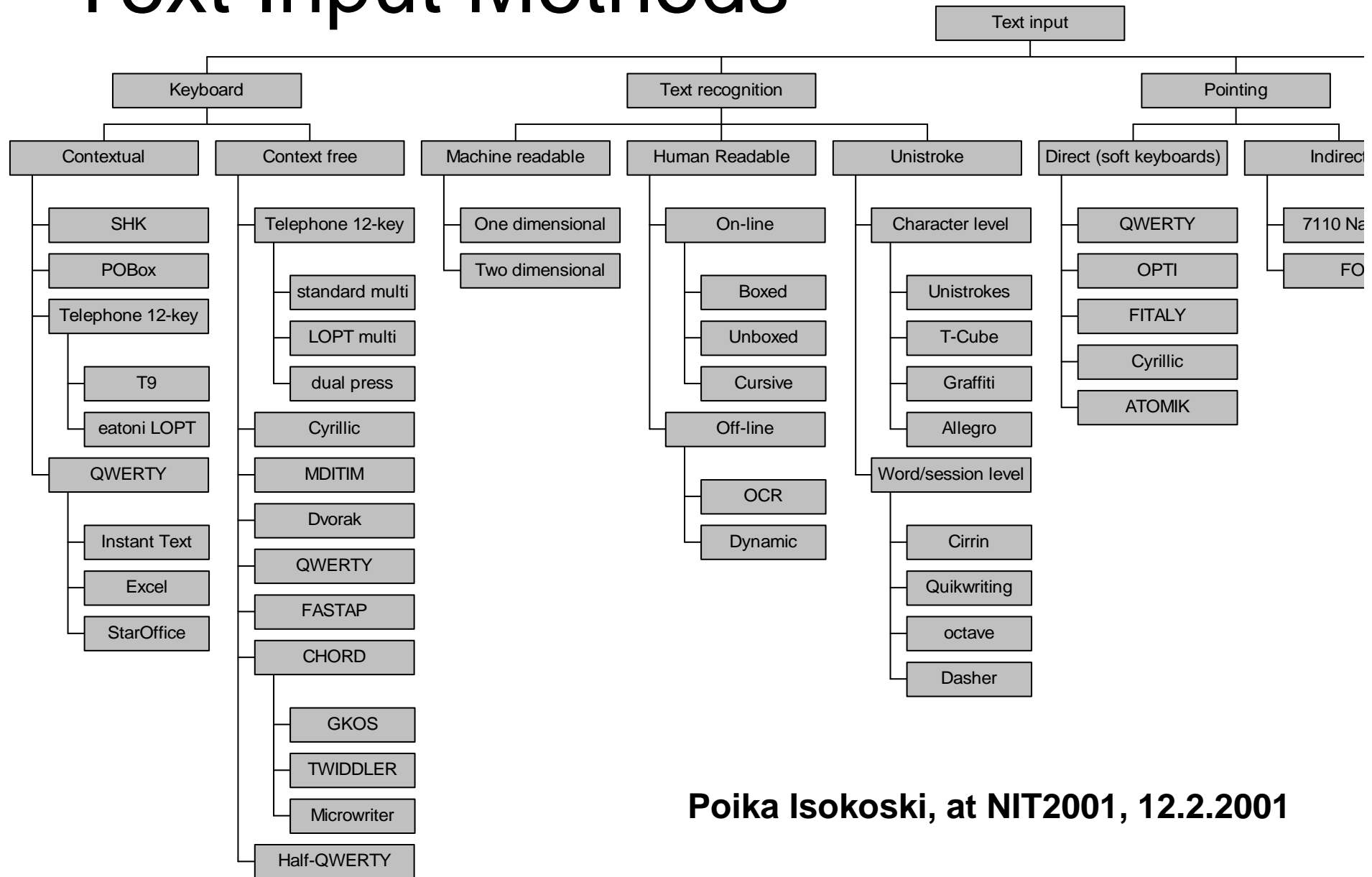
- Research platform
- Gesture and speech interaction
- *tilt-to-scroll* and *Rock 'n' Scroll* to include the use of gestures to issue commands.

## VIDEO

# Text input on mobile device - Why does it matter?

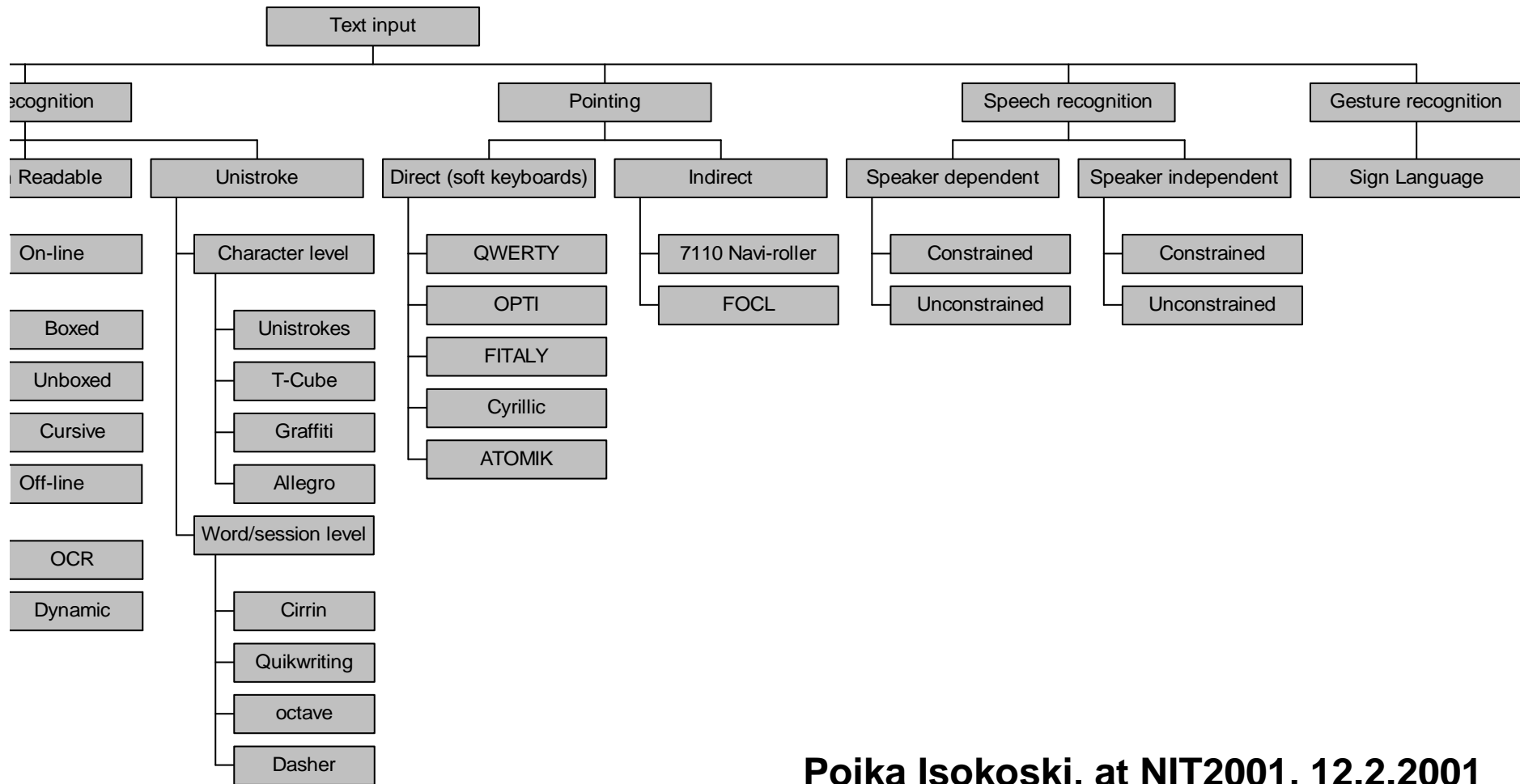
- In 2003 there have been 16 billion SMS per month in Europe.
- Mobile internet is on the rise – with new technologies (UMTS) it may become one important way to access the internet

# Text Input Methods



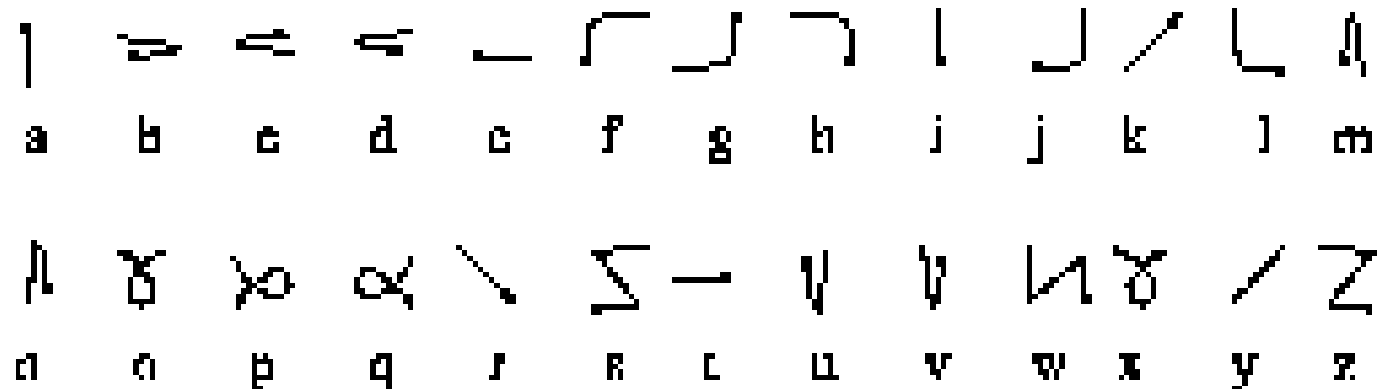
Poika Isokoski, at NIT2001, 12.2.2001

# Text Input Methods



Poika Isokoski, at NIT2001, 12.2.2001

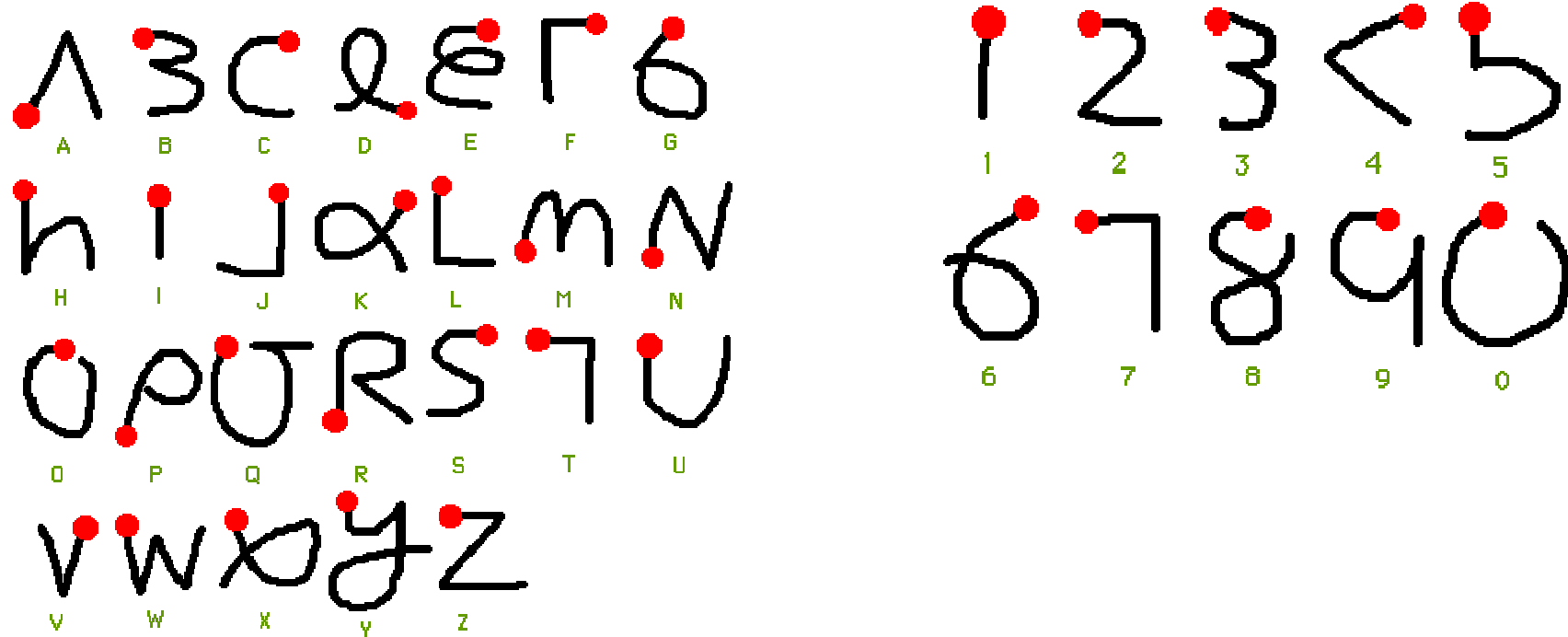
# Unistroke



- Explored in the PARCTab Experiment
- 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

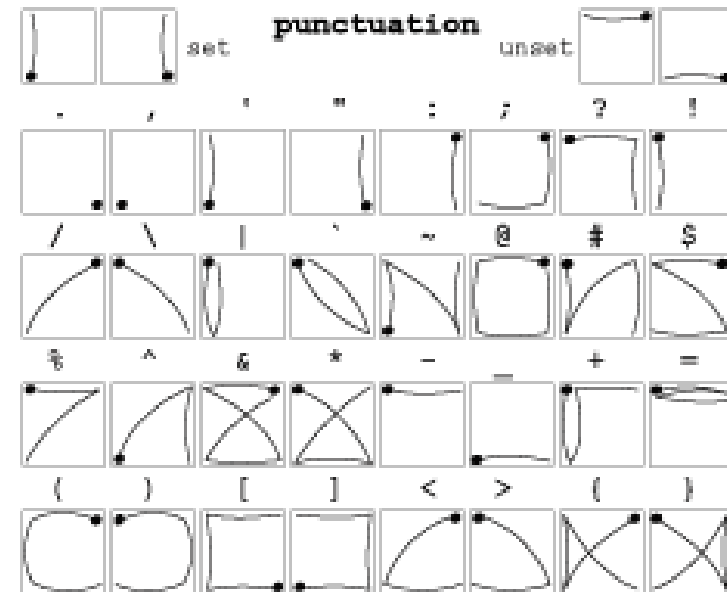
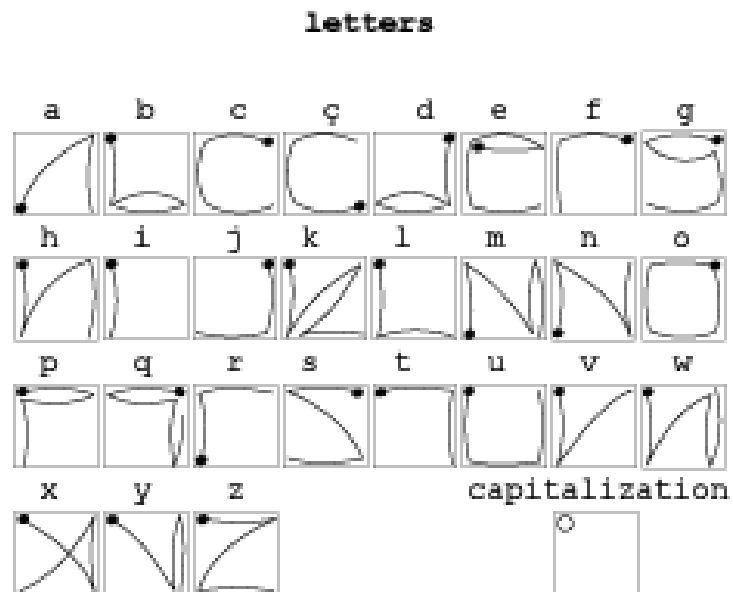
## Unistroke used in PalmOS





# EdgeWrite

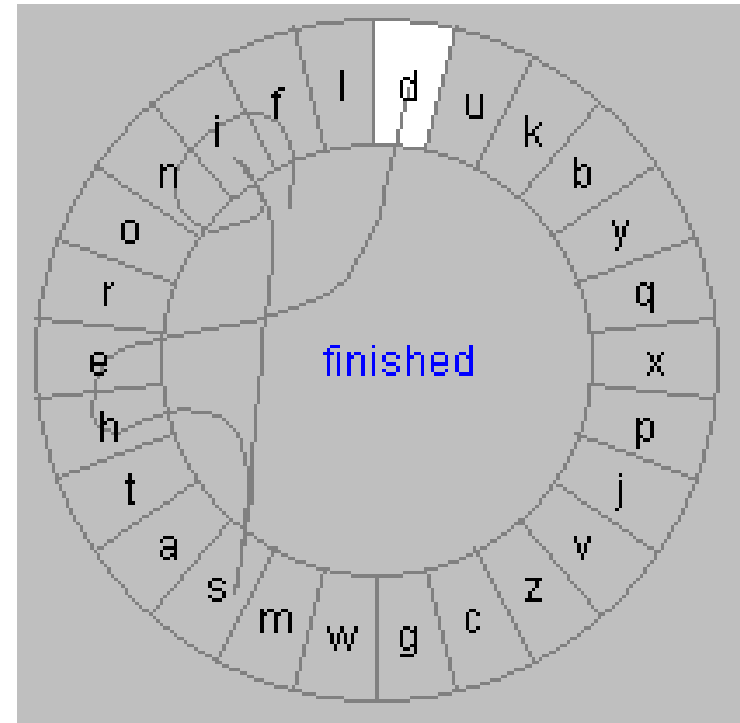
EdgeWrite Alphabet  
www.edgewrite.com



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

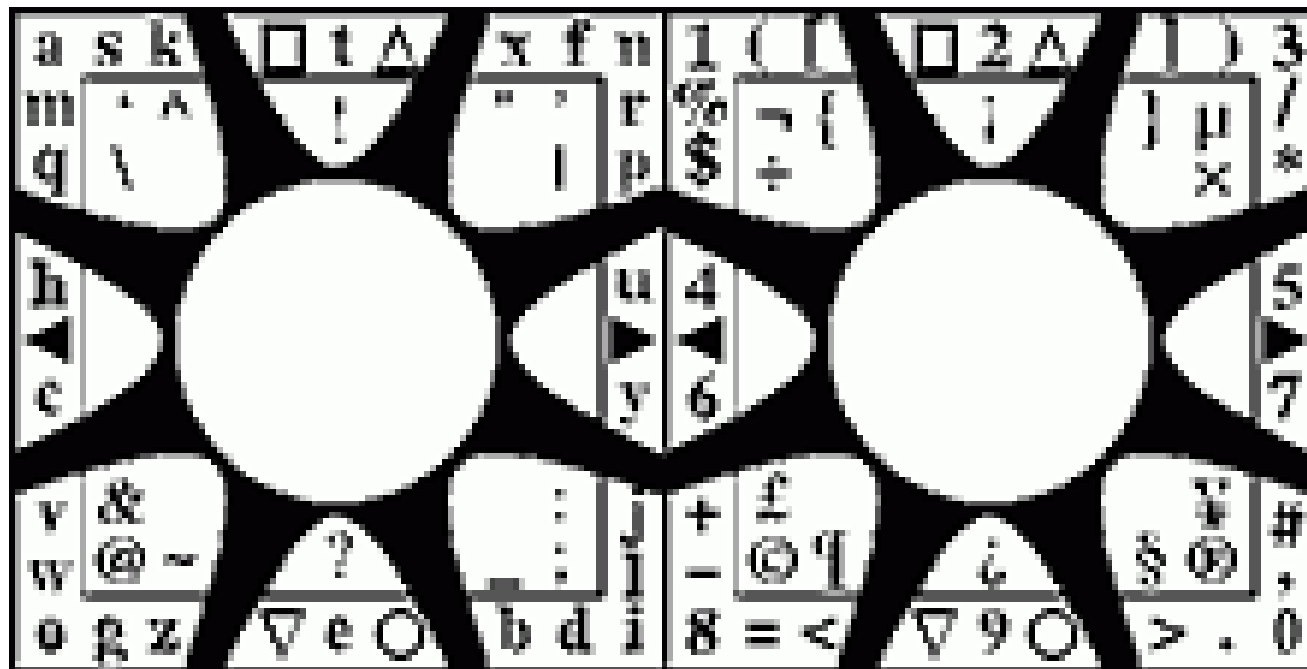
# Cirrin - (the CIRculaR INput device)

- 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

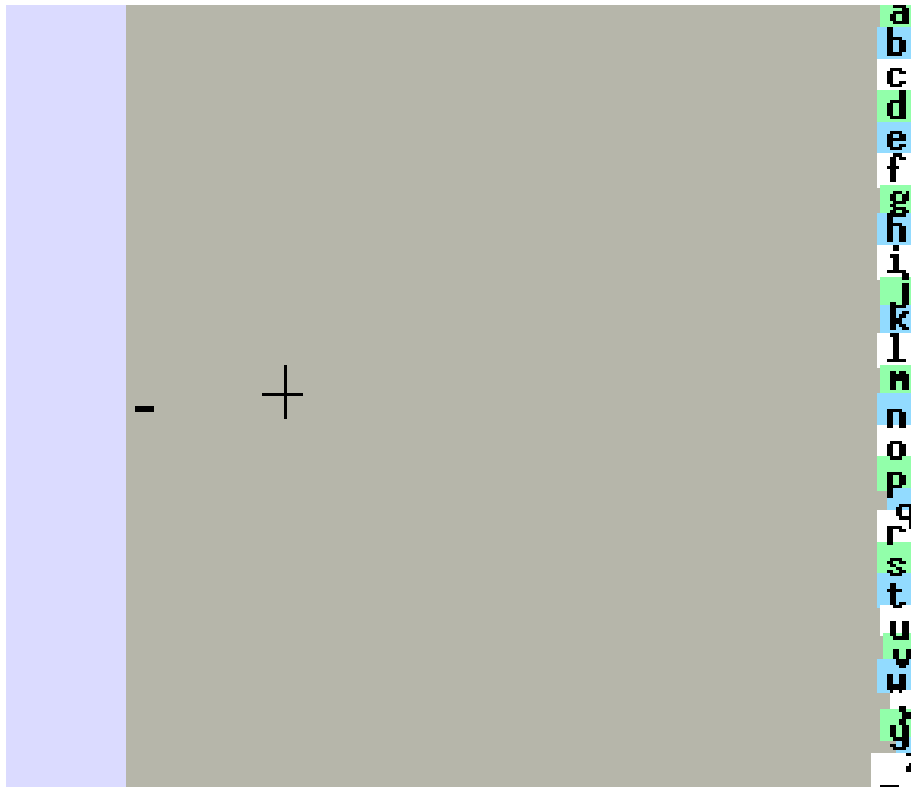


# Quikwriting

- <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://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/>

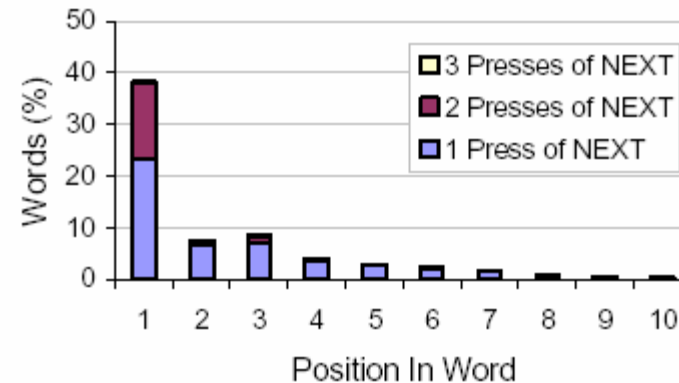


Figure 2. Press of NEXT vs. letter position in word

- Language is analysed 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 choose 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.

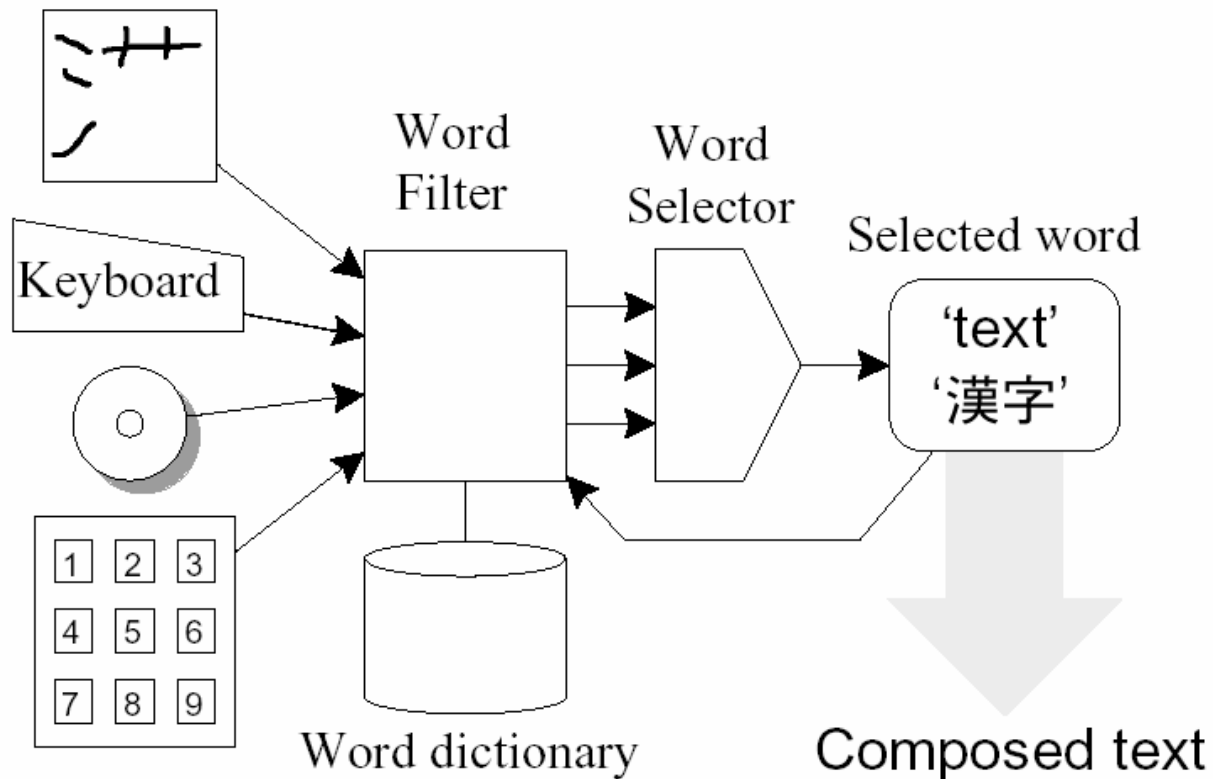
That's how Fastap technology works, you don't need to be careful!

- Different keys for numbers and letters
- Different height



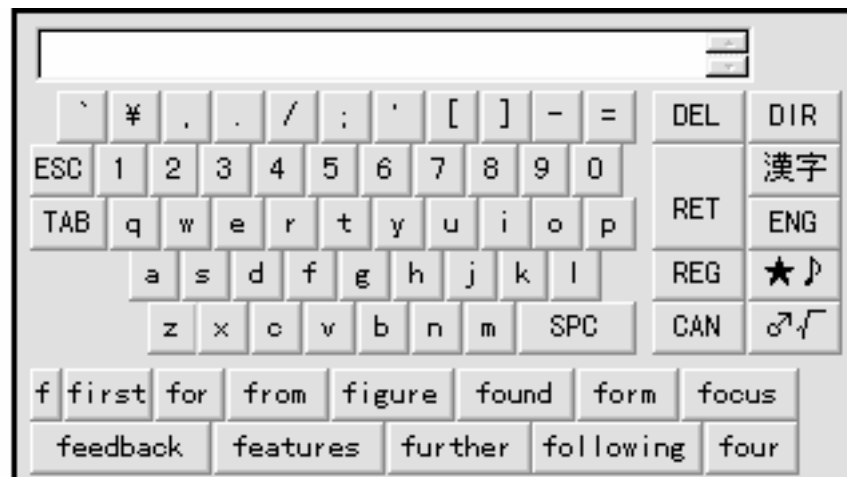
# Predictive Input

- 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

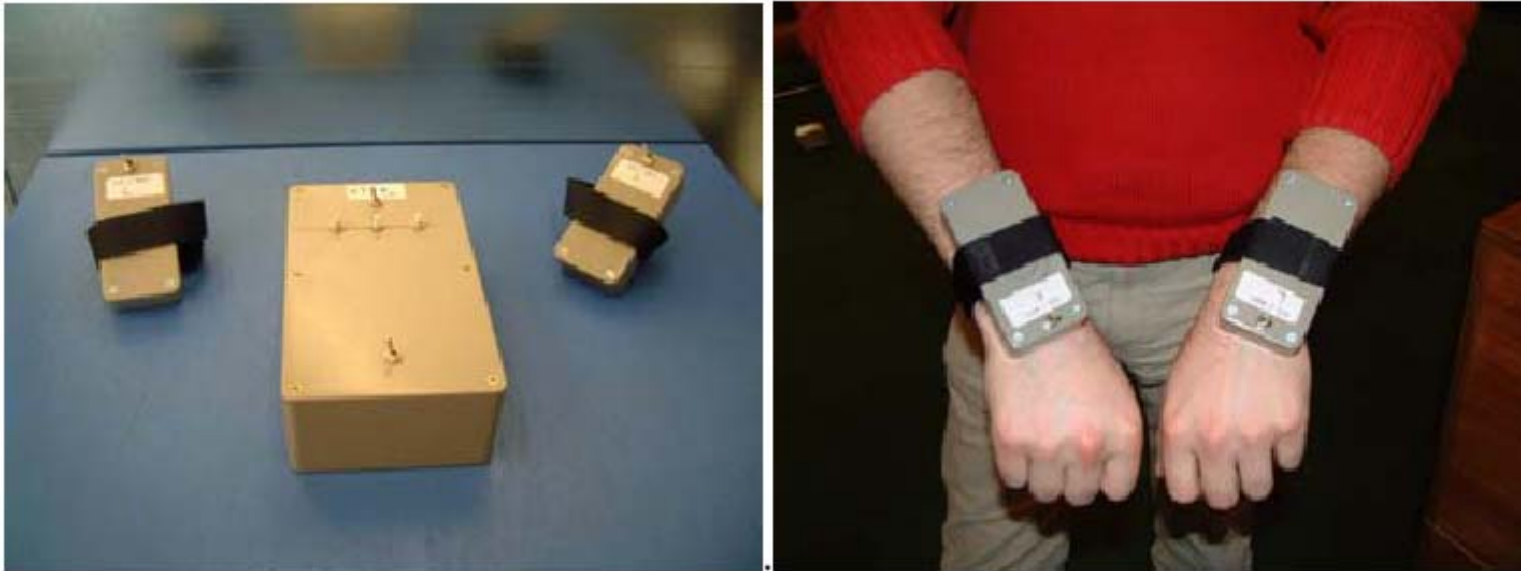


Fig. 1. (a) GentleGuide control unit and wrist devices (b) GentleGuide worn by a participant

- **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

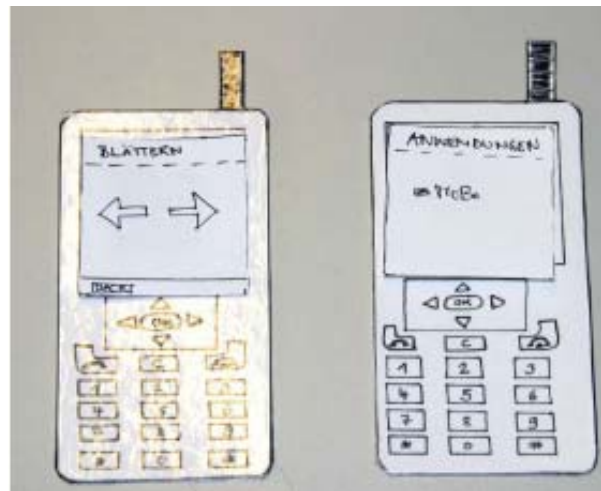
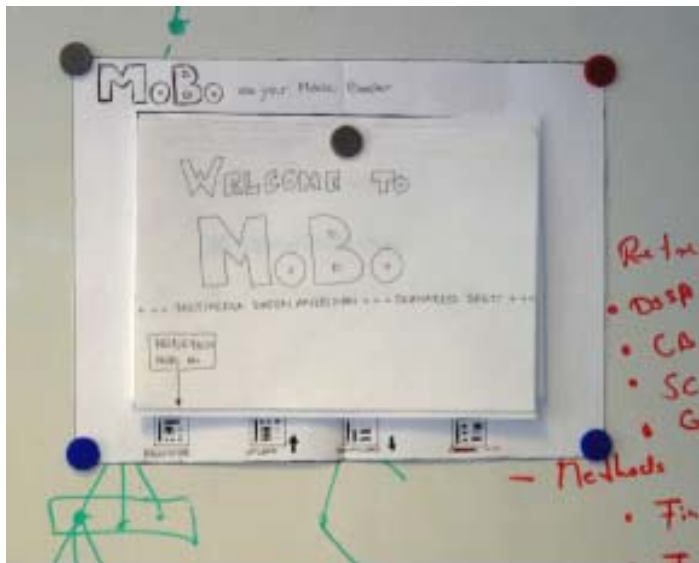
- Poika Isokoski, at NIT2001, 12.2.2001  
[http://www.cs.uta.fi/kurssit/Interact/NIT2001\\_PI.ppt](http://www.cs.uta.fi/kurssit/Interact/NIT2001_PI.ppt)
- The Dynabook Revisited - A Conversation with Alan Kay  
<http://www.honco.net/os/kay.html>
- Unistroke <http://sandbox.parc.com/parctab/csl9501/paper.html>
- 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



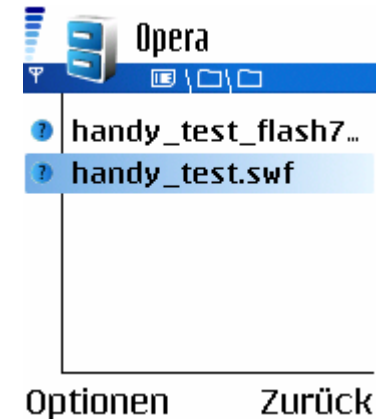
# Python for Series 60 Phones

## 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/>

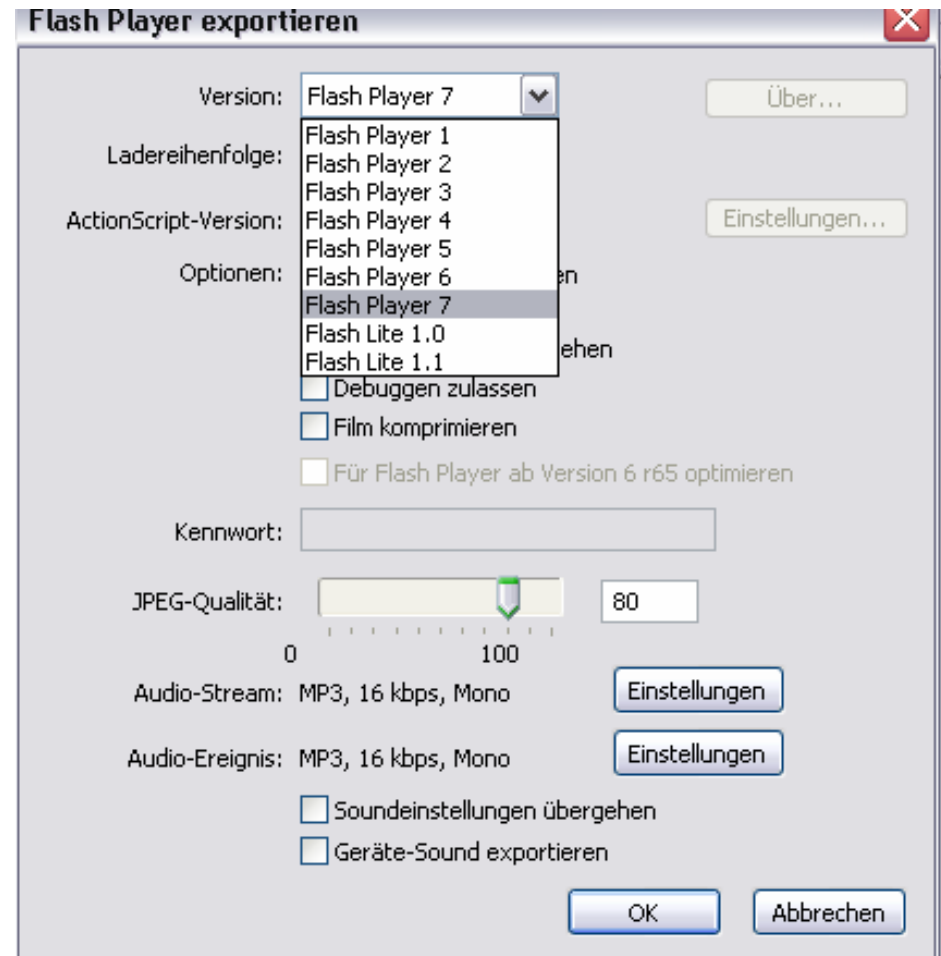
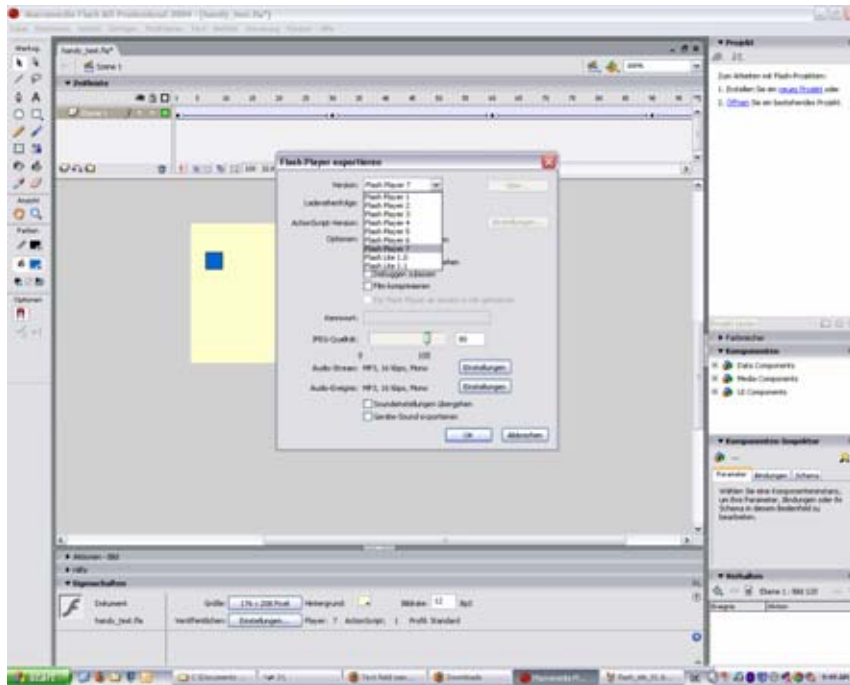
# Flash - Lite

- 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

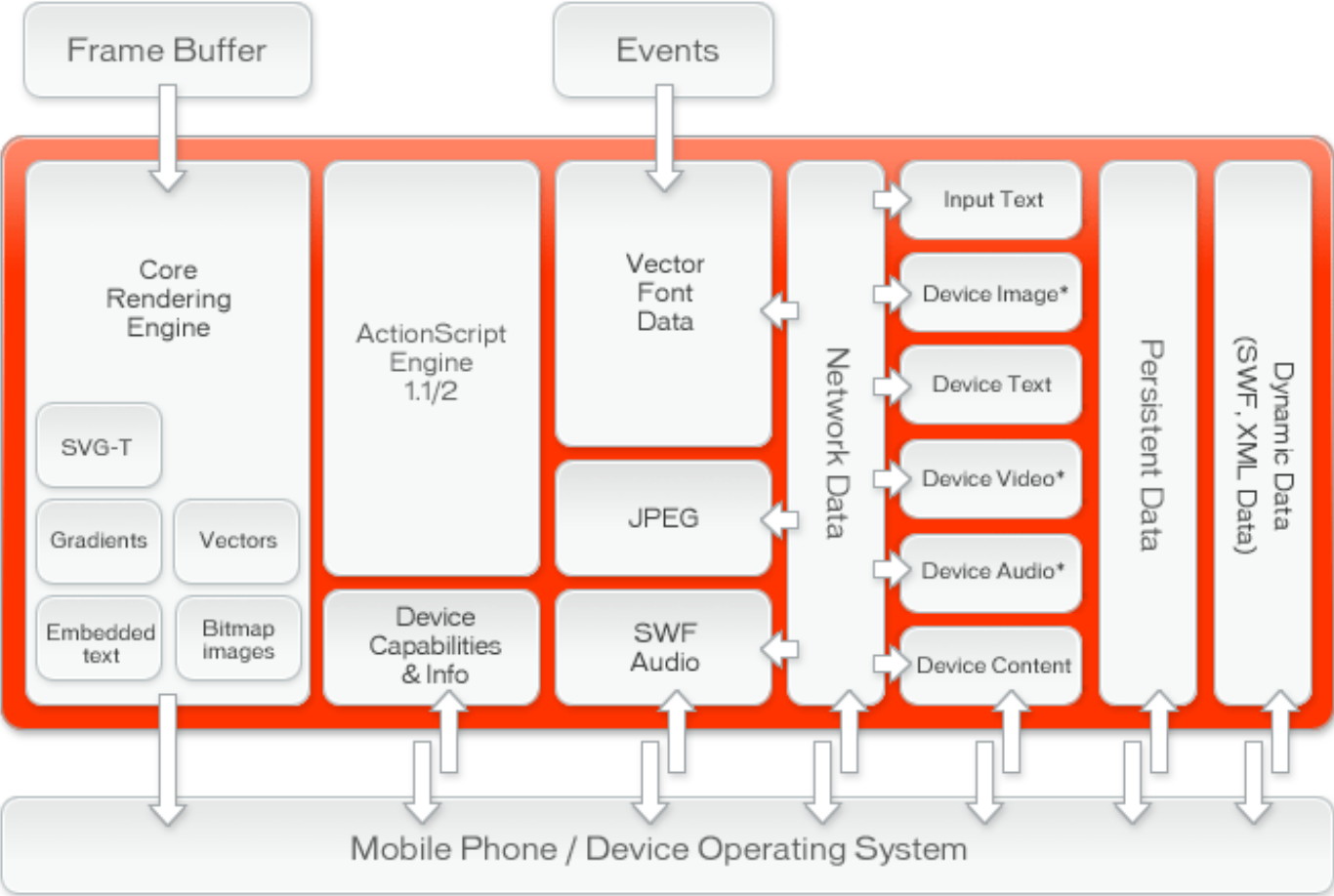




# Flash – Lite: Flash Professional 8



# Flash – lite: Architecture



\* Using on-device, platform-based codecs