

Practical exercises:

16th. Sep - choose project user interfaces / interaction

Human Factors ↔ ergonomics

factor: motivation → a need to be attracted and want to use the computer

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! Take good notes!
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Csapó bme.hu

Standards:

! ISO 13407 - focuses mostly on the design process, not only on the end product

In Hungary, software requirements:

- fulfill purpose
- display hu. characters on screen and in paper
- easy to use
- adapted to user
- hu language help topics
- no monitoring employees without them knowing
- provide feedback to employees about performance

Distribution of information

- theoretical capacity of our senses

! difference between hearing, speech, reading

- blind people can integrate socially easier than deaf people
→ is vision so crucial?

Memory - information processing steps:

- 1 code
- 2 store
- 3 Recall

2. short-term - things around us
(STM) - "queue" - like structure
- grouping - easier to remember no. in groups

LTM - so far it cannot be modelled in a computer
- starts before birth and lasts all life
- good procedures in the brain for searching and pattern matching based on similarity and errors

Interfaces

- diff. types of displays - numeric & graphic
- vision: very small part of electromagnetic spectrum
- vis. features: rods - high sensitivity to light (1ph.)
 - slow adaptation
 - 120 mil.

- Scotopic - b & w, no colors

↓
Photopic -

- angles = vision limits

cones - 8 mil. (diff. types - sensitive to diff. wavelengths, RGB)

• Michael Bach, de/ot/ - optical illusions

- Resolution issue has moved from monitors to portable devices. (solved)

- Multiple monitors - both pros & cons

- 3D - holographic - static already exists, dynamic - RealD

- polarised - IMAX - no head movement

RealD - allows movement of head

(2)

a little

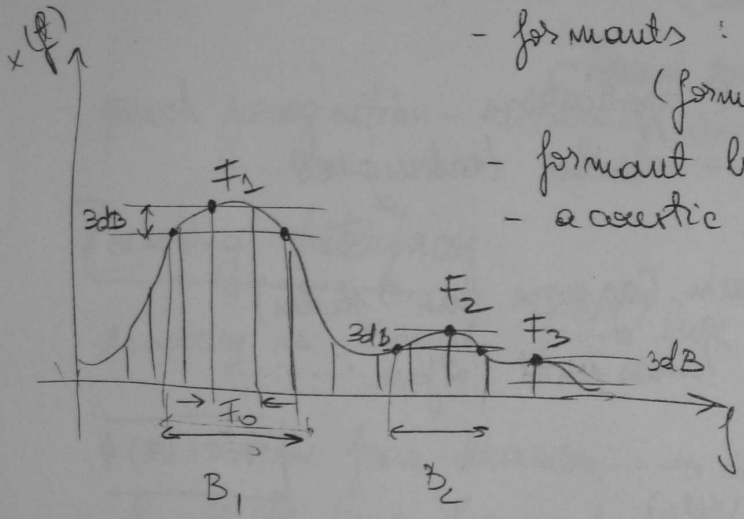
Speed
Feeds

Speech

Feedback → emitter's ^{own} perceptions
 → communication partner from the
 SUI ≠ VUI = speech / voice user interface

* diff.:
 SUI may involve visual interface,
 VUI does not

Units of perception: - sounds: spoken letters & silence! intervals
 - F_0 : pitch (base frequency)
 - duration



- formants: F_1, F_2, F_3
 (formant frequency)
 - formant bandwidths: B_1, B_2, \dots
 - acoustic meas. unit: phon

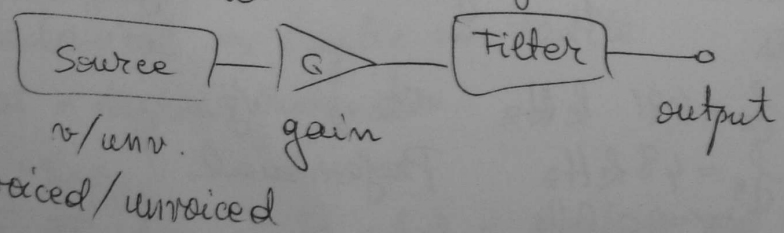
Units:	
Physical	Perception
Intensity [dB]	Volume [phon]

Masking sound - modified the hearing threshold (in f. domain)
 Vision - higher intelligibility of sounds when v. present

Speech synthesis

F_0 → intonation in most languages

Classical model: Source - filter:



Modern approach: waveform-based concatenation & proc.
 "Diphone"
 stored small units of human voice (sounds database)

- layout of

Speech recognition

- language
- ability to interrupt during "conversation"
- key words: rest is ignored
- isolated word: limited to one version of a word
- speaker dependent: training for recognizing one person's voice
time
- adaptation: during use time

Speaker identification

- forensic phonetics - criminal applications
- id., recog. & synth. → similar techniques

Presentation: PDF file, 5 min (no more than 5 slides)
to be sent to Tamas until 2pm

Speech User Interfaces (SUI, VUI)

HCI (2) 4

User environment

- menu structure - different for a audio channel
- recording booklet - instructions for the speaker
- analogy w/ database synchronicity & coherence
- voice characteristics → part of the audio image of the co.
- idle song issues

Music	$f_s = 44.1 \text{ kHz}$	CD quality	} ≠
	$f_s = 48 \text{ kHz}$	Professional	
Telephone	$BW \sim 20 \text{ kHz}$		
	$f_s = 8 \text{ kHz}$		
	$BW = 3.1 \text{ kHz}$		

⇒ aliasing error → for sampling conversion use low pass filter

- locomotion interface: movement on a surface that moves
- project Natal - Microsoft approach
 - no physical contact with any device
 - product: Kinect
- Ms. Surface - handles up to 50 objects at the same time (touchscreen typically 1-2 obj. - fingers)
- for the large-button phone - ~~large~~ more customers - business ppl. (instead of land wireline phones)

Small interface

- nose & head tracking

Hci(2)5

User-Centered Design

- opposite to technology approach (if we build it, someone will use it)
- design: engineers → ergonomic experts / psychologists
- minimum: one team member represents users
- optimal: real users through the development
- tasks: sometimes a dev. is used for a diff. task than designed
- from a traditional eng. point of view - difficult
 - sequential while user-cent. design - iterative
- involvement:
 - users don't understand concept
 - hard to explain
 - if not, user may not like it
- disabled users
 - motivated
 - tolerate errors
 - useful feedback
 - willingness to perform hard task

definition of
evaluation of
- initial

- definition of target - important for system/design evaluation
- evaluation of solutions - there are more than 1
 - depends on the resources & size of company
- involvement of users:
 - observation - of user while using device
 - impact on user behaviour
 - models - of user behaviour ^{no. of.}
 - based on small samples
 - example: Internet modem users peak time (prices)
 - testing - paid testers - duration of test & accuracy
 - how to detect random testers
- profile users - Who are they?
 - customer - they know what they want most of the times → best solution
 - can the customer's requirements be fulfilled?
 - organization - person that buys product (client) is not user ⇒ hard to get users for testing
 - ex: supervisory system for employees
 - end-users - easier task
 - tests (motivated)
 - specify the user group → feedback
- trend: companies sell products w/o testing ~~so the concept~~ ^{new} product
 - so competitors would not find out about product
- star process - not going through a phase ~~too~~ ^{in a 4 cycle}
 - focus on evaluation
 - time saving ↑

Information collection

- in the early phase, very ~~easy~~ ^{hard} to observe users in original environment

Software quality
- Functionality

- lab. environ. are preferred
- observation effect - only for the first hrs/days (ex: reality show)
- interviews: 1 interviewer / interviewee \rightarrow costly
- questionnaires: online - ~~too~~ much cheaper (closed q. scales)
scales - allow finer statistical analysis
open questions + accurate info
- need knowledgeable users (hard)

- Golden rules: 7 ± 2 items 2 records 3 clicks

(menu depth should not be more than 4 clicks)

- Pareto principle - who are the decisive figures?
- involve the 20% in tests & eval.
- Inverted Pyramid - modern news, webpage, inform. service:
conclusion is displayed first
- Quick 'n' Dirty - taken into account when designing functionality
- Graceful degradation - compromise in order to make user happy.
- user adaptation - levels of experience $\left\{ \begin{array}{l} \text{support - new users} \\ \text{speed - exper. users} \end{array} \right.$
- keep the user in control
- Audience: wide audience vs. device & time complexity needed
- if overlap is too small, create diff. products
- language - depends on target & audience
- err. handling - no. more useful than msg for user

Software quality

- Functionality can only be checked based on specifications
! changes in the specifications
- If Funct. is not sufficient \Rightarrow usability \neq
- Reliability - consistency in updates & versions
- real-life hard to test in lab (high-vol., long time, etc)
- Efficiency - related to usability
- depends on type of user (ex: typing tasks)
- Maintainability - includes error correction
- Portability - very hard topic
- ex: a lot of banking syst. implemented in Kobol
- critical issue for long-term systems (5-10 yrs)

Usability

E5: - Effective - Error tolerant
- Efficient - Easy to learn
- Engaging

- critical issue in HCI
- related to many of the other param.
- not defined in standards (good-practice rules) 5Es
- depending on the appl., each E could have a diff. weight in designing the program

- E1 - features of the software
- E2 - speed & load on the user few in one session
- accuracy: obtain desired output (after 1st stage)
- E3 - overall impression
- can provide contradictory requirement w/ E1 & E2
- Fault-tolerant - faults \rightarrow design
 \rightarrow implementation
- E4
- correction: self-correction, restore functionality, w/o human intervention

- ex: in a control room - manage error flooding by
tizing and eliminating low priority errors

- Learnability - initial state: plug 'n' play
E5 short learning phase

- Evaluation of quality aspects

types of eval. - diagnostic
- measurement

- in all phases, there should be a separate evaluation

- early phase - prediction - not always accurate

- later phases - results usually don't end up in the
product, because of deadline pressure

- results: - uncertainty - statistical tools can help

- questions - which users to test?

- important to plan

- how to find the users

- load on user - too much → leave
provider

- marginal conditions:

- resources available for the evaluation

- data - dependent of type of users: paid
volunteers

- numeric data can only be compared based on:

- environment

- subjects

- evaluators

} subjective elements

- tester options: developers are not good testers

- tasks: - main task ← for the user (E3) ✗
← for the developer/business

- new elements - can bring in bugs in the system

- MK: ex 3D display for navigation

- definition of tasks:

- evaluators - restrictions on possible feat.

- location: - real envir.: critical for E1

- data collection: - privacy
- also including focus groups

Practice Monday 18 Oct - upload by Friday
Class Thursday 14 Oct

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HCI(e)7

www.presi.com

1993 info.com.ch

1995 fs2.lme.hu - 500th

The design of the user interface - limited by technology

www.etc.com - eye tracking - accurate results

- expensive testing (users)

"Think Aloud" ← - user talks while browsing

Web 2.0

- web as a platform ← applications → functional

- data: propelling force

- component development

- loose structure

960,96
grid system

example icons: enhanced labs.com

Technologies

CSS = Cascading Style Sheets

ex.: In HTML:

<p> This is an example </p> →

In CSS:

This is an example.

```

P {
  color: red;
  font-size: 14pt;
  font-family: Arial;
}

```

```

P.bigger {
  font-size: 20pt;
}

```

In HTML:

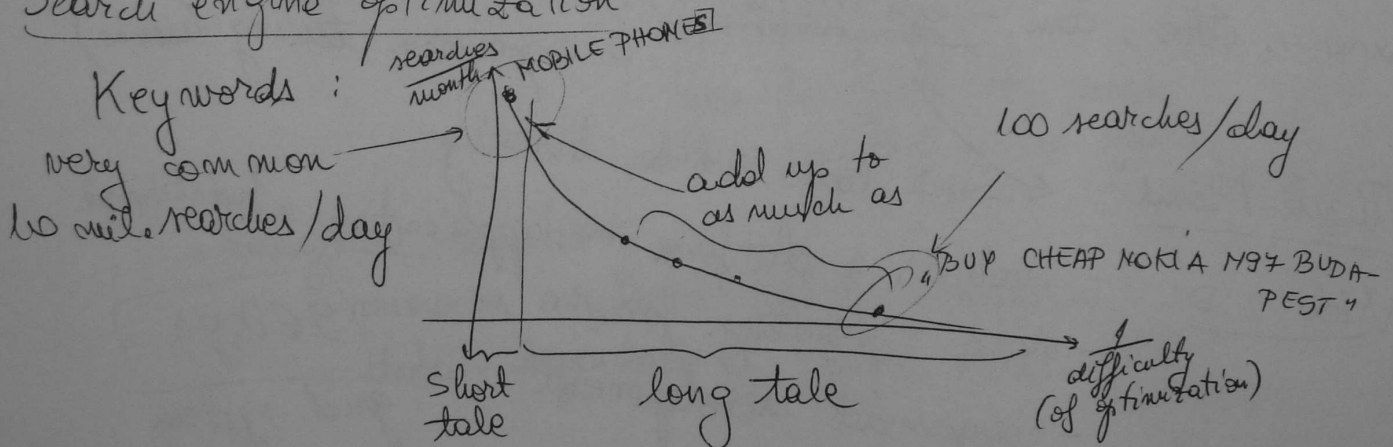
```

<p class="bigger"> Second example </p>

```

DHTML - enables the update of only parts of the web page without reloading the whole page.

Search engine optimization



- visually attract attention

HCI (p) 3

Design of continuous speech dictation system

- Speech recogniser in Windows!
- usages - controlling windows
- file management
- dictation

- roles :
- managers
 - software eng.
 - Hci specialist
 - marketing
 - (test) users
- } design team

LVC SR = large vocabulary continuous speech recognition

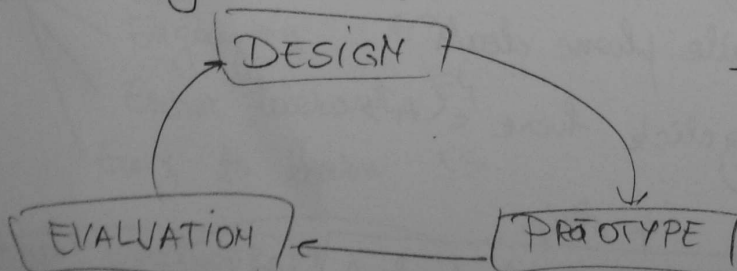
- operates fast enough on desktop computers
- high accuracy
- feature: adapt to user

- 1) Users
- blind people ← also need to implement TTS (text-to-speech)
 - business men
 - doctors

- 2) Environment
- indoor
 - out door ← app. needs visual contact to recog. mis-takes + noise

- 3) Task
- 2 sec. rule (response time)
 - 7 ± 2 commands
 - 3 clicks - correct a word by using only 3 utterances
 - walk up & use design - for unexperienced users
 - ? tutorial
- see pg. 8

Iterative design technique



- Functions :
- ON/OFF - speech command or button
- Punctuation marks
- New line (↵)

- Position on text :
 - search / select word
 - go to (line no. / word no.)
- (13)

↳ No. of testers : 60

Time for evaluation : 1 month

Devices - 2 TVs

→ 1 tester per TV per day

Money - 1000 \$

Location - user's home

↳ unknown people

- Task for the user:

- watch videos on YouTube

- browse & videos & search (?)

What data to collect - quantitative - no. of watched videos

- time until first video plays

At the end of the test : data from 54 people (10% failure)

Data Analysis - mean, max. & min

#ci(1)8

SEO - search engine optimization

ON-site - key word selection tools

- Google Adwords CPC - Cost per Click

- Visual appearance + content - relevant for key words

- Tag optimization:

BAD } For the best mobile phone deals
click here

GOOD } For the tip strip

best mobile phone deals click here

GOOD
(15)

- Correction
 - Undo command
 - Replace - current word } with - new word
 - word position }
- Spelling - common words first letter names
- Select - no. of words or sentences
- from " " to " " words
- Editing style
 - commands
- Help - context depending help (eg. how to spell)

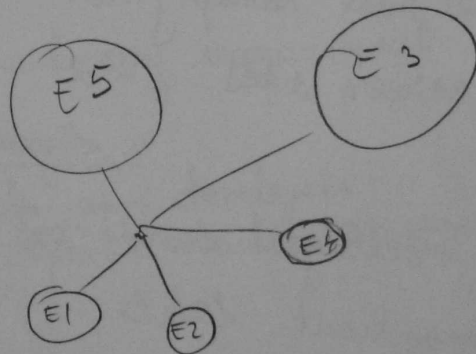
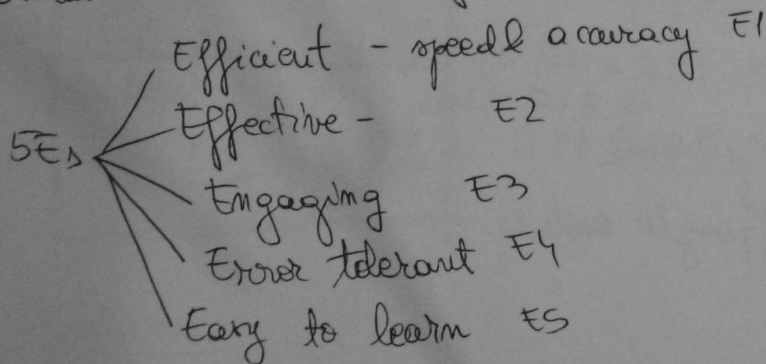
25th October - practical lecture - 2nd prez.
 28th Oct. - lecture

Hci(p)4

Evaluation

Topic: Internet @ TV

Conclusion: Does the UI of Internet match the user needs?



What to evaluate:

- User experience - new to I@TV
 - large users of the Internet
 - people who use Internet for entertainment

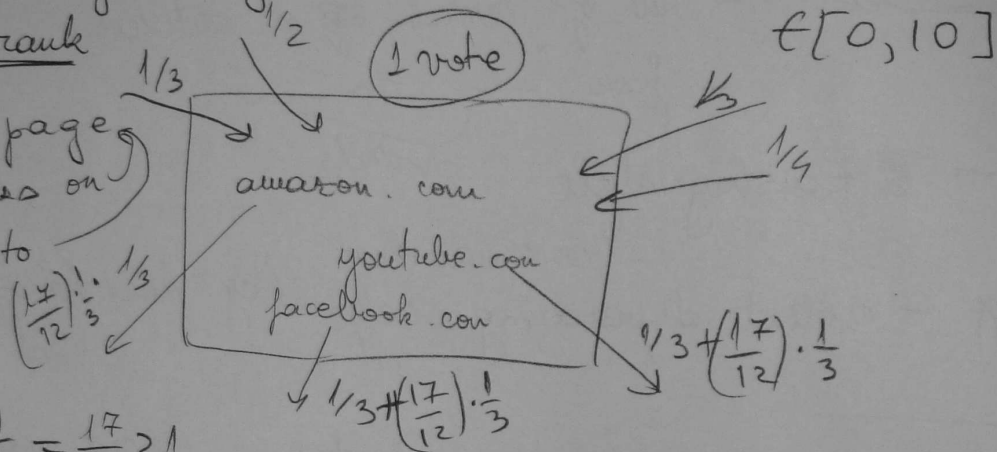
- Sitemap - parts of the webpage to crawl
- relevance and frequency (to check back)
- W3C validation - tips to improve web page

Off site optimization

- concurrency investigation - which sites link to.

page rank

ex: 1 web page
3 links on
4 links to



$$\Rightarrow \frac{1}{2} + \frac{2}{3} + \frac{1}{4} = \frac{17}{12} > 1$$

- published by Google
- link optimization: link, title & alternative texts from ~~other sites~~ in bound links to the web page

Hci (e) 9

Mobile web app.

- default thinking
- screen sizes: 2.2" \rightarrow 196 x 100 or 240 x 120 pixels
or 320 x 200
- 3.5" \rightarrow 300 x 480
- intelligent zoom - on Google mobile
- size limit: 10kB

Smart phones - OS that 3rd party developers can access and build app. for it with the official SDK (software dev. kit)

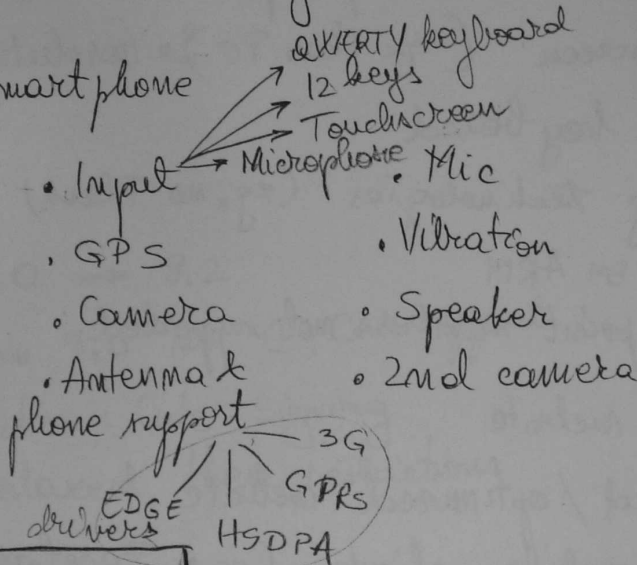
Symbian - Nokia - declining market share

Research in Motion - RIM BlackBerry - mostly in US

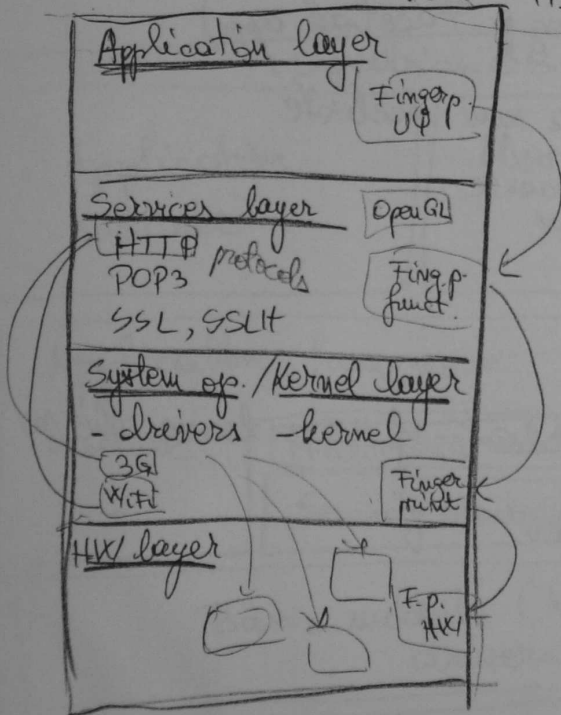
- ARM architecture - good en. consumption
 - fix point calculations
 - preemptive multitasking
- Maemo - Linux based mobile

ex: Design a smartphone

- CPU
- RAM
- Battery
- Screen
- Memory



- Gyroscope
 - Bluetooth
 - Fingerprint reader
- (should be on 2nd layer)



- ex:
- 1st layer: Mic
 - 2nd l. waveform
 - 3rd l. MP3
 - 4th l. UI

Drivers: low level programmed in C, C++

Kernel: - start-up OS
- memory management

Service layer
- help app. developers
ex: OpenGL - handle 3D graphics

Symbian

- most widespread

- Nokia Smart phones: Symbian Series 40
(Sony Dr. Symbian UIQ)

the UI differs

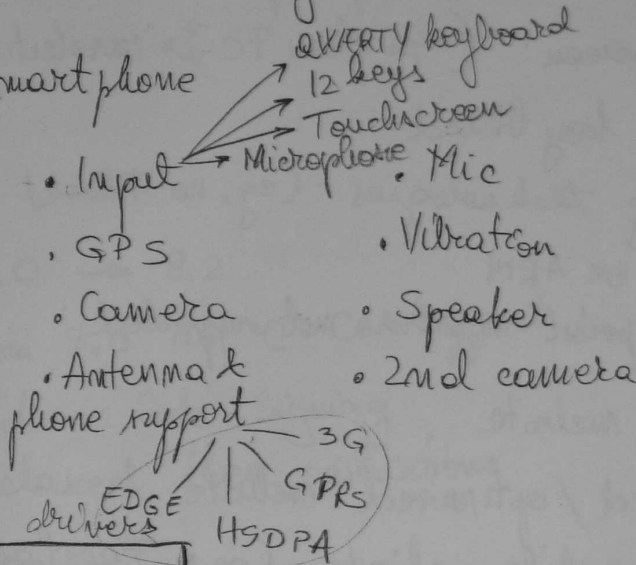
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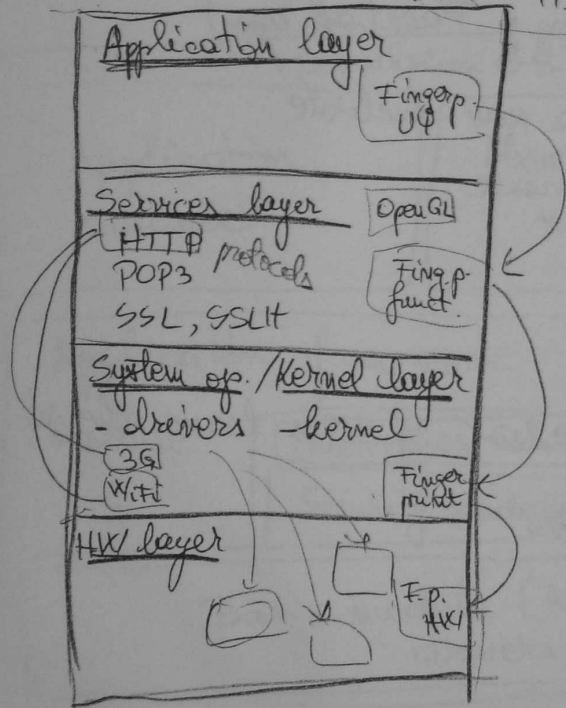
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- Nokia Smart phones: Symbian Series $\frac{40}{60 *}$ mainly used
(Sony Dr. Symbian UIQ)

the UI differs

Nov. 22nd - Adam Somlai Fisher

Ho

Hannes Steer

Mobile Web UI's

- Differences between mobile dev. & PC

- no mouse on mobile ~~plus~~ devices
- small screen (~4x than PC in resolution)
- no full keyboard
- missing technologies (eg. no Flash)
- built on ARM
- fixed point numbers not supported

Options:

- 1) original website
- 2) modified / optimized website
- 3) design mobile clients (eg. Facebook app)

Benefits:

- 1) - no need to develop a new website
- 2) - much better user experience

Com.:

- 2) - expensive

Value > Pain

Research:

- for every pointless click ~20% of users leave the site

Reasons for using internet on mobile dev.

- 1) Urgent information
- 2) Daily routine
- 3) Special interests

- Exercise - design Facebook app for mobile ~~plus~~ devices

- Big buttons
- New fullscreen windows

C1 (4) E

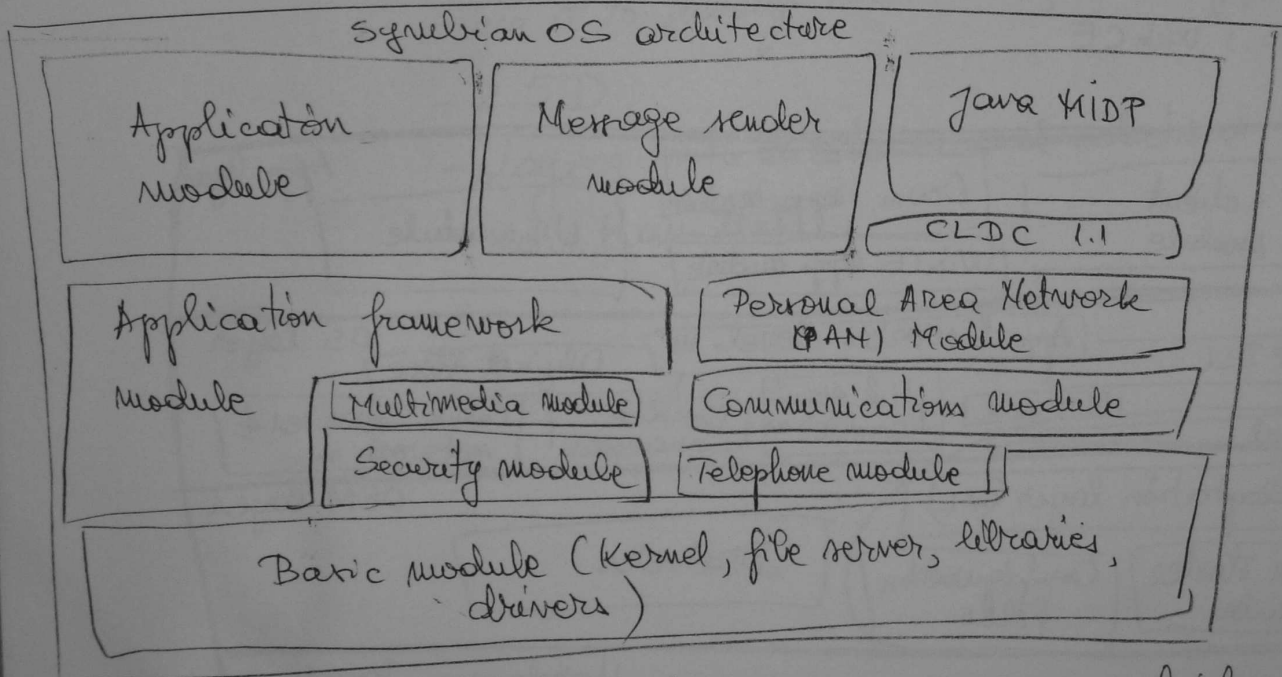
- Homepage:
- Friends
 - Inbox
 - Chat
 - Notifications

- Exit / Log out button
- News feed menu - tap on a post → pop-up menu

Heice10

(cont. pg 17)

- versions 6.0 → 9.2
- starting from 9.0 no C, C++ support
- another restriction: Code Signing
- 9.1 & 9.2 relaxed these restrictions



Libraries - drivers basic functions represented on higher level

ex. driver: $\begin{matrix} \text{---} \\ \text{---} \\ \text{---} \\ \text{---} \end{matrix} \rightarrow 0100001110$
 library: $010001110 \rightarrow \text{MP3 encoded, 11001011}$

Telephone module - includes 3G, EDGE, GPRS, 2.5G, 2G...

Security - Memory - since smartphones need to work continuous (no reboot) app. memory needs to be allo^c

- cated so no other app. would use it.
- DRM - Digital Right Management
 - anti-piracy low-level security
 - the reason for MM module on top of security

App. framework -

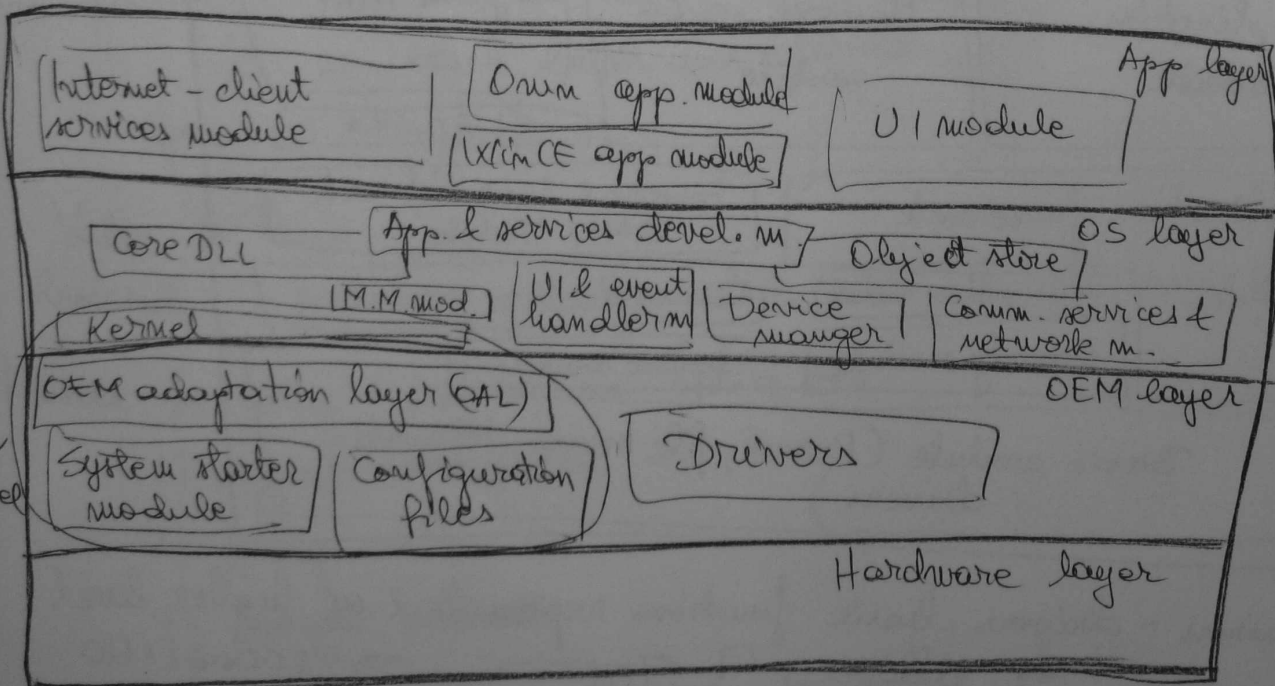
Communication: - IPv4, IPv6, TCP, UDP, POP3, ^{bitstream → email} WWW ...
 - higher level

App. module - a mix of the built-in app. of OS + 3rd party
 - ex: dialer, calendar

Message reader - SMS, email, MMS
 → very simple to create an app that sends ↪

Windows Mobile

- OS: WinCE



- System starter module ←
 - Configuration files - are loaded in memory by ↪
 - Object store - "Memory" - mem. is physically in HW layer
 (20) - higher level repres. of mem.
- part of the Kernel

DLL - a way to access the desktop world
Windows Phone 7

- new user interface: kinetic movement

Hci (e) 11

Interfaces

- people can participate and modify their space
- use senses to convey information - heat
- visual representation of WiFi
- 'Prezi' - physical space - distance
 - navigation in real life → intuitive
 - spatial memory - number keys
 - use it to develop their ideas, not only present
 - 2.5D
 - playing with orientation and relations
 - more than text

iPhone

(HCI(e)12

huteran

- from P. 4 supports multi-tasking
- vector based UI
- App store - upload & download apps.
 - spread worldwide, centralized
 - competition
- Success - 1000s of apps - also a mess in the beginning
 - touchscreen ← other dev. also had it
 - Mac users - multi touch, no stylus
 - only part / good start
- UI ≠ easy to use
 - built-in camera
 - HIX/components - design & layout, appearance

UI elements

- Kinetic scroll - speed, acceleration
- Animation on icons
- close to the real world
 - Bloomberg surveys: the most successful MK campaign in the world
 - iPhone 1: 100 \$ mil \$
(2nd most successful MK in 95 - 50 mil \$)
- - inertia, friction
- 1st generation:
 - touchscreen not disabled during call
 - no T9 search for contacts
 - duration to make call
- (T9: Predictive Text Input - dictionary better for contacts - small dict. - contacts names)
 - antenna signal ~~low~~ if touched

- Internet browsing - better UI
- no Flash player

4th. Generation:

- Retina display - high resolution
- advanced gyroscope - same as X/i/mote
- better battery time
- video call - only on WiFi (usually 3G)

Android

- multiplatform (HTC main manufacturer)
- free development
- Google internet app. (same as iPhone)
- Android Market - not necessarily
- DRM free (iPhone: good DRM)
- created by Open Handset Alliance
- Linux 2.6 kernel
- supports a lot of screen resolutions
- 2D & 3D can be mixed
- multitouch

Version 2.0

- navigation software ~~Go Home~~ "Car Home" App.
+ voice recognition & TTS

- 2.1 - Live Wallpapers
- can read signal strength with API

2.2 - REV2 (Revision 2)

- turn device into a WiFi hotspot
- Dalvik JIT (Just In Time) - major improvements

Augmented reality

Ronald Azuma def. - real-time
- artificial information on real-world
- 3D

- Milgram's Reality - Virtuality Continuum

Real \leftrightarrow Aug. Real \leftrightarrow Aug. Virt. \leftrightarrow Virtual

- Mediate - modification of media content

ex: mobile dev: compass + gps
spatial displays (ex. London Piccadilly Circus)

- Tracking - many solutions

- Input - gloves, lights (Play Station), mobile device

- Applications - adds

- complex design tasks

- navigation - head-up displays

- mock-up of industrial applications

- military

- tourism

- art

- games, sports

(HCI) 6

Smart Home (Home Automation)

Intelligence = collaboration of devices inside the home

Uses:

- energy usage
- better security
- comfort

world

electrical eng. - wired or wireless

- topology: star
- main unit: control
- motion detection, thermal sensing

HCI - touch interface, speech-driven

Scenario - fire while watching TV - alarm system

Room type	Security	Lighting	Heating / Cooling	Audio / Video	Energy saving
Bedroom			night	speech recog.	} Balance (washing machine)
Living room		Use sun light	+ ambient lighting	Speech recog.	
Kitchen	Fridge lock		day		
Office					
Bathroom			2hr at a time Mirror display		
everywhere / general	Sensors Alarm Automatic call Presence min. Only local access	Intensity	Syncau / weather	Remote access Follow me TV Solar system	Light on if presence

Other: Manual controls - in case of computer failure

Scenario: Group of friends living in a house

Living room

- speech recognition - working everywhere
- large TV
- ~~speech recognition~~ large microphones
- fridge - monitor contacts

- more people in the room
 - SR off
 - cooling
- security
 - music switched off for alarm