User Interfaces for Mobile and Wearable Computing

Form and Function

COMS E6176
Prof. Feiner
Columbia University
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In the hand

- **Tiqit**
  - 300 MHz National Geode
  - 256MB SDRAM
  - 15GB HDD
  - 4” VGA color LCD w/ touchscreen, backlight
  - USB, PCMCIA, MMC, IR, dock
  - 56-key QWERTY kbd, thumb joystick
  - 5.9” x 4.0” x 1.2”, 20 oz.
  - Windows XP/Linux/UNIX

Est. Q2 2004 commercial availability
In the hand

- **OQO UPC**
  - 1GHz Transmeta Crusoe TM5800
  - 256MB RAM
  - 20GB HDD
  - 5" 800×480 color LCD
  - Thumb kbd
  - Synaptics touchscreen
  - 1394 FireWire, USB 1.1, audio out, OQO-link docking connector, microphone
  - Built in 802.11 and Bluetooth wireless networking
  - 4.9" x 3.4" x 0.9
  - Windows XP

Est. Fall 2004

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In the hand

- **Garmin iQue 3600**
  - Palm OS 5
  - Integrated GPS (WAAS-enabled)
  - 32MB RAM
  - 320 x 480 color LCD
  - MP3 Player

$589
In the hand

- **Garmin Rino 110/120/130**
  - GPS-integrated FRS/GMRS radio
  - Can send location to other radios for display
  - Automated update possible
  - Hunting/fishing calendar
  - 130 has compass, altimeter, weather radio
  - Ca. $194–$375 list

In the hand

- **Nokia N-Gage mobile game deck**
  - GSM phone
  - 176 x 208 12-bit color LCD
  - 133.7 x 69.7 x 20.2mm, 137gm
  - MMC cards
  - Bluetooth
  - Music player/recorder, FM radio
  - Email, XHTML
  - USB 1.1
  - Java J2ME
  - $199
In the hand

- **Cybiko Xtreme**
  - 18MHz Hitachi H8S
  - 512Kb ROM, 2Mb RAM
  - 160x100 grayscale LCD
  - 3.2” x 5.6” x .8”, .33 lbs.
  - Wireless net @ 19.2K, 902–928MHz radio
  - Can serve as Internet gateway
  - Friend finder (w/compatibility rating)

Ca. $56 (Xtreme) to $15 (original), all remaindered

Over the shoulder

- **Charmed CharmIT**
  - 800MHz Transmeta Crusoe
  - 256MB SDRAM
  - 20GB HDD
  - USB, IrDA
  - Linux

2002, $2495
On the belt

- **CMU Spot**
  - 59–206MHz Intel StrongARM SA-1110 (scalable power)
  - 256MB SDRAM
  - IEEE 1394
  - DVI @ 1024x768
  - 14 A/D current sensors monitor energy dissipation
  - 6” x 3” x 1”, 9.5 oz.
  - CF
  - Linux

2002 prototype

On the belt

- **Via II CT 1G**
  - 1GHz Transmeta Crusoe
  - 128MB DDR
  - 9.85” x 3.15” x 1.35”, 22.8 oz.
  - 6.2GB HDD
  - PCMCIA
  - USB 2.0
  - Handheld SVGA display
  - Windows . . .
On the belt

- **Xybernaut poma**
  - "personal multimedia appliance"
  - 128MHz Hitachi SH-4
  - 32MB RAM
  - CF, USB
  - 5.5" x 3.5" x 1.0"
  - 10.9 oz.
  - VGA color head-worn display
  - Windows CEE

2002, ca. $2000

On the arm

- **Symbol WSS 1000**
  - WWC 1000 Wearable Wrist Computer
    - 16MHz NEC V25
    - 8.5 oz.
  - Ring Scanner
    - 0.8"x1.7"x0.7", 1.1 oz.
On the arm

- IBM-Citizen WatchPad 1.5
  - Linux 2.4
  - QVGA LCD
  - Bluetooth
  - Accelerometer
  - Fingerprint sensor

Prototype

On the arm

- onHand
  - English version of Ruputer
  - 2MB flash RAM
  - 102x64 LCD
  - PIM, file manager, calculator, games, viewers
  - RS232 or IR
  - C SDK
  - 52 gm

$139
On the arm

- **Fossil Wrist PDA, PDA/PC**
  - Downloads address book, date book, todo list, memo pad from Palm/Pocket PC
- **Fossil Wrist PDA with Palm OS**
  - Palm OS 4.1
  - 33MHz Motorola DragonballVZ
  - Stylus in watch band
  - 2MB RAM, 2MB Flash
  - 160 x 160 grayscale
  - 3.5 x 5.1 x 1.25cm, 5.7 oz.
  - 4-day battery life
- **Fossil Wrist Net (SPOT) Watch**
  - Time, news, weather, IM, calendar, scores, quotes, traffic alerts, listings, . . .

$69 remained and Canceled, but better version promised. . . .

Clipped and pinned

- **PLAY research studio**
  - Awareable Computers
- **WearBoy**: Hacked GameBoy
- **Reminder Bracelet**: LEDs connected to Palm PDA
- **Jewelry**

Research prototypes
**Clipped and pinned**

- **Georgia Tech Gesture Pendant**
  - B&W NTSC video camera
  - Illuminated by near-IR LEDs
  - Gestures recognized by desktop from video broadcast 900MHz transmitter

**Pocketed**

- **Lovegety et al.**
  - Blue/pink versions blink/beep when within 15'
  - Three modes: talk, karaoke, get2

$21
Buttoned

- **iButton**
  - Chip in 16mm can
  - ID: 64bit
  - Memory: ≤ 64kbit
  - Real-time clock: clock, timer, counter
  - Secure: ≤ Java crypto iButton
  - Temperature: log at regular intervals

$2.23 (ID)–$49 (Java)

On the back

- **MIT MIThril**
  - Assorted low-power computing cores
  - Linux
  - 10Mbit ethernet body net
  - WiFi
  - Assorted sensors

Research testbed
On the back

- **Columbia Touring Machine**
  - Dell M50 (2GHz Mobile P4, 1GB SDRAM, nVidia Quadro 4 Go, 30GB HDD), Fujitsu pen computer
  - SVGA stereo, see-through head-worn display
  - RTK GPS/inertial orientation tracker
  - IEEE 802.11b

- **Chameleon**
  - **Antelope Technologies MCC**
    - **Core**
      - Fits in different shells
      - 1 GHz Transmeta Crusoe
      - 256MB SDRAM
      - 10GB HDD
      - 5"x2.9"x0.74", 9.1 oz.
    - **Handheld shell**
      - 6.3" XGA color LCD w/touchscreen
      - Battery
      - PCMCIA Type II
      - 8.5"x4.7"x1.9", combined 1.63 lbs.
      - USB, audio i/o

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