

# *User Interfaces for Mobile and Wearable Computing*

## *Form and Function*

COMS E6176  
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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

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## *In the hand*

### ■ QOO 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, QOO-link docking connector, microphone
- Built in 802.11 and Bluetooth wireless networking
- 4.9" x 3.4" x 0.9
- Windows XP



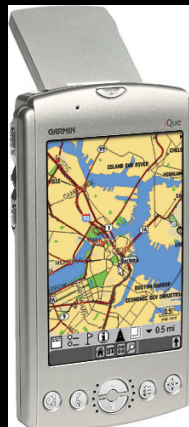
Est. Fall 2004

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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

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## *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



Hunt & Fish	
Date	09-JUN-02
Location	Olathe Lake
Prediction	Excellent Day
Best Times	
10:59a	12:59p
11:18a	01:18p
Good Times	
04:48a	05:48a
05:10a	06:10a

Ca. \$194-\$375 list

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## *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

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## *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)



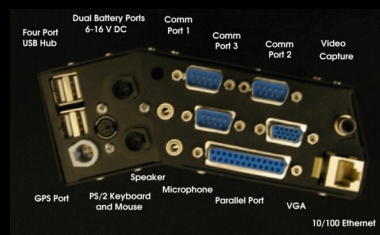
Ca. \$56 (Xtreme) to \$15 (original), all remaindered

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## *Over the shoulder*

### ■ Charmed CharmIT

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



2002, \$2495

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## *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

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## *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 . . .



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## 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

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## 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.



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## On the arm

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



Prototype

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## 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

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## 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 remaindered



Canceled, but better version promised. . . .



\$179-\$199

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## Clipped and pinned

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



Research prototypes

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## *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



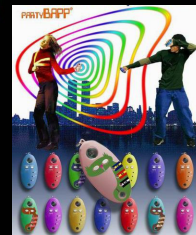
Research prototypes

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## *Pocketed*

- Lovegety et al.

- Blue/pink versions blink/beep when within 15'
- Three modes: talk, karaoke, get2



\$21

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# Buttoned

## ■ iButton

- Chip in 16mm can
  - ID: 64bit
  - Memory:  $\leq 64\text{kbit}$
  - Real-time clock: clock, timer, counter
  - Secure:  $\leq$  Java crypto iButton
  - Temperature: log at regular intervals



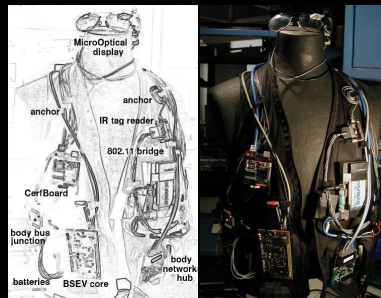
\$2.23 (ID)—\$49 (Java)

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# On the back

## ■ MIT MIThril

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



Research testbed

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## 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



Research testbed

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## 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



\$2600 (core) + \$1395 (shell)

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