

IxD Theory 2: Telecomunicazioni

IUAV University of Venice

*Visual and Multimedia Communication
graduate programme*

Pervasive computing

Pervasive computing: other names

Pervasive computing

Ubiquitous computing

Ambient intelligence (AmI)

The disappearing computer

(Adam Greenfield, *Everywhere*)

Pervasive computing: other names

Pervasive computing

Ubiquitous computing

Ambient intelligence (AmI)

The disappearing computer

'Information processing embedded in the objects and surfaces of everyday life.'

(Adam Greenfield, *Everywhere*)

The vision

Distributed and interconnected computing—
everywhere

Information **always accessible**

Location aware: know where it is and you are

Context aware: **knows your situation** and guesses
your needs

Different scales: body to city, hand-held to wall

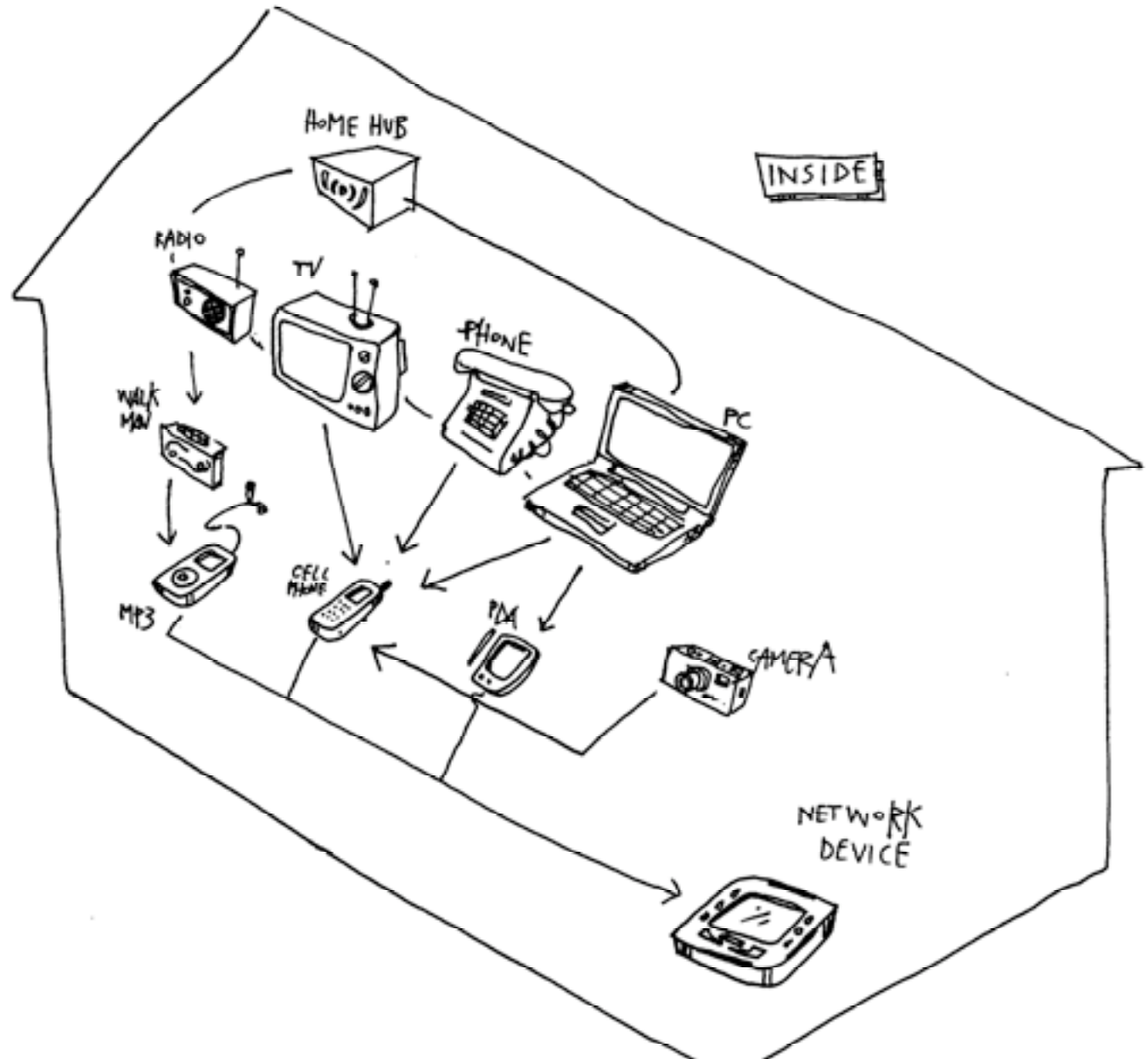
Intuitive interfaces: beyond the desktop

Peripheral attention: you shouldn't have to
concentrate

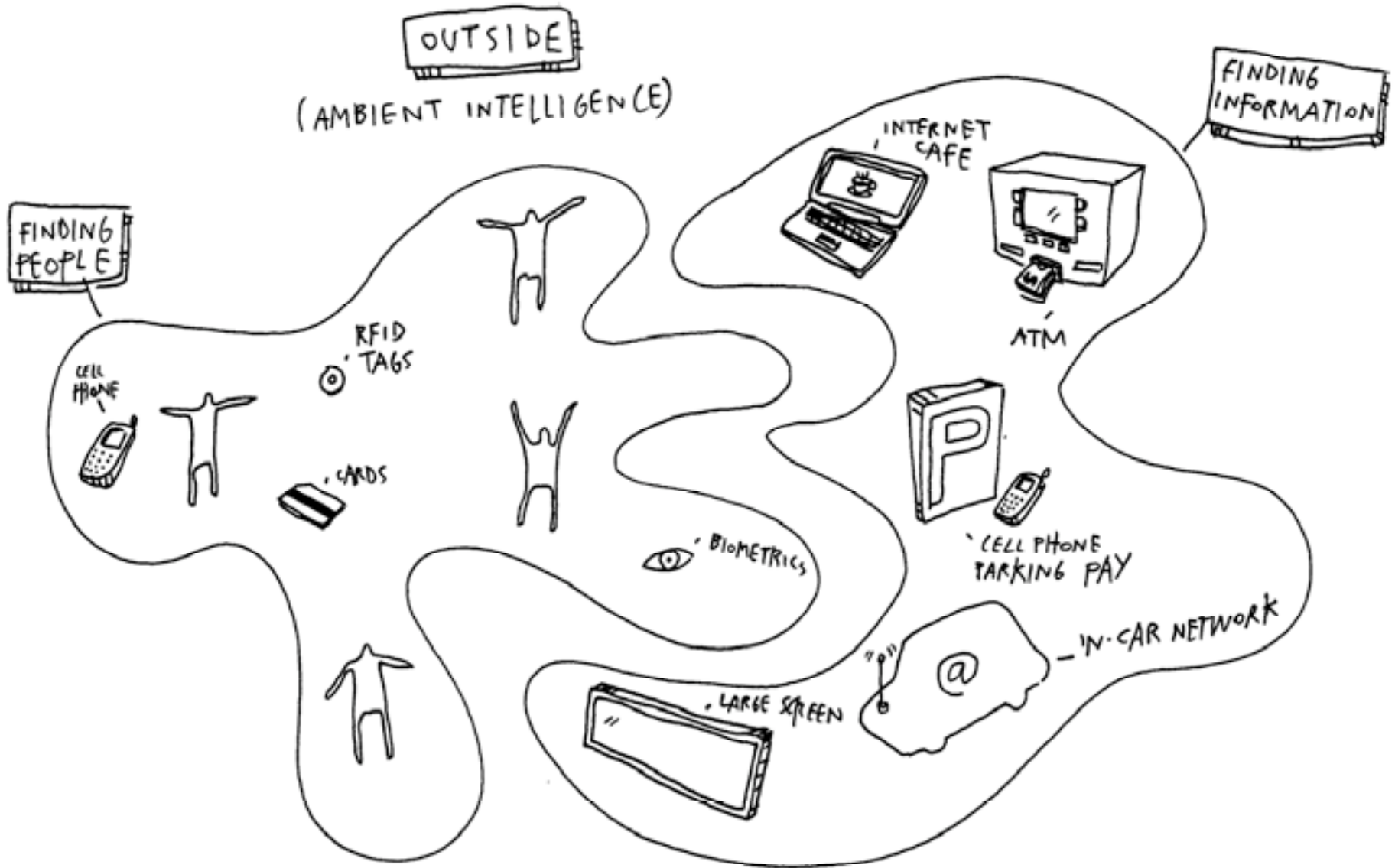
Not a tool, but an **environment**

Used by **ordinary people**—know nothing about
computers

At home



Outside



Drawings: Dario Buzzini

Ambient intelligence

“Imagine a future where human environments respond to human preferences and needs. In this world, devices equipped with simple intelligence and the abilities to sense, communicate, and act will be unremarkable features of our world. We will expect the car to warn us of hazards, track our location and provide timely route advice.

“We will speak to simple machines and hold conversations with more complex systems, such as intelligent homes that will help us monitor conditions, track routine tasks, and program the behaviour of the heat, the lights, the garden watering and the entertainment centre.

“Such systems will also acquire, and adapt to our preferences over time. In sum, we will come to view simple software intelligence as an ambient feature of our environment.”

(2nd Workshop on Artificial Intelligence Techniques for Ambient Intelligence (AITAmI'07) - Hyderabad, India. 6-7th January 2007)

What is in place today

Mobile phone networks

Paying by mobile phone

Mobile internet

Navigator/traffic problem reporting

NFRFID (e.g. i-Mob per i vaporetti)

Road pricing: cameras that can read a number plate

Home entertainment networks

Wearable computers

Location-based games

City wireless hot-spots

Internet server on a chip (allows every machine to have an internet address)so objects can speak to objects

Some current research areas

Low-power batteries

Cooperating objects and wireless sensor networks

Seeing how collections of artefacts can act together, so as to produce new behaviour and new functionality

Designing new information artefacts built into everyday objects

Understanding where users are, what they are doing and in what context

Understanding how people can manage their identity in the ubicomp world

Ambient assisted living for the elderly or handicapped

and... ensuring that people's experience in these new environments is coherent and engaging.

A BIT OF HISTORY...

Xerox PARC: Mark Weiser

Ubiquitous computing

Beyond the desktop

Everywhere and in everything

Scales: tab, pad, board

Calm technology

Doesn't insist on your attention

Uses peripheral attention

Remember: 1980s

No wireless networking

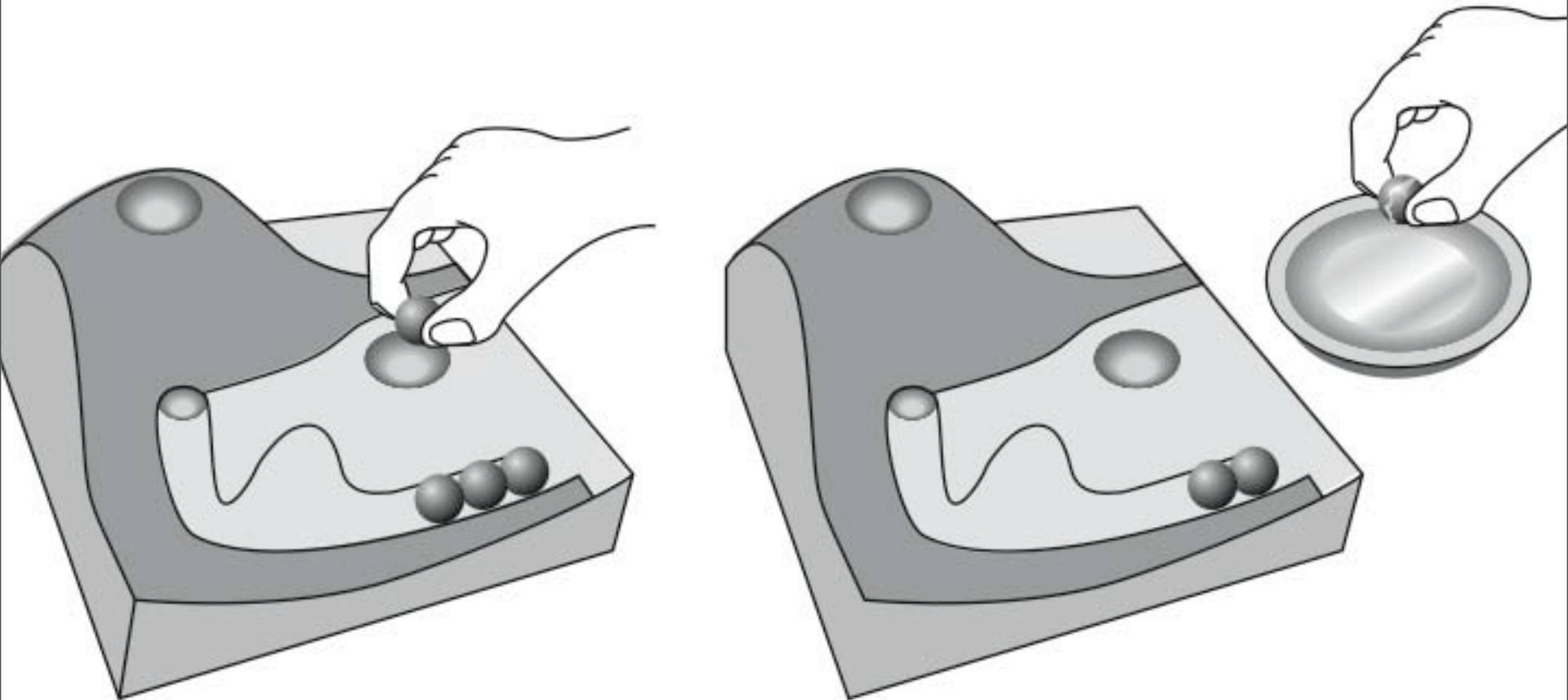
Few powerful computers: e.g. Apple personal computer had 64kb memory

Active Badge (with Olivetti UK)

One of first examples

Royal College of Art: Durrell Bishop 1991

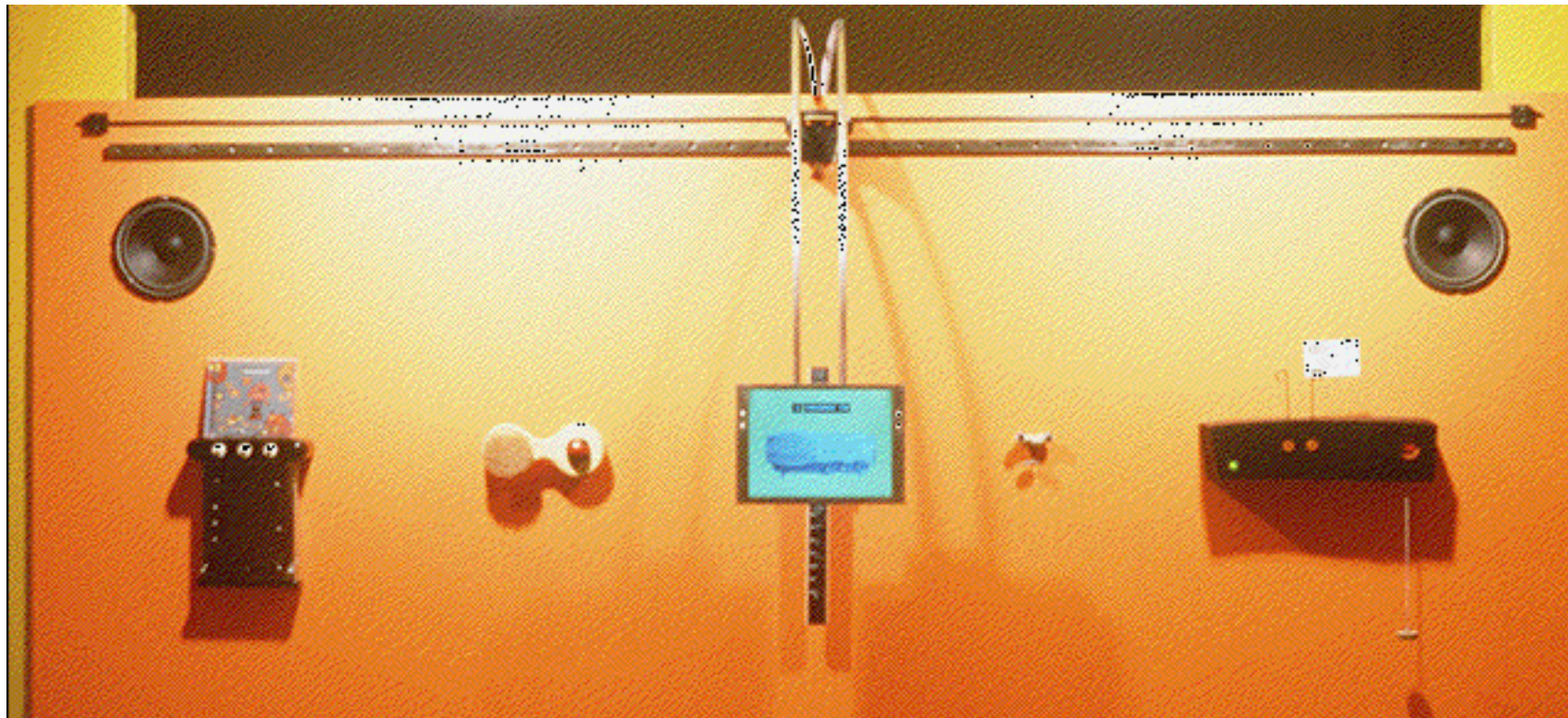
Using people's natural knowledge of the physical world to understand how 'intelligent' objects work.



Royal College of Art: Durrell Bishop 1990s

Objects are 'pointers' to digital data (don't hold the data in them).

Allows objects to be made of very varied materials.



Media Lab

Different ways of interacting physically with computation

Hiroshi Ishii—Tangible Bits laboratory

Neil Gershenfeld—Things That Think laboratory

Other interesting groups

NYU ITP

(Interactive Telecommunications Program)

Dan O'Sullivan, Tom Igoe—Physical Computing

Digital Art and Design Masters programme

Interaction Design Institute Ivrea

("Interaction-Ivrea")

Casey Reas, Massimo Banzi, Yaniv Steiner, Hernando Barragan

Developed Processing (started at Media Lab)

*Developed boards for prototyping: Wiring +
Arduino*

*Instant Soup: website for learning physical
prototyping.*

Examples



The screenshot shows a web browser displaying the CNN International website. At the top, there is a Lexus advertisement with the text "THE WORLD'S FIRST PERFORMANCE HYBRID ROLL OVER". Below the ad is the CNN International logo and navigation links for "CNN MOBILE", "E-MAIL", "RSS", and "PODCASTS". A search bar is present with "THE WEB" and "CNN.COM" options. A blue navigation bar contains links for "Home", "Asia", "Europe", "U.S.", "World", "Business", "Tech", "Science", "Entertainment", "Sport", "Travel", "Weather", and "Special". The main content area is titled "TECHNOLOGY" and includes tools for "Save", "Print", "E-mail", and "Most Popular". The article is by "digitalbiz" in association with "KONICA MINOLTA". The headline is "Smart fashion strive for long-distance interaction", posted on January 9, 2007. The author is Kevin Voigt for CNN. The article text discusses digital technology in clothing, mentioning "Hug Shirt" and "electronic garb". A photograph of a woman in a white and red smart shirt is on the left, with a vertical credit line: "(PHOTO COURTESY: OUTCERIA)".

LEXUS THE WORLD'S FIRST PERFORMANCE HYBRID ROLL OVER

CNN INTERNATIONAL
Member Center: [Sign In](#) | [Register](#)

SEARCH THE WEB CNN.COM

Home Asia Europe U.S. World Business **Tech** Science Entertainment Sport Travel Weather Special

TECHNOLOGY Tools: [Save](#) | [Print](#) | [E-mail](#) | [Most Popular](#)

digitalbiz In association with: KONICA MINOLTA

Smart fashion strive for long-distance interaction

POSTED: 0618 GMT (1418 HKT), January 9, 2007

By Kevin Voigt For CNN Adjust font size:

(CNN) – Digital technology surrounds our homes, our workplace and our leisure hours. Now the digital revolution is poised to envelop our bodies.

Electronic garb has captured public imagination since 1930s serialized comics like "Buck Rogers" and "Dick Tracy."

Although technological advances have made breakthroughs in production and durability of textiles, added electronic functionality of clothing has lagged behind advances in computing, communications and appliances. That could soon change.

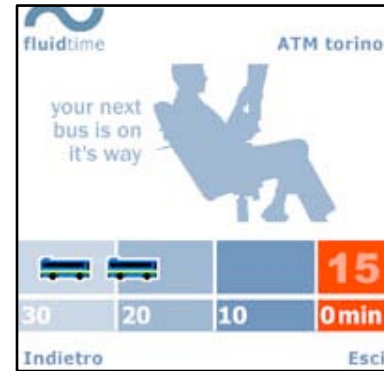
Enter the "Hug Shirt." Armed with electronic sensors that gauge body temperature, pressure and heart rate, the Hug Shirt allows

(PHOTO COURTESY: OUTCERIA)

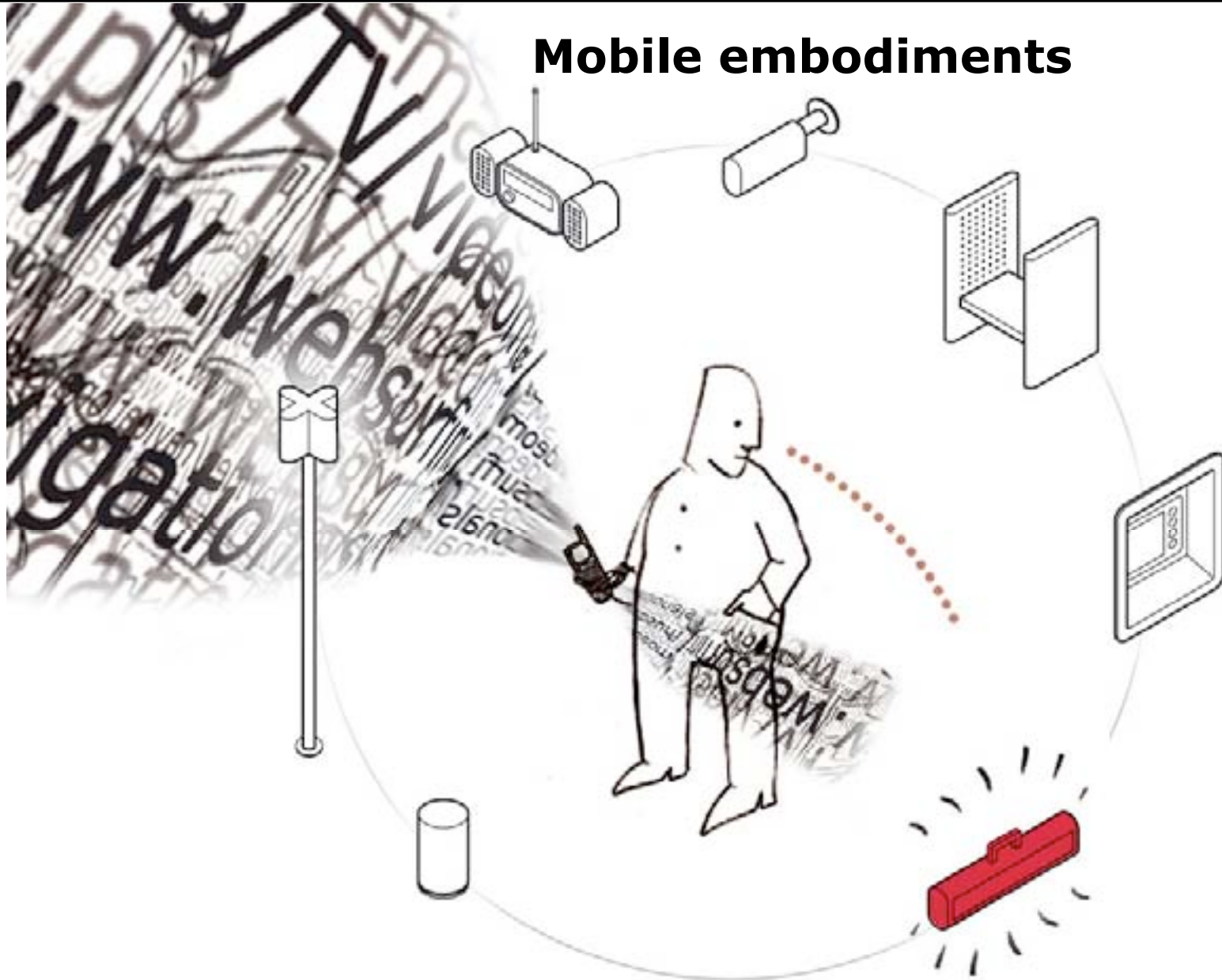
La mia Cinquecento

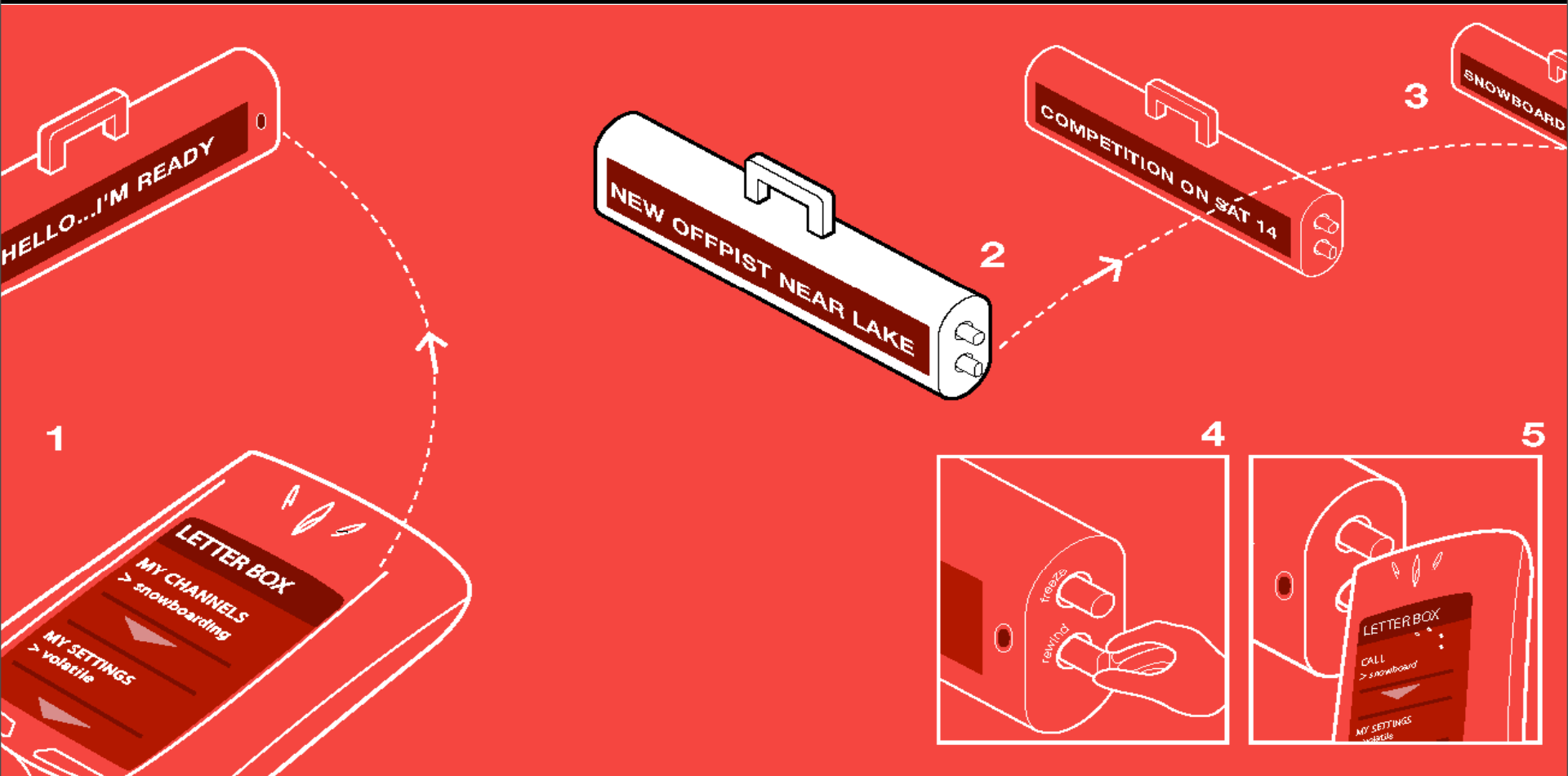


Fluid-time



Mobile embodiments





1
The first time that Letter Box gets in contact with your mobile phone it asked you to set up its filters and preferences. You will decide which news channels are redirected to the Letter Box and its modalities.

2
Every time that Letter Box detects your mobile phone it starts displaying the contents related to your personal settings.

3
Letter Box allows you to buffer messages and to replay the last ones that were displayed.

4
You can freeze a message and keep with it with you...

5
The first time that Letter Box gets in contact with your mobile phone it asked you to set up its filters and preferences. You will decide which news channels are redirected to the Letter Box and its modalities.

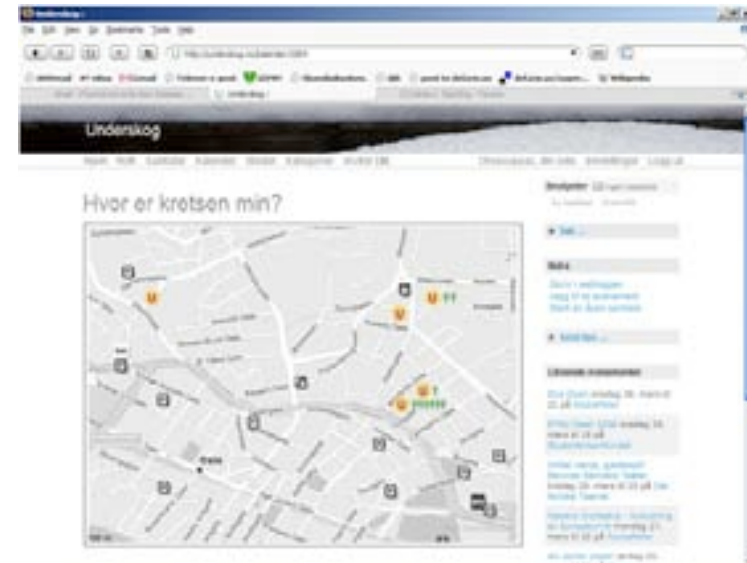
Philips Research

Philips' Vision of the Future and The New Everyday



Underskog Oslo

Touchable services: Underskog



<http://www.nearfield.org/2007/01/touchable-services-underskog>

The technologies needed

Connected devices

Wireless networking e.g. Bluetooth, mobile phone)

Internet

Ad hoc networks

Interoperability of information

World wide web

HTML

XML

Recognition of location of equipment and individuals

Sensors

GSM location sensing

RFID tags

Video recognition

The technologies needed

Fluid interaction

Voice recognition

Pen on paper input

Gesture recognition

Portable equipment

Miniaturised devices

Low-power chips

Long-life batteries

The technologies needed

Wireless sensor networks

Tiny nodes:

Sensor(s)

Radio transceiver

Microcontroller

Battery

Size from a shoe box ... to a grain of rice
("smart dust"—as yet in the future)

Wireless sensor networks

Low power—able to store power

Elements bound to fail

Can move the elements around

Can be combined in various ways

Can combine different kinds of sensors

Can be built and left unattended

Can work in harsh conditions

Uses

- Battlefield (gas, radioactivity or movement)
- Transport monitoring
- Climate monitoring
- House monitoring

Wireless sensor networks

eg Earthscope

“ 3,000 stations that are to track faint tremors, measure crustal deformation and make three-dimensional maps of the earth's interior from crust to core.

“Some 2,000 more instruments are to be mobile — wireless and sun- or wind-powered — and 400 devices are to move east in a wave from California across the nation over the course of a decade.

“The goal is to uncover the secrets of how the continent formed and evolved, revolutionizing the study of volcanoes, fault systems, mineral deposits and earthquakes.

“Begun in 2003, EarthScope is to be completed by 2008 and run until 2023.” William J. Broad, [*A Web of Sensors, Taking Earth's Pulse \(New York Times\)*](#)

Some problems

Privacy, security

Interacting with these systems

Over-dependence

Technical

Problems: privacy, security

Do we want to be tracked at our every move?

Do we want information about us swimming about in a huge soup of uncontrolled data?

Can people catch our data without us knowing?

Am I being tracked?

Who is controlling who?

Problems: over-dependence

Will we become incapable of acting without these ubiquitous aids?

Will there be some apocalyptic social collapse if, for instance, we can't generate the electricity needed to run all these systems?

Problems: the social side

What are the implications of working **on the move**?

How to manage issues of **surveillance/privacy**?

How can **social protocols** be supported by technology protocols?

How does someone **trust** a system that is invisible?

How does someone manage the different aspects of their **identity** appropriate to different interlocutors: friends, family, school, the police, social services, etc?

Problems: the technical side

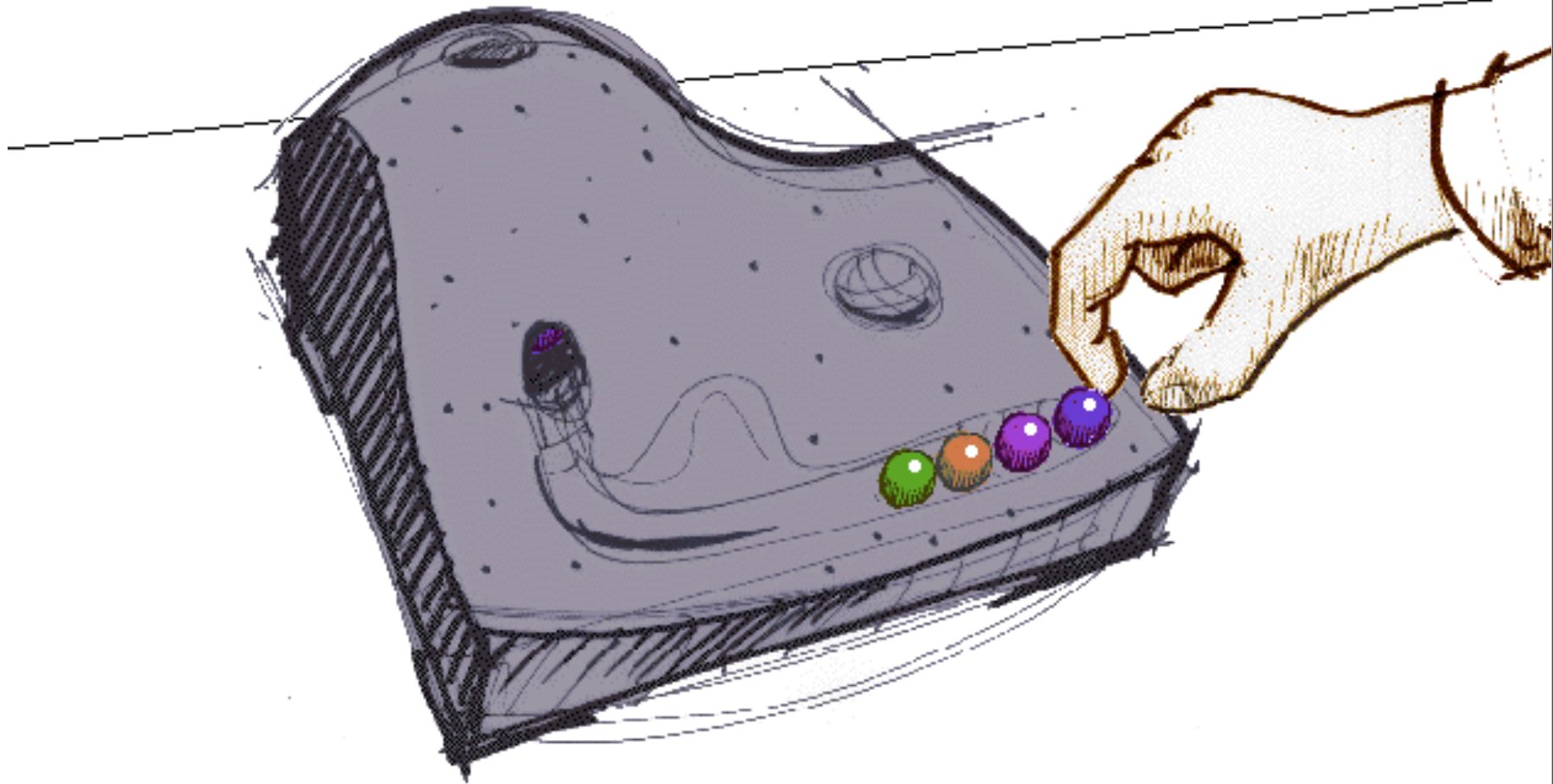
There will be so much hardware and software that some of it inevitably will break. How do you make the networks robust?

Equipment will come and go into networks: how does the system recognize it?

What standards are needed to make it all work together?

How will the inevitable decay of systems be managed?

Problems: interacting with these systems



Problems: interacting with these systems

Systems work on their own, rather than you actively using them.

They are invisible so how do you know if they are there or what they are doing?

How to design gesture-based interfaces that are really robust and comprehensible?

How to design interfaces that are scalable—from wall-scale to watch-scale?

Problems: interacting with these systems

How does the system know I am addressing it?

When I ask it to do something, how do I know it is attending?

When I issue a command, how does it know what it relates to?

How do I know if it understands my command? And is correctly executing my intended action?

How do I recover from mistakes?

(Victoria Belotti, quoted in *Everywhere*)

Resources

Adam Greenfield: *Everywhere*, published by New Riders

Bruce Sterling, Lorraine Wild: *Shaping Things* (Mediaworks Pamphlets)

Stefano Marzano, (Head of Design at Philips) *The New Everyday: Views on Ambient Intelligence*, published by 010, Rotterdam (out of print)

Marc Weiser's papers, (including a download in Work of OpenHouse

<http://www.ubiq.com/hypertext/weiser/WeiserPapers.html>

<http://sandbox.xerox.com/ubicomp/>

Bill Gates:

<http://www.microsoft.com/presspass/ofnote/11-02worldin2003.msp>

Resources 2

Special edition of Communications of the ACM

Streitz, N. and Nixon, P. (2005) *The Disappearing Computer*.
Communications of the ACM, 48 (3). pp. 32-35. ISSN 0001-0782

The EU Disappearing Computer initiative

<http://www.disappearing-computer.net/projects.html>

Wearables

<http://www.media.mit.edu/wearables/lizzy/mit-ideo/index.html>

[http://edition.cnn.com/2007/TECH/ptech/01/08/
wearable.digital/](http://edition.cnn.com/2007/TECH/ptech/01/08/wearable.digital/)

Resources 3

Touch: nearfield communication projects from Oslo School of Architecture and Design

<http://www.nearfield.org/>

Terry Winograd: Understanding Context (paper)

<http://hci.stanford.edu/winograd/papers/context/context.pdf>