Physical hyperlinks

Detail the technologies that link things, places or people to digital data.

The inspiration for physical hyperlinks seems to come from things like this
The blue plaques in London, show places of historical significance.

A desire to annotate the world?

To connect the web to physical space.

A history of 'spatial annotation projects'

Murmur

A history of 'spatial annotation projects'

Geostickies

A history of 'spatial annotation projects'

Annotate Space by Andrea Moed.
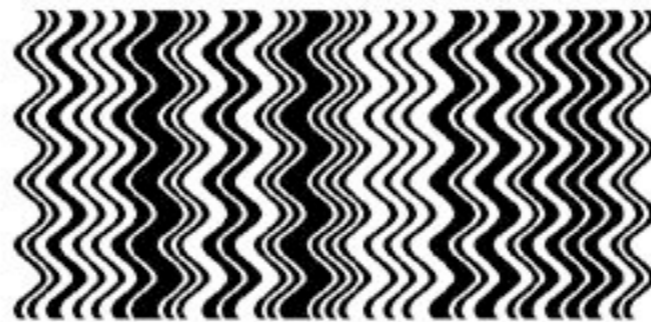
HP's cooltown project investigated how to extend the web to encompass the physical as well as the virtual world.

To provide infrastructure for nomadic computing,
More specifically, the project's aim was to apply lessons learned from the success of the Web to nomadic computing, via two objectives.

"everything has a web page": each entity in our physical world, whether electronic or not, is to have an associated web resource called a web presence.

Their concepts extended to letting people annotate media with their IDs.

But there are more complex interactions that can be achieved with this 'hyperlinking' technology.

Visual markers, Bluetooth, SMS & RFID

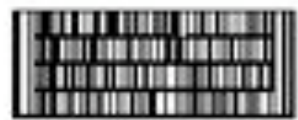Now go through many of the technologies that are available to use for physical hyperlinking.

Visual markers

QR Code

Aztec Code

Data Matrix Code

Rolls-Royce DMT Code

Codablock

DataMatrix

Maxicode

Barcodes 1948 invented, 1966 commercial use, 1980s successful

They come in many shapes and sizes

"Barcodes are widely used to implement Auto ID Data Capture (AIDC) systems that improve the speed and accuracy of computer data entry."

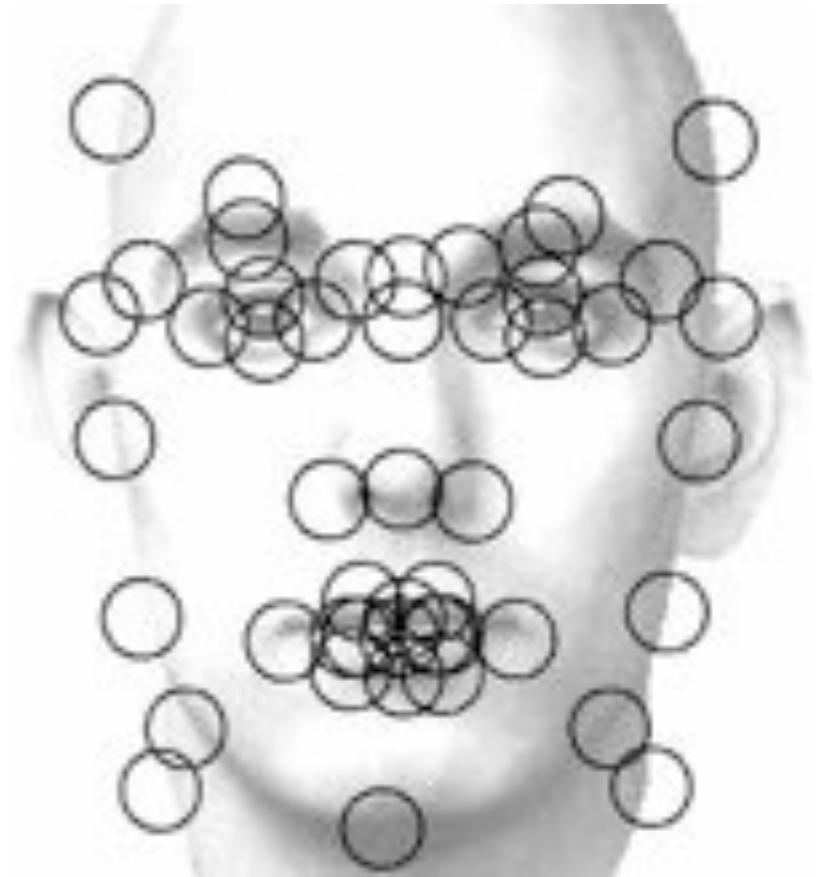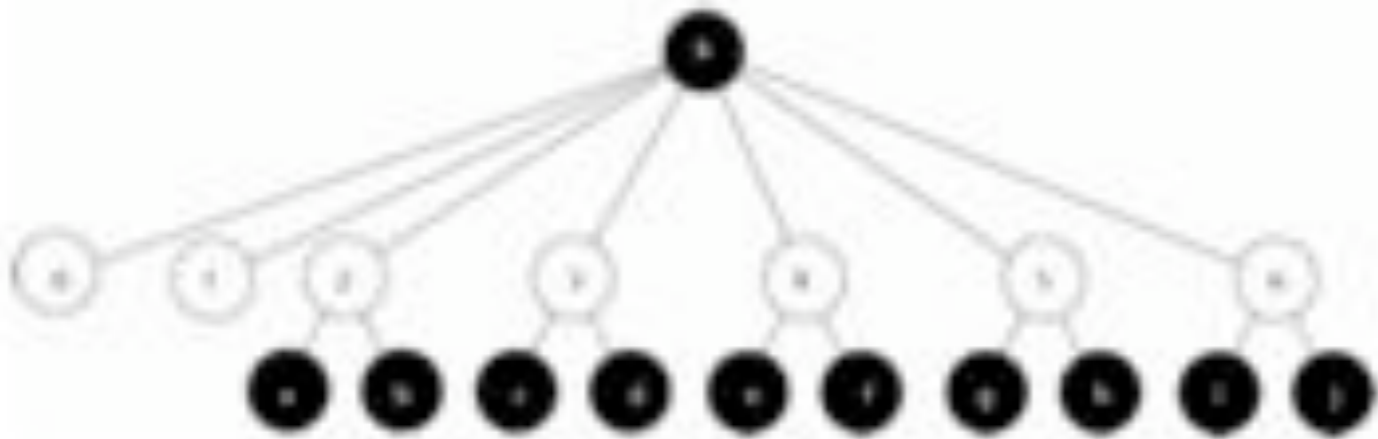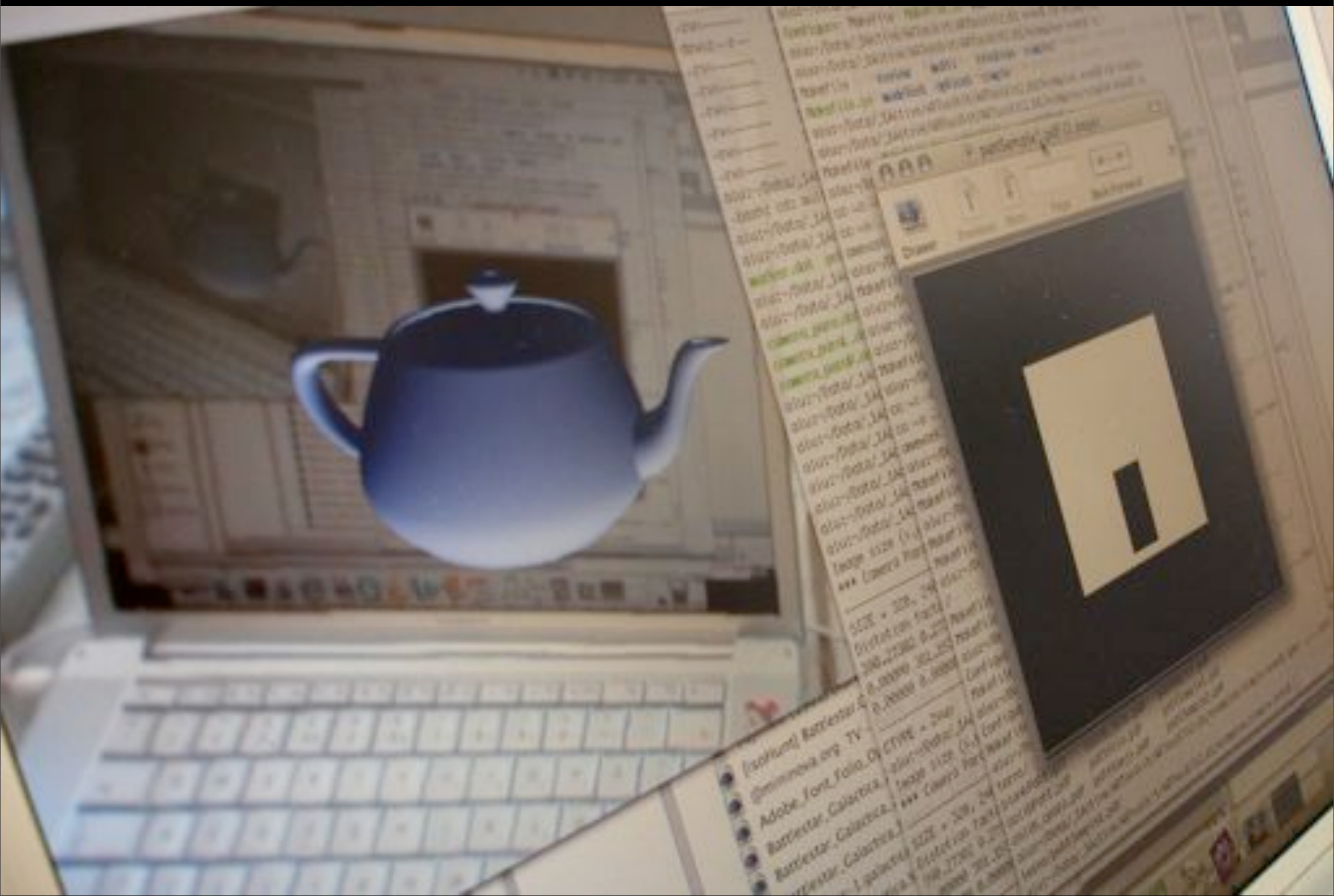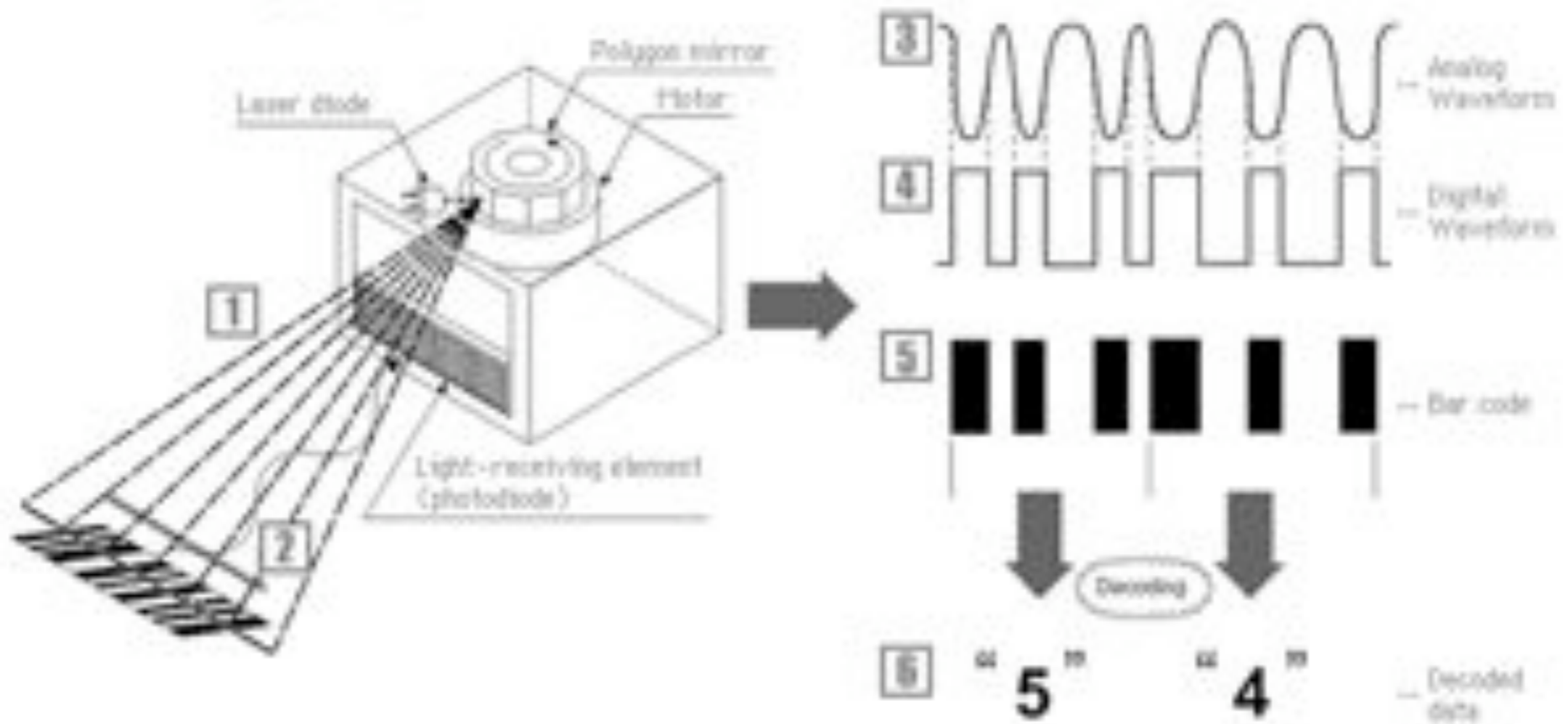UPC: "automating the grocery checkout process could reduce labor costs"

Image and pattern recognition.
This is a code embedded in text.
But could also be facial recognition or pattern recognition.

http://web.media.mit.edu/~enrico/research/research.php?projectTitle=Visual%20Markers%20Design

AR markers are markers that can be tracked in time and space.

1-1. Reading principle

Visual markers need line of sight to be read.

The reading technologies are LEDs, Lasers and scanners, cameras and cameraphones.

So here are examples of 2D barcodes in use, mainly in Japan.
McDonalds provides links to its website

Shops allow you to find out more about items and to order.

Photo: Akaalias: http://flickr.com/photos/74845103@N00/425606803/
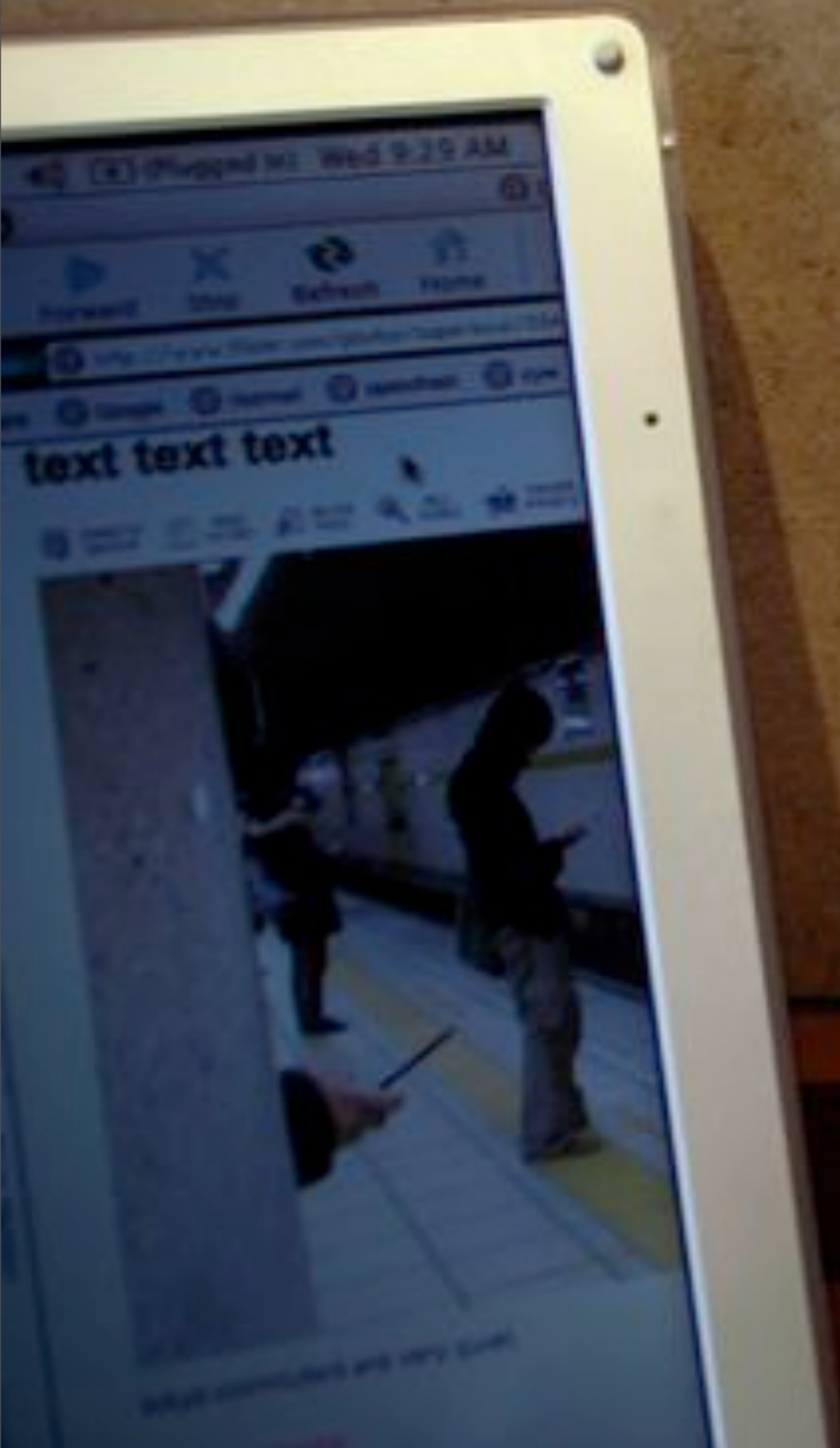
Infrastructure is labelled and identified, perhaps with login information.

Photo: Superlocal: http://flickr.com/photos/superlocal/459403476/

People print their own. This Tshirt is a phone number.

Interestingly they can be used at a variety of scales, from small printed magazine adverts up to building sized banners.

Image: http://www.nytimes.com/2007/04/01/business/01code.html?
ex=1333080000&en=8bb1180541c7a895&ei=5088&partner=rssnyt&emc=rss

Hold very little data

They can be used from almost any imaging device, that means that mobile phones, laptops, urban screens can all *display* barcodes that are usable.

Can be graphically embedded in interesting ways.

Semapedia is a project that intends to 'hyperlink your world'.

"Our goal is to connect the virtual and physical world by bringing the right information from the internet to the relevant place in physical space."

http://www.semapedia.org/

a cat-shaped handheld barcode reader

It was a system that linked barcode IDs to advertisers websites

For roughly a year, starting in October, 2000, The Dallas Morning News and other Belo-owned newspapers added the barcodes next to major articles (Belo had invested in Digital Convergence).

The data format was proprietary, being scrambled so as not to be usable as plain text.

They have also been hacked (with protests from the parent company)

Each CueCat has a unique serial number, and users suspected that Digital Convergence could compile a database of all barcodes scanned by a given user and connect it to the user's name and address.

Barcodes

- Visible!

- Need line of sight

- 1D and 2D

- Hold very little data

- 2D tags are slow

- focus and lighting problems

- one-way unless you have a printer

- very small data (mostly a pointer)

- Can scale, from a few cm to anything you can point a camera at

Bluetooth & SMS

Yellow Arrow is an early project that looked at putting digital information into places, and used the mobile phone and SMS as a platform.

At the moment there is also huge interest from advertisers and marketers in making interactive, place-based advertising, this is a bluetooth poster that offers TV ads directly to your phone.

Bluetooth marketing

"Turn on bluetooth to receive something naughty" or somesuch.

Bluetooth

- Works at a relatively long range

- Have to pair devices for data transfers, can be a unusable process

- The 'data bubble' is large and difficult to visualise

SMS

- Requires typing on the keypad

- Requires users to read/enter the codes

- Have wait for feedback

- Relies on the network

- Simple to implement

RFID

So lets move on to RFID

RFID is seen as a replacement for barcodes.

In practice RFID is having trouble with reliability and implementation.

This is Nokia's early vision of NFC in use with 'Smart posters'

Swiping a poster would view content, buy tickets, etc.
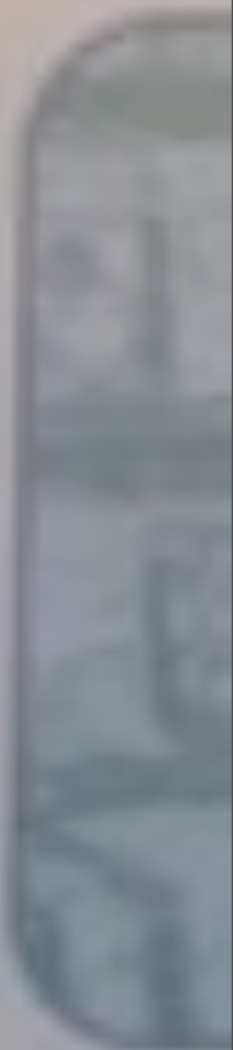
Here RFID is being used in a trial in NYC.

Smart posters implemented.

Testing of RFID posters in Finland:

Paper showing the differences between linking technologies:
http://www.hcilab.org/events/mirw2006/pdf/mirw2006_belt.pdf

RFID

- Fast feedback

- Invisible (can be a bad thing)

- Two way with the same device

- More data than barcodes

- Often break down when there are more than one tag

- Susceptible to moisture, physical damage
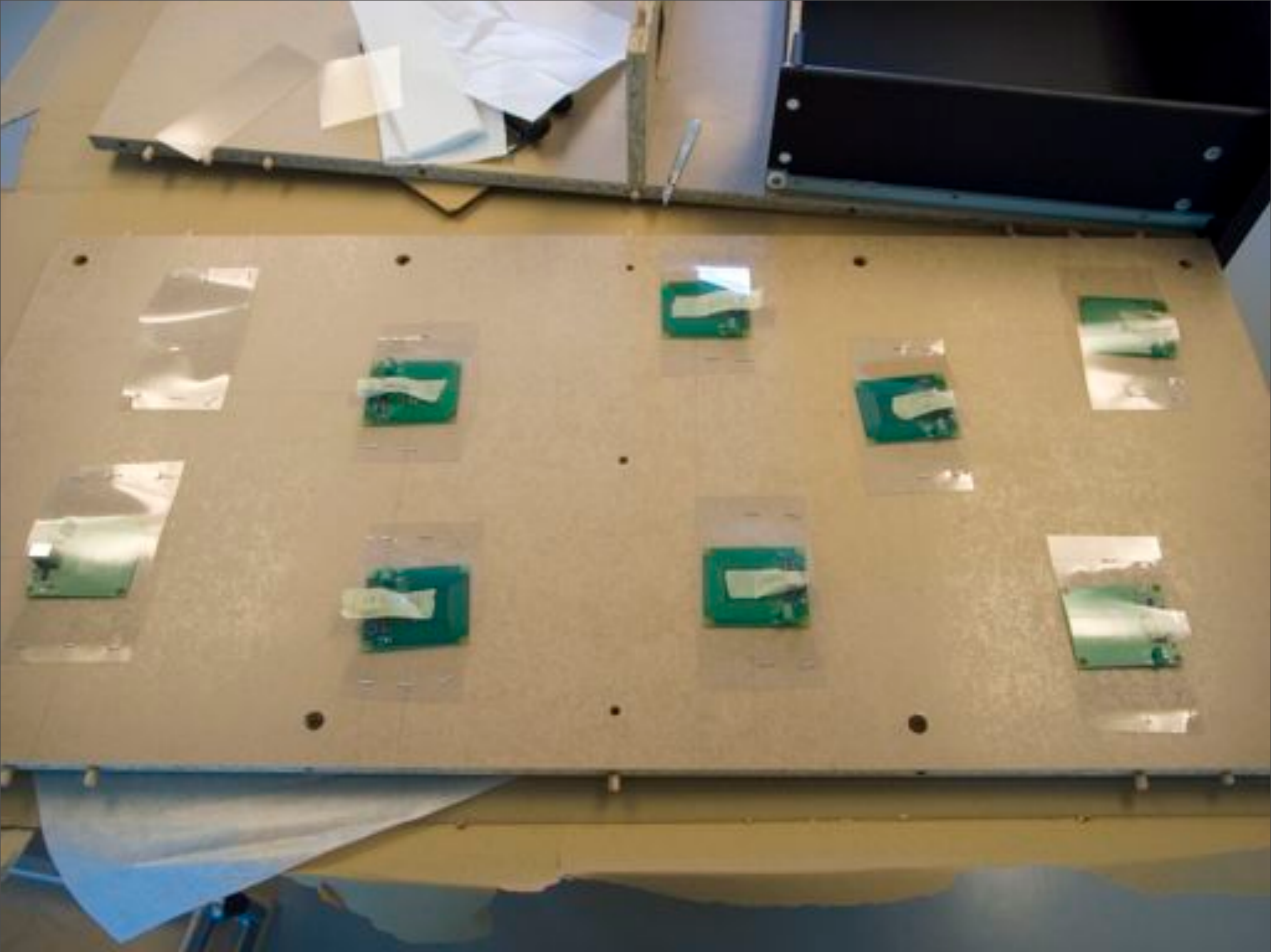
- In most cases requires J2ME development

Some physical prototyping with RFID

Just some quick notes on hardware prototyping with RFID.

Phidgets work really well and are very simple USB devices.
Get up and running quickly with tags and objects and media.

http://www.trossenrobotics.com/RFIDhome.aspx

We used nine readers in the Orooni table.

Different kinds of low frequency tags (mostly standard packaging)

The Innovations ID-12 readers are very small, self-contained readers and antennae.

http://www.id-innovations.com/products.htm

We have them working with the Arduino platform, and students have created these robust modules.

Started to test all of the tags with relative read ranges.