

Large public interactive displays – Overview

by Marcel Lancelle, 2004

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Many different projects exist that are more or less related to large public interactive displays. Most of them exist for research purposes. The following text describes different issues, ideas and existing solutions.

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Introduction

A lot of related research projects concentrate on intelligent environments like interactive workspaces. While these projects remain interesting for technical reference, this project aims at public spaces where people pass by rather occasionally than by intension. Short interaction types will be the most

common case. Issues like maintenance, misuse and vandalism arise and the environment is less controlled (like lighting conditions) and thus more difficult to handle from the technical point of view.

Large displays are getting cheaper and will be available at more and more places. More intelligent content that is context sensitive and able to react on user interaction can enhance the usefulness of the displays by magnitudes.

Providing local information of general interest is the key application for public large interactive displays. Broadcasting general information like world news or advertisement is also an important factor.

It costs money to buy and maintain such systems as well as for providing the content. I could identify three major reasons for providing a large display:

- **to earn money**
- **to inform customers**
- **to make people happy**

City councils (wanting to support the community development or just to be modern), companies or research institutions seem to be the most important potential providers of such systems.

Common output technologies

Large Displays

- LED (or other light) matrix displays: bright images, low power consumption, low maintenance cost
- projectors (single or multiple blended, front or rear projection), DLP, Laser
- (Plasma screens: may be too small, only available up to about 70")

The images must be bright because usually the location can't be darkened.

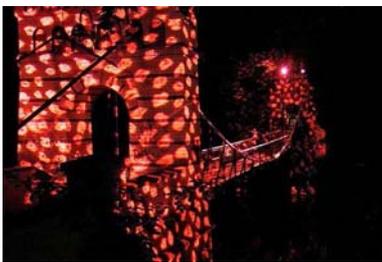
Projection screens can allow front or rear projection, can be opaque or semi transparent surfaces or even water or fog.

For coverage of wide angles many projectors are required which is quite expensive. If no simultaneous projection is necessary, a single projector may be used that is rotated into the required direction.

Projection distortions may be corrected or suitable surfaces detected auto-



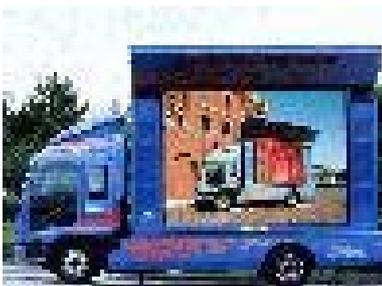
The Steerable Camera Projector, INRIA Alpes



Roses projected on a bridge



Blinkenlights (windows of a house used as pixels)



mobile LED display

matically using additional cameras.

Even though planar surfaces are most efficient, projection surfaces can have arbitrary geometry.

Screens can also be mobile (e.g. mounted on a van).

The images in the

middle column show some unconventional displays.

Other output devices

- Speaker for **sound** or **speech** output. Using ultrasonic interference sound may also be produced at local spots only.
- Perfumes to distribute **smell**.
- Release of fog, confetti, water spray, hot or cold air, advertising gifts.
- **Actuators** like small electric motors moving something.

Input technologies

A big difference exists for interaction depending on whether the user can touch the screen (like a wall sized projection) or not.

Cameras are very flexible and can be used for the detection of people pass-

ing by, face recognition, tracking of people, motion tracking and gesture recognition, recognition of the pointing direction and also for hand touch sensing using IR lighting and camera.

Audio input can be used for tracking, speech detection and recognition (microphone arrays), also the pitch of the voice to control something on the screen.

A local weather station can detect ambient temperature, wind speed and wind direction, air pressure and humidity.

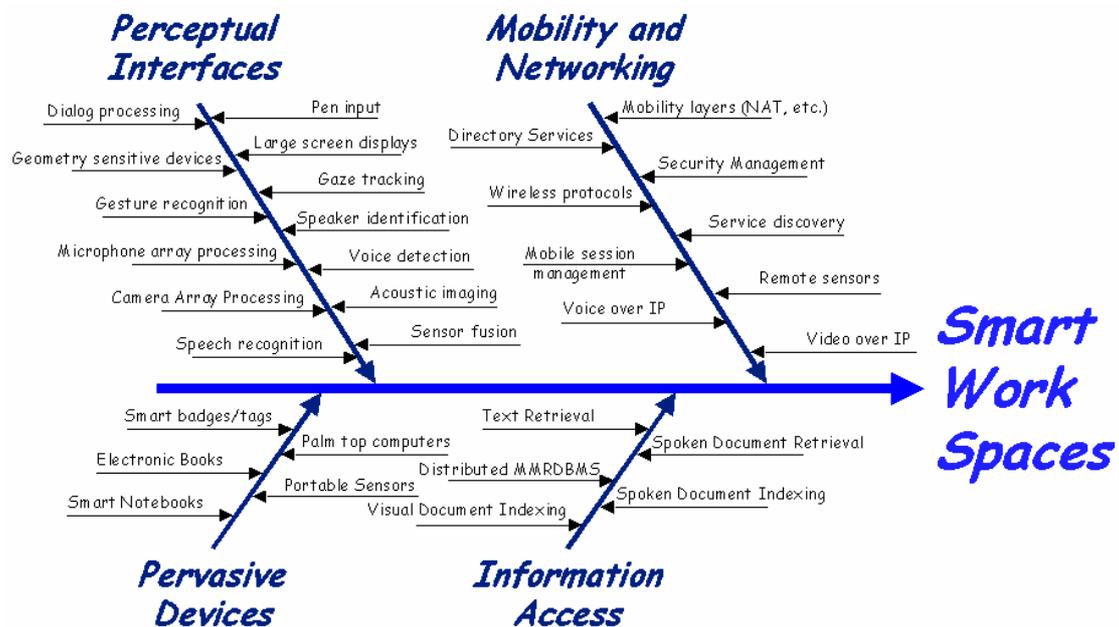
Pressure mats can be used to recognize if someone stands on them.

Identification of individuals can be done by recognizing face, speech, ID cards (transmitters, magnetic cards, bar

codes, keyboard), small led transmitters / laser pointers of ID code. They can be active (user triggered) or passive (permanently scanning every person passing).

Another kind of input is more indirect: posting content or interacting via a personal device like a PDA, a cell phone or a computer via an internet connection.

Some of the related technologies can be found in the following figure listing technologies for a smart work space:



Smart Spaces Technologies (source <http://www.nist.gov/smartspace>)

Examples and proposals

Earning money

- advertisement of local or global content, multiple companies sharing the display or a single company owning the screen
- research projects
- indirect: by making people happy: e.g. scientific institutions receiving public funding to convince that it is worth spending money for them

Informing customers / people

- weather (local)

- news (world and local)
- providing / broadcasting information of general interest: weather, news, museum pieces, scientific images (e.g. telescope images or movies recorded from the space shuttle like in "space night", a German TV show), small video clips of scientific facts or news changing all 12 hours, ...
- providing additional information for local objects (like the shoe retail store example)

- campaigns (stop smoking, wear seat belt, don't drink and drive, ...)
- transportation information (e.g. flights, train destinations and schedule, bus station, ...)
- sports stadium / racing courts (horses, cars, ...)
- distribution: auctions, market
- public facilities, hospitals, financial institutions (stock exchange, ...)
- events like concerts, exhibitions, award shows, ...
- education (teaching, collaboration, organized communications between pupils from very different places)
- information (weather, notice board, local events)
- tourist information
- providing a local map with search functionality (to find somebody in a building (but this is maybe more a kiosk application))
- webpage content may be proposed by an automatic search (to see what's on in a 1 km radius for the next 24 hours)

Making people happy (/ support the community)

- showing art (images, short video clips, music, ...), either international or local
- community development support: people can show their photos or self-made arts to others
- interactive toys to have fun (people passing by can influence some part of the content (by waving, jumping around, or by just walking by), somebody passing by: modifies the background colour of the screen or makes a gesture to put objects on the

screen: starting a small virtual fireworks rocket or interacting with a screen pet (feeding, petting, ...): small mirrored image of video capture for interaction control; a game that is controlled by jumping around)

- get to know other people
- supporting a community to develop opinions: arguments pro/contra something
- story telling with many authors - anybody can add the next phrase / add an image
- show websites proposed by others (one finds a handy or funny page or wants to promote his own one and can propose it so that others see it and may get the link from a webpage)
- provide access to the www
- communication: group video conferences, getting to know remote places and interacting with people there
- share content with others (notice boards, photos / videos, funny websites, schedule / date planner for arranging dates in a group, searching for car sharing persons for spontaneous long distance travels or regular events, ...)
- Entertainment (movies, multi-user-games, TV live submission: e.g. sports events)
- show a mirrored image in infrared / false colours / edges or other image transformations like distortions
- distracting or entertaining people that are waiting for something (their train / plane, ...)
- (enable collaboration)

Future

In a visionary scenario most people will have their own portable device for individual information. Large displays are possibly advantageous because they can show more information at once and they can show the same in-

formation to all others. Advertisement could be more important. There are lots of static large public advertisements that will be replaced by their digital animated versions.

References

Paper

- resources mentioned in ACID, many papers from CSCW 2000 (<http://www.appliancestudio.com/csw/papers.htm>)
- **K:info: An Architecture for Smart Billboards for Informal Public Spaces (MIT)**
- Barehands: Implement-Free Interaction with a Wall-Mounted Display (Brown, Stanford)
- Bare-Hand Human-Computer Interaction (CLIPS-IMAG)
- Computer-vision-based Human-Computer Interaction with a Back Projection Wall Using Arm Gestures (Dortmund)
- Constructing Public Discourse with Ethnographic/SMS Texts (Media Lab Europe)
- Designing displays for Human Connectedness (Media Lab Europe)
- Fluid Interaction with High-resolution Wall-size Displays (Stanford)
- Implementation of a Laser-based Interaction Technique for Projection Screens (Fraunhofer)
- Intelligent Environments for Informal Public Spaces: the Ki/o Kiosk Platform (MIT)
- Perceptual and social cognition aspects of situated displays (British Columbia)
- Situated Information for Pervasive Computing (MIT)
- Supporting group interaction using large situated display appliances in community nexuses (Sussex)

Other interesting resources

- Stanford interactive mural / new devices for new interactions (<http://www.cs.umd.edu/~francois/>)
- Visualization and Interaction for Business and Entertainment (<http://research.microsoft.com/vibe/>)
- Intelligent environment resource page: (<http://research.microsoft.com/ierp/>)
- need of large public displays (Fujitsu): (<http://www.fujitsu.com/id/services/crossindustry/largedisplay/>)
- The SMS Public Display Project: (<http://www.equator.ac.uk/Projects/Digitalcare/Smspublic.htm>)
- Perception, recognition and integration for interactive environments: steerable projector, audio tracking, detection and recognition of speech (http://www.inria.fr/rapportsactivite/RA2003/prima2003/prima_tf.html)
- Stanford Interactive Workspaces Project (<http://iwork.stanford.edu/>)
- A book that could be interesting: *Public and Situated Displays (Social and Interactional Aspects of Shared Display Technologies)*
- Machine-to-machine communication (linking handheld devices with display e.g.): (<http://www.m2mpoint.com/>)
- Smart spaces (<http://www.nist.gov/smartspace>)