

VISUALIZAR '08: Database City

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Madrid Zero: Distributed Urban Networks of Political Artefacts

While the art of interactive visualization data sets has increasingly created a new body of research and knowledge during the last years, few projects have focused on real-time visualization of physical data gathered through large networks of distributed sensors, beyond data already accessible from the web through official agencies, like weather data or traffic conditions.

This is due to the complexity and elevated cost of setting up large distributed networks. The following proposal presents a framework to develop and deploy a big number of interconnected devices in urban space, based on the open standard Internet Zero or i0.

Open framework for distributed computing

Madrid zero will facilitate distributed networks of sensors and actuators communicating through the Internet based on open standards. It will also allow real-time visualization of network traffic (both globally through projections, displays or on-line applications and locally through peer to peer communication between sensor and actuator nodes).

The project is presented as an open proposal, and it is expected it will be the basis to implement projects developed at the Visualizar workshop. Nevertheless, this paper also describes implementations of different topologies of networks, which could also be considered starting points for a self-contained project. It is also expected the workshop will open up future implementations of i0 in different contexts.

Thus, the aim of the workshop will include exposing this technology and document it in a way so that can be implemented by any member of the community.

The importance of distributed networks

Many debates are nowadays about whether peer to peer sharing of digital information should be left unregulated (since it removes all power from central agencies and distribution companies). It is clear the new revolution of media content creation and distribution is basically distributed in nature, thanks to the Internet and increasingly web 2.0 tools, open repositories for software development and other community-based platforms for collaboration.

This projects assumes it is also needed to experiment with distributed networks of 'physical' nodes, as opposed to digital, or virtual, nodes. What information these nodes could be sensing (traffic noise, sky color, frequency of passers-by, CO2 emissions, etc) and how it could be visualized (through a rotating sign, a local projection, an rss feed, or a laser projection on a cloud) are open questions for artists, architects and designers. But I believe the next step after tangible computing will be networked, distributed computing, so it is time to start creating tools to experiment with networked objects.

The city is a perfect playground to set up distributed networks. Understanding the complexity of interconnected flows which take place simultaneously in different urban locations have social, cultural and political implications.

Political artefacts

A technological artefact is not only a set of components of hardware and software: it is a fascinating element; a social catalyst; an agent of communication; an open box of narrative; a laboratory –not for the application of measuring instruments– but of visibilities and invisibilities. It is a space of continuous cultural renegotiation; a territory of community and social experimentation behind its spectacular and seductive appearance. [Hurtado, Control-Room]

Madrid Zero will allow citizens to easily deploy(1) distributed networks of political artefacts across the city. Political artefacts:

- create a novel and interesting situation.
- question current notions of public space.
- make visible the invisible.
- induces a strong reaction from passers-by.
- provokes spontaneous encounters and conversations.

(1)To deploy: To install, test and implement a computer system or application. The term can be used to refer to any installation and testing, such as setting up a new network in an enterprise, to installing a server farm, to implementing a new application over a distributed computing network. The word deploy has roots as a military term, used to describe the placement of equipment and troops in a battlefield. [Wikipedia]

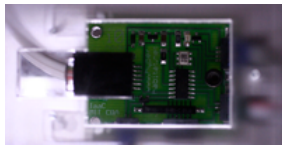
What this proposal is about

Madrid Zero will offer a toolkit to implement a low-cost distributed network of political artefacts across the city, using open software and hardware tools, and the know-how to create and visualize these types of systems. This way it will open up a new territory for artistic practice and research with distributed systems of tangible devices interconnected with open standards through the internet.

Research background

The proposal builds up on academic and research experiences within the following contexts:

Internet Zero



Internet Zero is being developed at MIT Center for Bits and Atoms in collaboration with Cisco Systems and Schneider Electric. Internet Zero is both a set of protocols and hardware implementation which aims to bring the reconfigurability of the digital world to the physical world at reasonable costs. One of the research areas of MIT CBA, the project is at this stage open for academic and experimental use.

Hyperhabitat



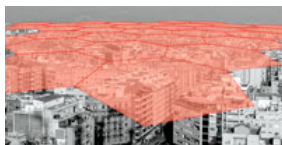
Internet Zero has recently been implemented for 'Hyperhabitat' a project by Vicente Guallart for the Venice Biennale of architecture, interconnecting a network of 120 objects, and integrated with a visualization developed by Bestiario.

Box



A project developed at Interaction-lvrea between 2001 and 2003, Box provided a tool kit to experiment with distributed networks of physical objects linked by radio, exploring the meaning of networked objects and its interactive applications.

Invisible Cities



Research project developed with support of International Design Research Scholarship Enric Brucall, ELISAVA foundation, looking at the integration of digital networks in public space.

Political Artefacts



Workshops taught at Medellín, Glasgow, Barcelona and Split in different academic contexts, developing strategies for urban participation and strategies for community actions using low technologies.

System Architecture

Internet Zero, as a distributed architecture, does not need servers for setting up systems, and allows peer to peer communication between leaf nodes, both locally and globally. Routing from local i0 networks to the internet might be done both with a hacked Linksys 54G running Linux based Open Wrt firmware or through a computer running an application which performs SLIP - UDP-THTP forwarding of packages, currently implemented in both Python and Processing.

Nodes, Bridges, Routers, Sensors, Actuators, IPv6 addresses, Open Protocols, Components

i0 nodes are based on the AVR ATtiny44 microcontroller, with 4Kb of RAM and 256 bytes of EEPROM. This IC, even its small size and price, is capable of performing Analog to Digital conversion (for reading sensor data), Pulse Width Modulation (for dimming lights or motors), and communicate through the i0 network. IPv6 own address is stored in EEPROM.

The i0 software could easily be ported to the AVR ATmega168 found on Arduinos, thus facilitating the use of this framework by the Arduino community. Currently all the programming has to be done in Assembly, but a library could be created to access communication routines from the Arduino IDE.

[...]

Self-regulated, distributed networks of political artefacts

Cacerolada

Cacerolada (también conocido como cacerolazo, caceroleada o caceroleo) es una forma de manifestación, autoconvocada espontáneamente por un grupo de personas o ciudadanos, o bien respondiendo al llamamiento de una fuerza política u otra organización, generalmente en contra de un gobierno o de determinadas decisiones o políticas gubernamentales, y más raramente en pro de una causa. Su característica más destacada, y que la distingue de otros tipos de protesta, radica en que los manifestantes manifiestan su descontento mediante ruido acompasado, a una hora acordada de antemano (o en otros casos en forma espontánea), desde sus propias casas y sin necesidad de concentrarse en un lugar determinado, asomándose a ventanas y balcones o en los antejardines de las casas, y blandiendo rítmicamente los objetos que tienen a mano (comúnmente, cacerolas y otros utensilios domésticos, de ahí su nombre), pudiendo de esta manera alcanzar la protesta un alto grado de adhesión y participación. [Wikipedia]

Cacerolada will provide a low-cost kit to connect a cacerola to self-regulated distributed networks for noisy and synchronized political action.