The Silence of the Lands

Building a Distributed Socio-Technical Architecture to Promote the Museum as a Site of Cultural Negotiation

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Overview

* Problem

* Objectives

* Design approach and rationale

* Distributed socio-technical architecture:

  – description

  – technical specifications

  – demo

* Intellectual merit of the project

* Broad impact and application scenarios

The Problem

* **Preservation and enjoyment of natural quiet** (in natural park, open space, urban setting, etc.): a concern for EPA, city councils, etc.

* Opposing demands from **different social groups**

* Need for a reasoned discussion and bottom-up processes of **social negotiation**
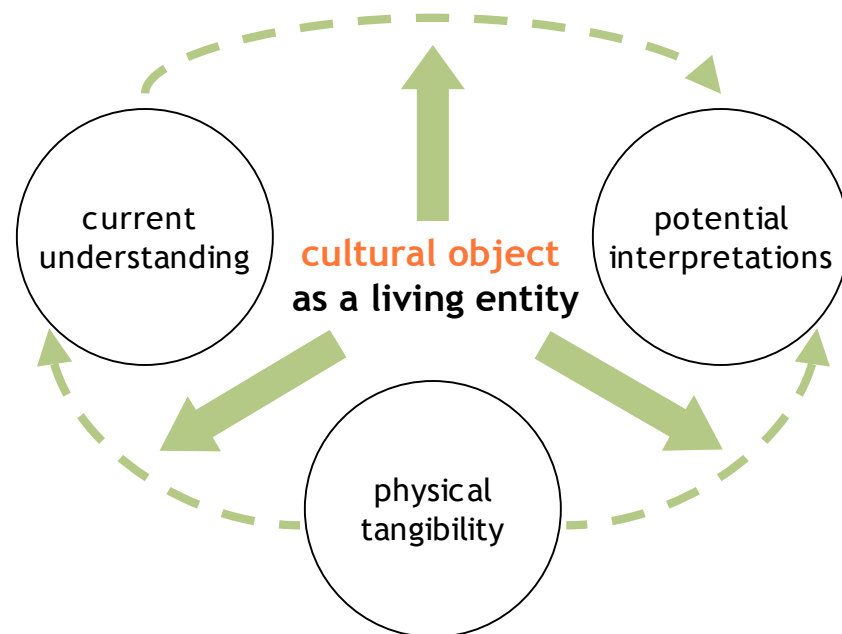
©City of Boulder Open Space

Objectives

✳ Empower the **interaction** among:

- *current understanding*
- *potential interpretations*
- *physical tangibility*

of the sounds to which natural quiet is associated

Objectives (cont'd)

✳ Enable citizens to use **ambient sounds** (rather than words) as conversation pieces or *boundary objects*

✳ Supporting **creativity and social discourse** by encouraging the *collaborative construction of a virtual museum* of natural quiet

virtual

cultural

physical

virtual museum: actualization of living or intangible objects

Virtual Museums: Excursus

✳ Forms of virtuality for the museum may be:

- **Duplication and extension of reality**: new forms of accessibility and ways of communication
- **Recombination and personalization**: new forms of learning and knowledge construction
- **Interconnection**: new places for display and collection
- **Socio-technical distribution**: new forms of social creativity and museum construction

Design Approach

* Preservation: not simply to archive natural sounds but to give voice to a **broad repertoire of interpretations**

  Social Creativity

* Display and exhibition: take on a dynamic and open interplay with **education and outreach**

  Informed Participation

* Entire framework: transformed by processes of participation and **collaborative design** in which local communities play an important role
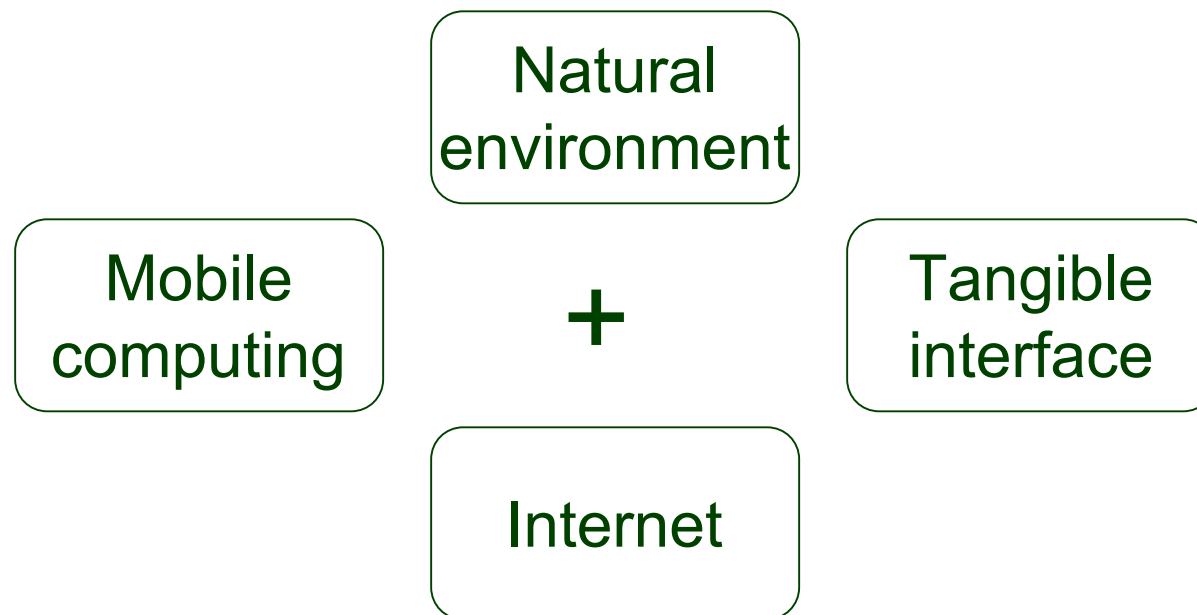
  Meta-Design

Rationale

✴ In order to fulfill our objectives and design approach, the technical system must be woven into:
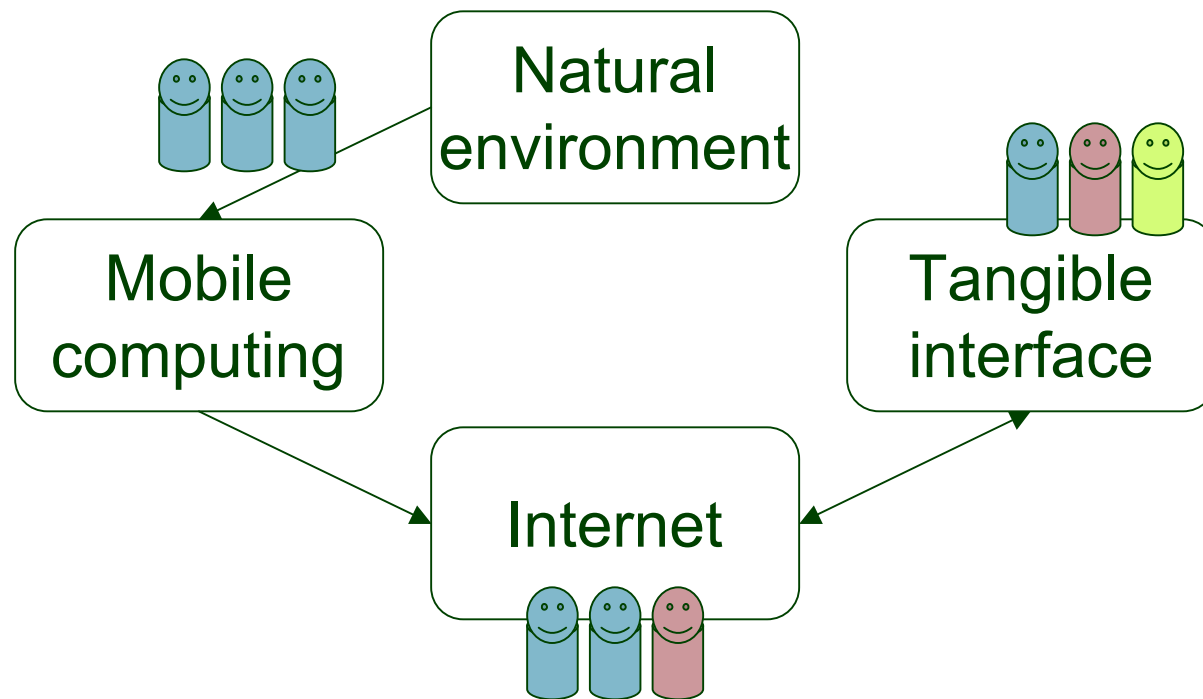
- **Local natural environment**
- **Social fabric of the community**

**Need for a
distributed and engaging
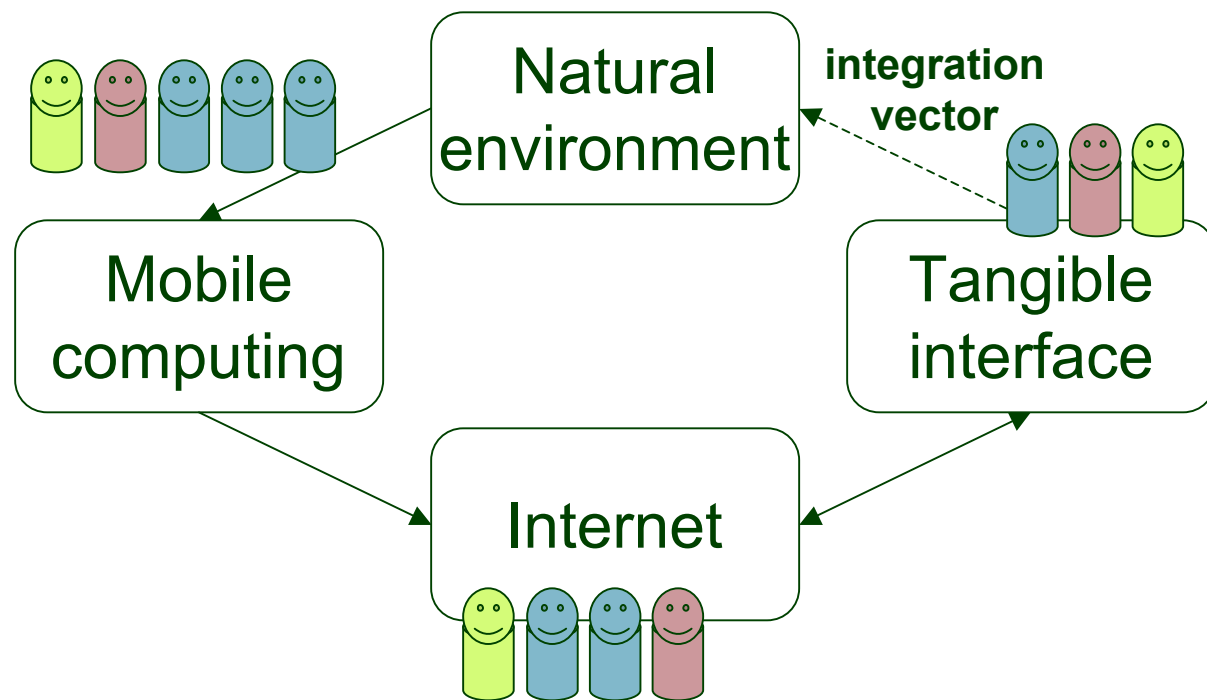socio-technical architecture**

Socio-Technical Architecture: Overview

Natural environment

Mobile computing

+

Tangible interface

Internet

Socio-Technical Architecture: Overview

Socio-Technical Architecture: Overview

The Silence of the Lands

SoL: Data Flow

Virtual soundscape
(historical, all sessions)

Virtual soundscape
(temporary, one*session)

Collective soundscape

Individual soundscape n
(sounds*walks)

Individual soundscape 2
(sounds*walks)

Individual soundscape 1
(sounds*walks)

Ambient sounds

EDC

Web server

Handheld devices

Open space

1 2 3a 3b 3c 4 5 6 7 8 9
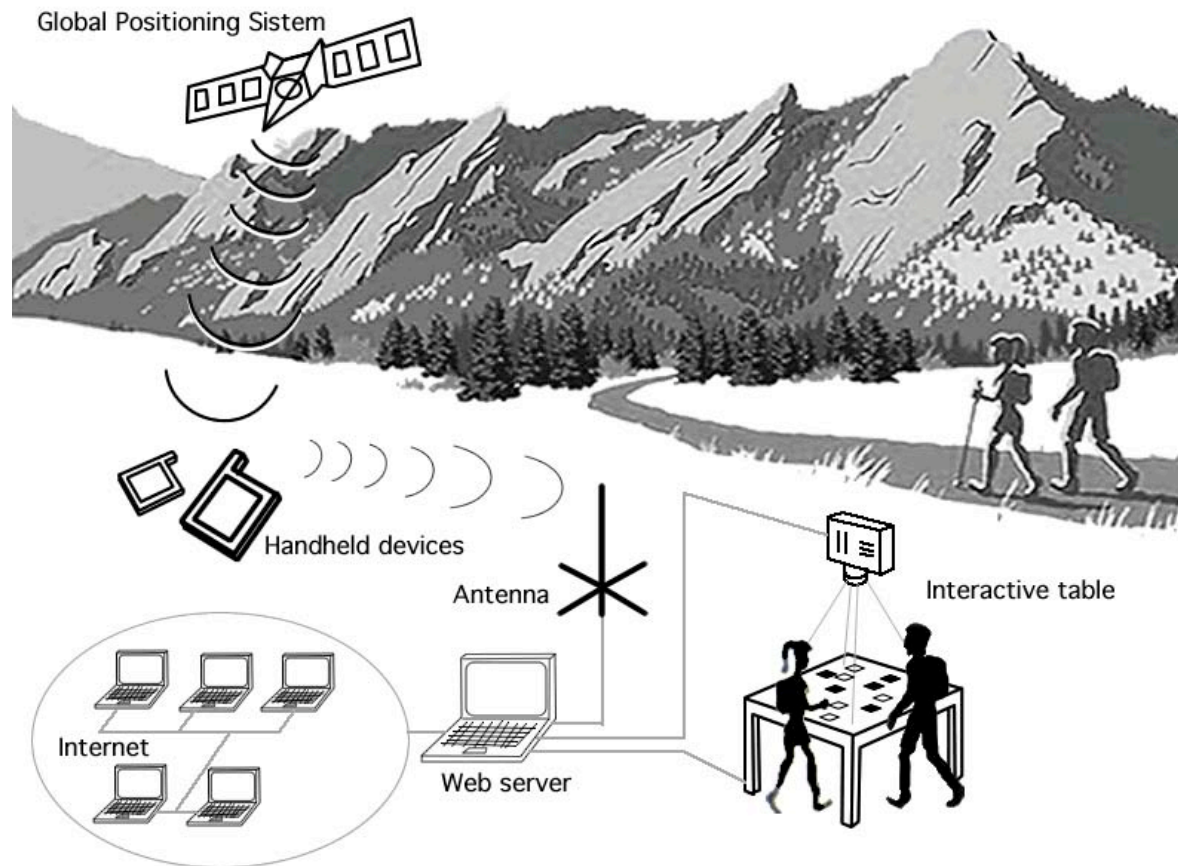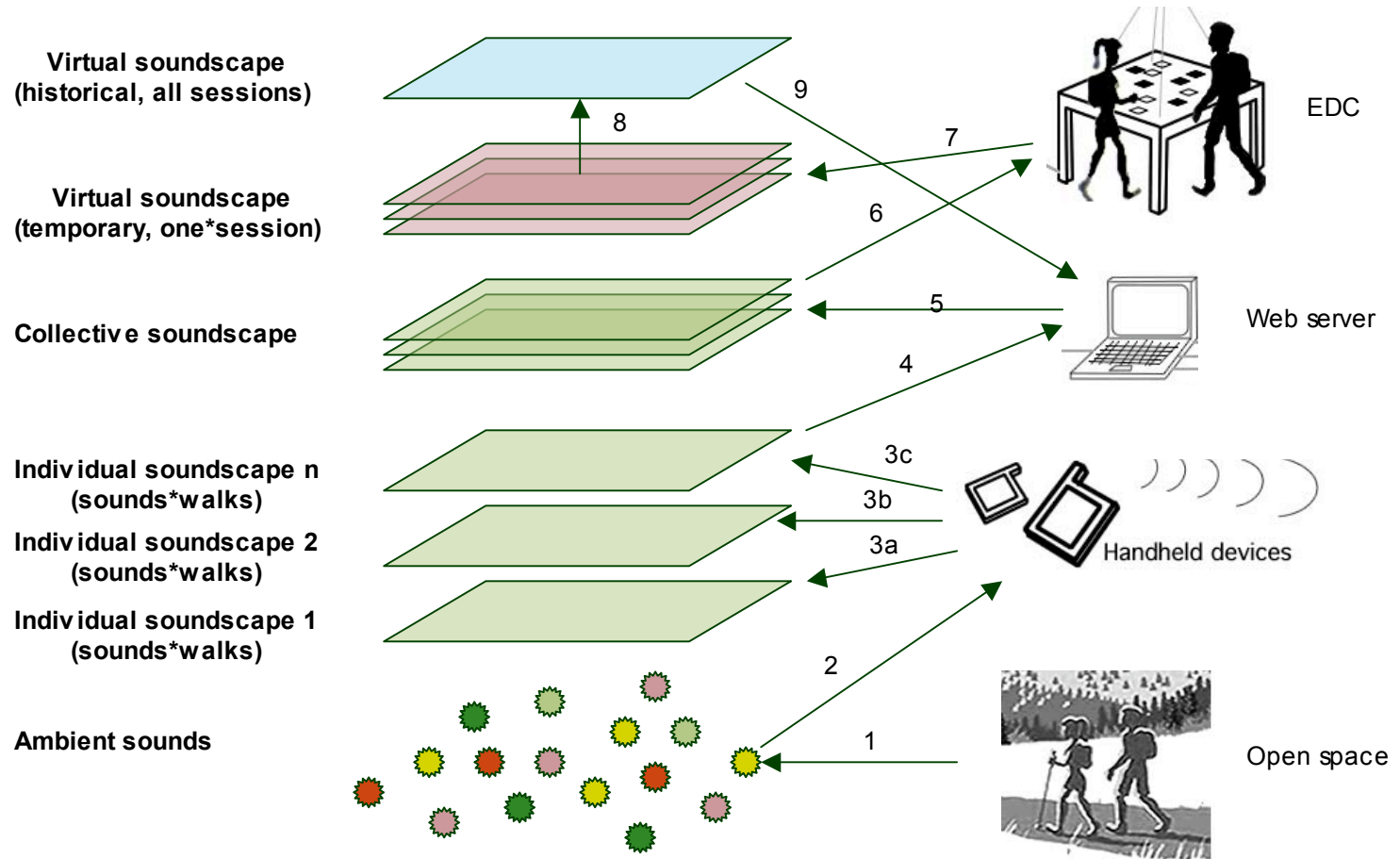
Elements of Distribution and Engagement

✳ The distribution among different *physical and mediated environments* and different *social contexts* empowers the **integration** of:

- design time and use time

- individual and social creativity

- action and reflection

- local and global actions

- also, it supports migration paths (from passive to active roles) and sense-making

Combining Multiple Interaction Spaces

Interaction space #1

Interaction space #2

Interaction space #3

Interaction space #4

Handheld devices

Internet

EDC

Individual-Social Creativity

Handheld devices

Individual Creativity

EDC

Internet
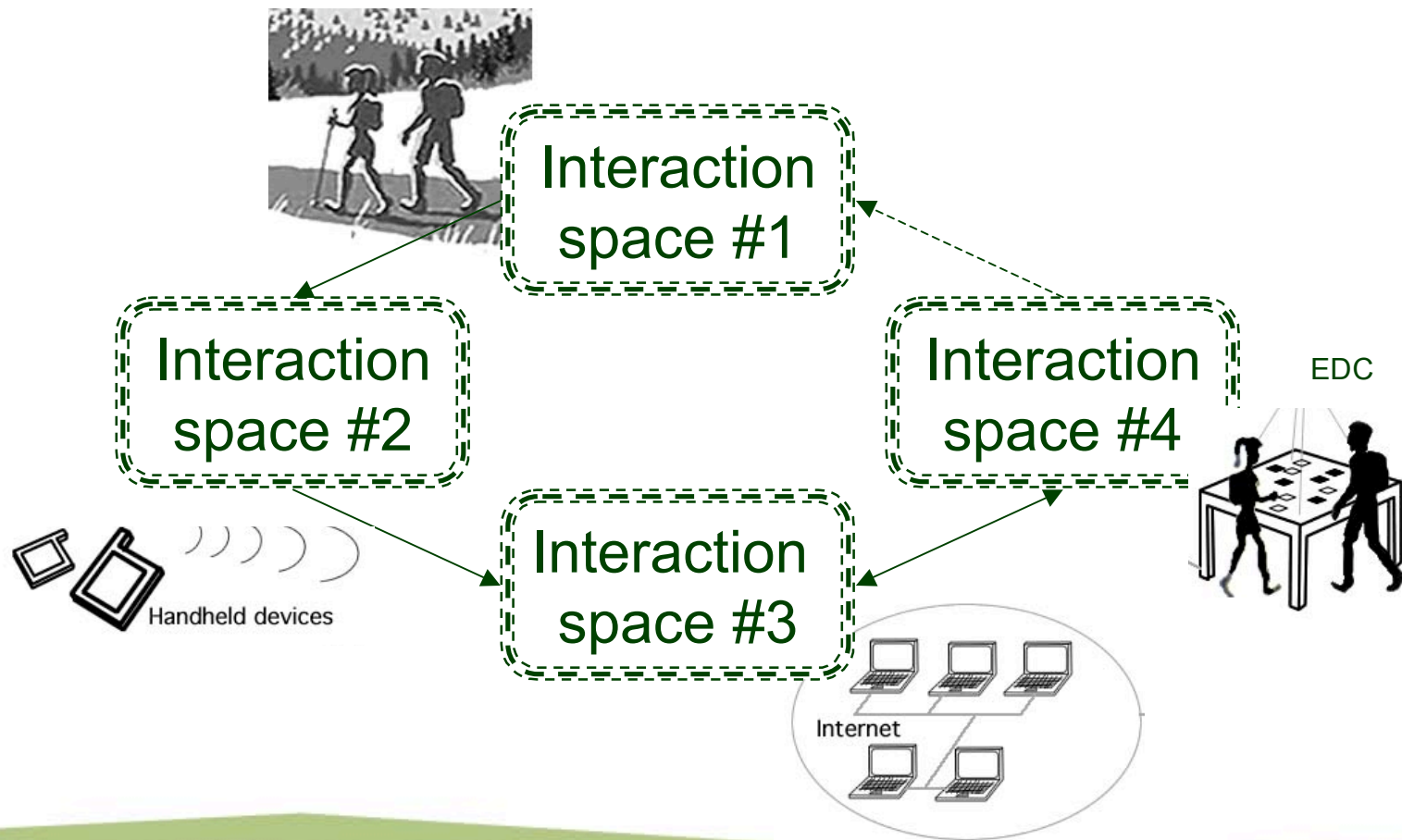
Individual - Social Creativity

Social Creativity

Action-Reflection

Action

EDC
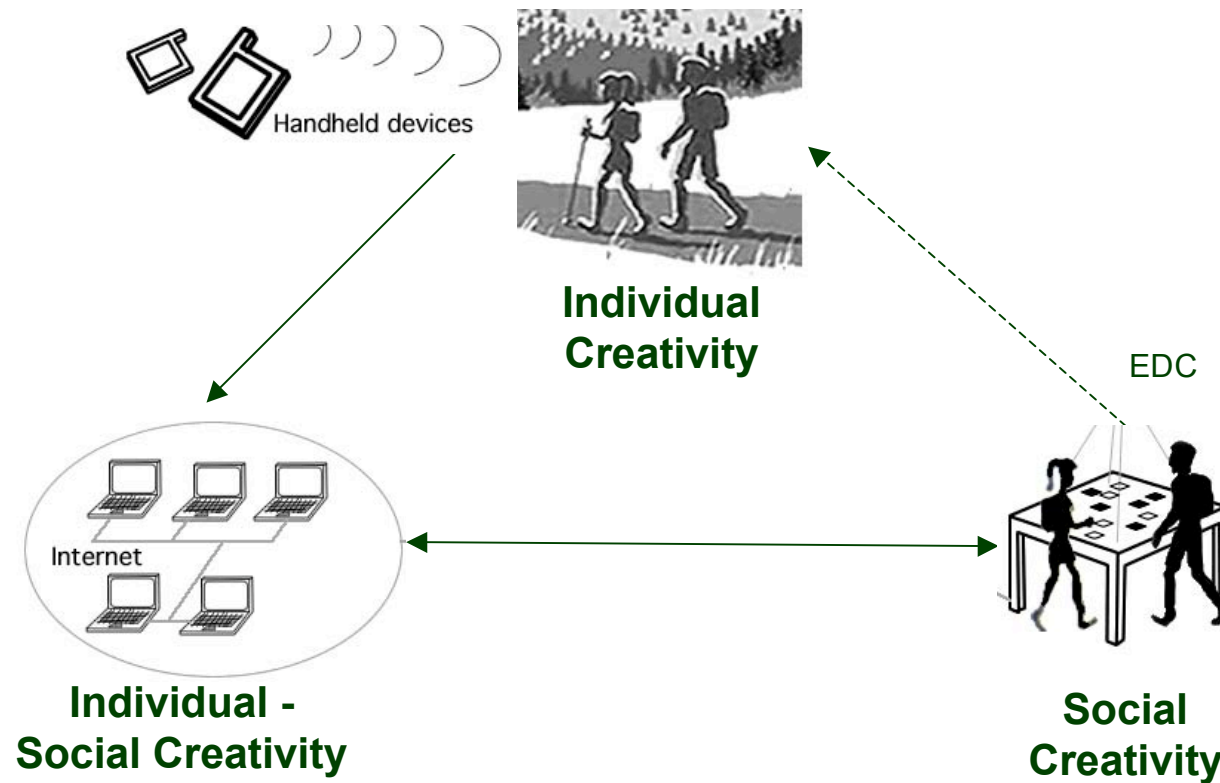
Reflection

Action-Reflection

Interaction Roles

Handheld devices

Contributor

EDC

Contributor - Viewer

Internet

Contributor - Spectator
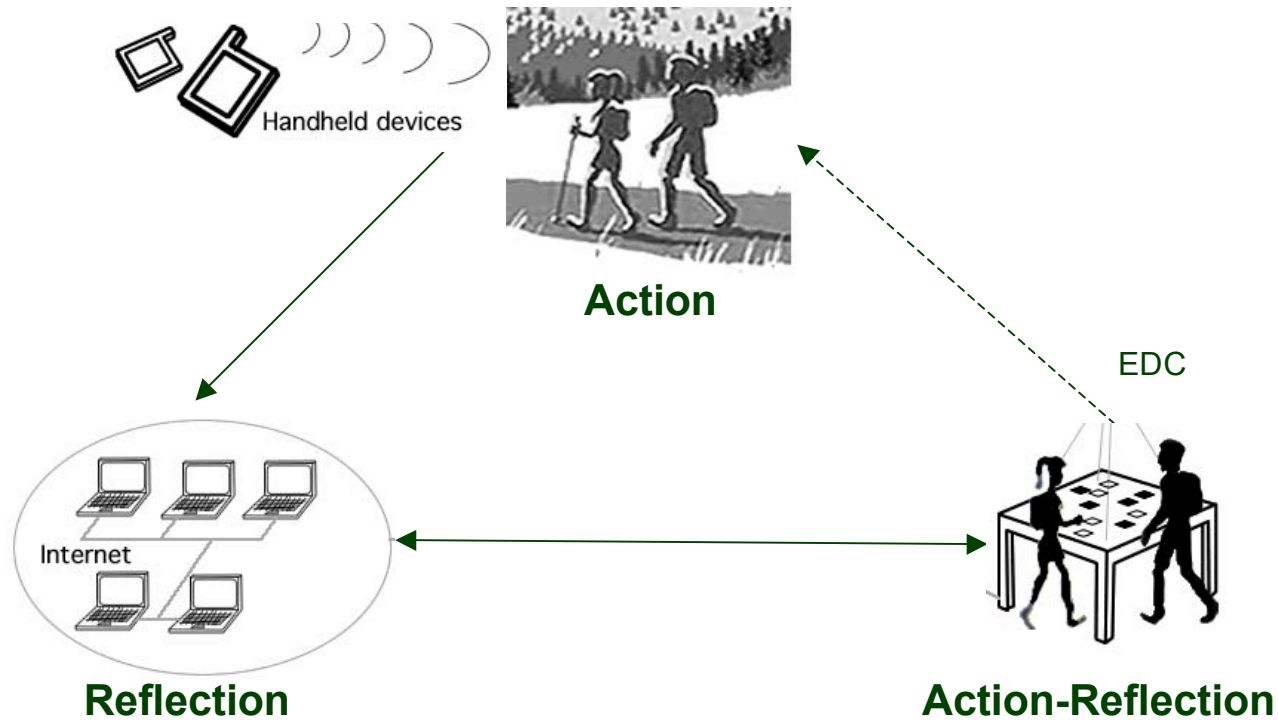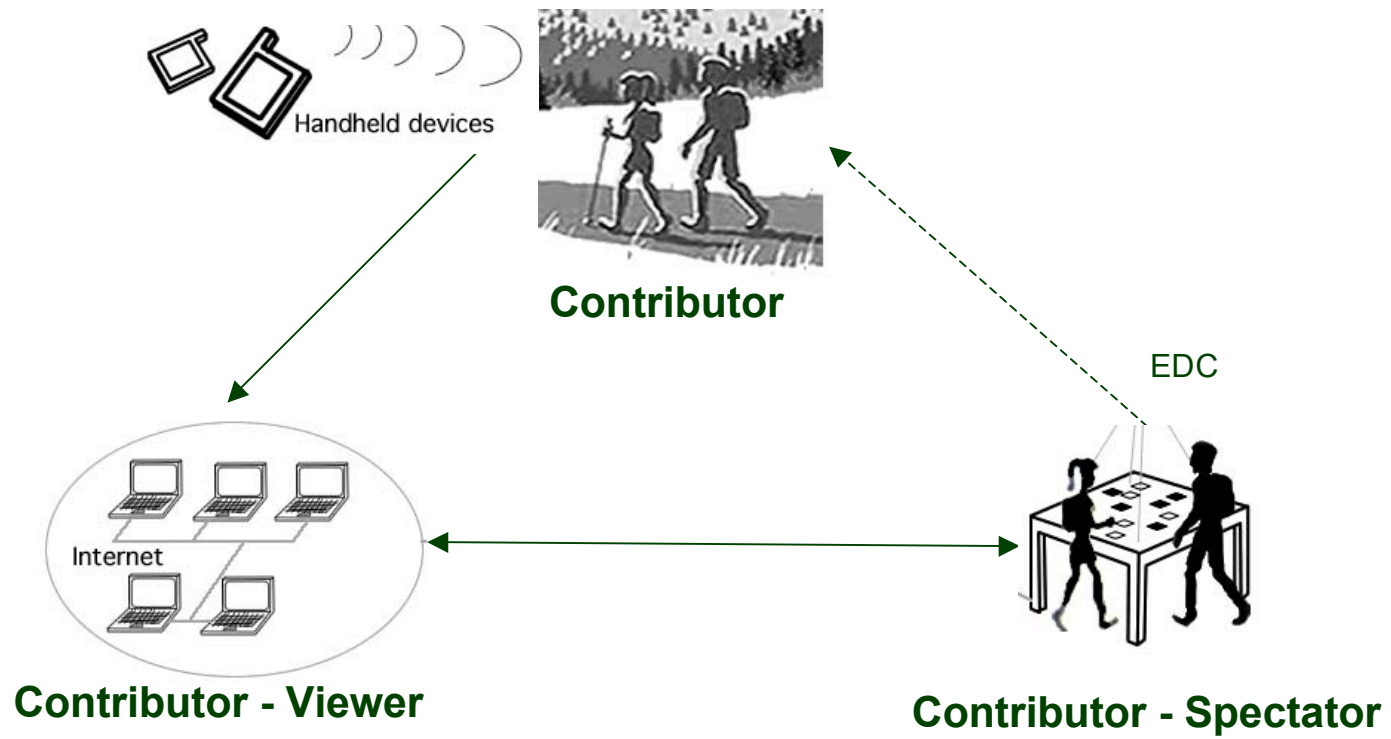
Connecting Places, Actions, and Data

* Two main categories:

  - **Place experience**
    (direct experience)

  - **Place imagination**
    (memory + wishes)
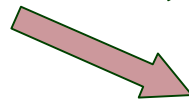
* Articulated as follows:

  - **Data catching**
    (direct experience)

  - **Data description**
    (cognitive mapping)

  - **Data interpretation**
    (face-to-face interaction)

Data Catching:
collecting sounds in the natural environment

✳ By means of the **PDA application** participants can:

- Create an account and/or identify themselves
- Record ambient sounds and play them back
- Geo-reference both their actual walk and the recorded ambient sounds
- *Navigational map*
- *Wireless uploading*

Data Description:
managing your soundscape on the Web

✳ By means of purposely designed **web tools** participants can:

- Visualize and navigate the collective soundscape
- Access and manage their own individual soundscape
- Make changes to their individual soundscape
- Associate a chromatic code to sounds according to their interpretation
- Associate a keyword and an image to sounds
- *Make other associations*
- *Use a library for sounds and effects*
- *Explore by audio-visual "tuning"*
- *Filter by day-time and/or season*

Data Interpretation (Explorative Mode):
collectively exploring sounds in the EDC

✳ In the *explorative mode* of the **EDC** participants can:

- Visualize the historical "virtual soundscape" (interaction history, evolving artifact)

- Activate the visualization of the collective soundscape

- Navigate the collective soundscape

- Listen to the sounds and see in the reflection space the information associated to them

- Trigger the entrance into the collaborative mode

- *Filter by day-time and/or season*

- *Audio-visual "tuning" and sound spatialization*

Data Interpretation (Collaborative Mode):
collaborating to the virtual soundscape in the EDC

✳ In the *explorative mode* of the **EDC** participants can:

- Negotiate choices:
  - ➢ Change sounds' chromatic associations
  - ➢ Bring sounds from the collective soundscape into the virtual soundscape
- Create a "temporary" virtual soundscape
- *Cluster sounds to create sounding areas*
- *Change other associations*

EDC: Modes and Classes of Objects

users

triggers

C

S

...

virtual soundscape
(historical)

virtual soundscape
(temporary*n)

selection

COLLAB. MODE

tools

P

Z

mode switch

EXPL. MODE

collective soundscape (individual soundscapes*n)

visualization
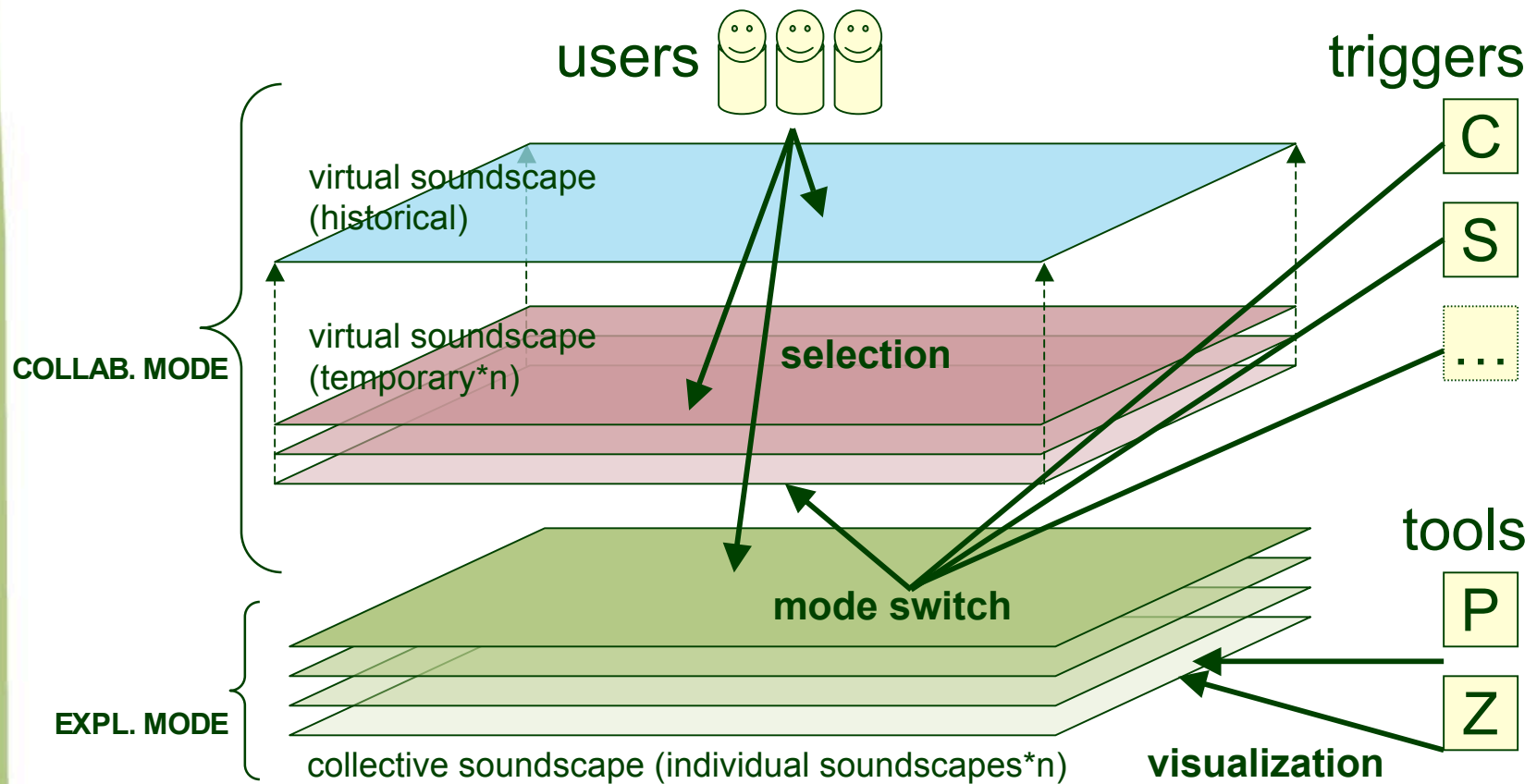
EDC: Interaction and Collaboration

* **Events** are triggered to provoke *engagement and collaboration*

* **Activity feedback** is provided to nurture *trust and satisfaction* (temporary virtual soundscape)

* **Algorithms** are used to *integrate local actions* (single session) *and global result* (historical virtual soundscape)
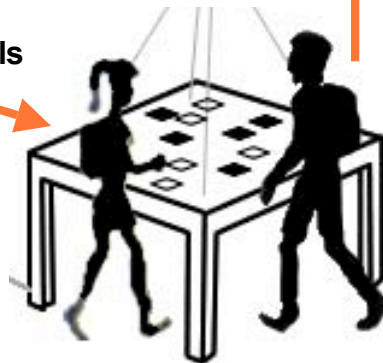
EDC: Action and Reflection Space

Sound info and Associations

This sound was recorded by (name) on (date) at (time).

Its coordinates are (GPS).

The sound is associated with the color (color), the keyword (keyword), and the displayed image.

It is/it is not part of your ideal soundscape:

Explorative Tools

Collective Soundscape

Temporary Virtual Soundscape

This is the ideal soundscape you are creating.

Each choice you make around the table is reflected here!

If you want to listen to it, go to www.silence.com.

Collaborative Tools
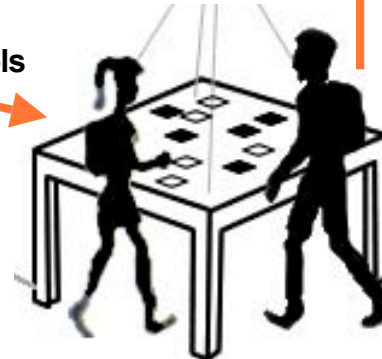
Triggered Event

Technical Specifications: Overview

* **PDA**
  - Programming language
  - System architecture
  - GPS
* **Web server**
  - Storage data management
  - Data transaction
  - GIS server
  - Web interface
* **EDC**
  - Data extraction and integration
  - Future work

PDA Application: Requirements

* Recording high audio quality (44000 kHz, 16 bit, 1 channel)
* Provide full-duplex audio interface
* Work as a real-time system (low latency)
* Portable on different system (Win CE, Palm, Symbian)

PDA Application: Programming Language

✳ ## Java J2ME

- Cross-platform (+)
- Virtual machine and multimedia extension supported only on Symbian (mobile phone) (-)
- Non real-time (-)

✳ ## C#

- Fast development (+)
- Largely supported (library) (+)
- Non portable (-)
- Non real-time (-)

✳ ## VC++ for Win CE

- Real-time system (+)
- Portable both on Symbian and Palm (+)
- Direct access to hardware layer (+)
- Low level language (-)

PDA Application: System Architecture

* Full-duplex audio
* FMOD library (free but not open source)
* Uses multi-thread technology to synchronize operations
* Blue tooth interface to GPS (virtual COM)
* 1GB storage space
* Data recording on txt file (temporary solution)
* *FTP to transfer media file (big size)*
* *GML for storage data*
* *HTTP socket for data transfer (GML)*

Web Server

✳ Manages storage data (geographic information, audio objects, user accounts)

✳ Creates a bridge between different sources (PDA, GIS data, MapServer, MySQL, Squeak)

✳ Provides a web interface

✳ Uses PHP as a script engine (open source)

Database

Every "data transaction" uses the same database:

- SQL is the "shared language" of the system
- Never lost information
- Keeps track of user actions and behaviors
- Keeps a historical track of all system states
- Allow user activity evaluation

Database (cont'd)

✳ **Uses MySQL:**

- MySQL is an open source project

- Largely supported, very stable

- Cross platform (Mac, Linux, Windows)

- Supports huge databases and different kinds of storage engines

- Supports geographic data and functionalities

- Supports spatial queries that link geographic data and user data

GIS Server: MapServer

* Provides graphic representations

* Supports projection (library PROJ4)

* Supports different data format as a source (Shape file, MySQL data, WMS client)

* Generates different output (jpg images, WMS output, Flash files, GML)

* Creates overlapping layers of GIS data and user data

* Separates geographic data (Shape file) from user data (MySQL) but keeps them coherent

Web Interface

* **Apache + PHP + Macromedia Flash:**

  - Creates a navigation tools for stored data

  - Uses Flash to mix geographic data (from MapServer as JPEGs) and MySQL data (from MapServer as a Flash layer)

  - Uses PHP to interact with MySQL and allow users to describe collected data

  - Is accessible from everywhere through the Web

Tangible Interface: EDC

* **All actions are stored in the MySQL database. It allows to:**
  * Analyze user actions
  * Create and shows the virtual soundscape (animation)
  * Keep track of all system states
  * Allow information exchange between action space and Web

* **New features:**
  * Vocal inputs in the collaborative mode
  * PHP web pages to extract data from the database and show them in the reflection space
  * Action space, reflection space, and Web share the same database

Tangible Interface: EDC (cont'd)

✳ **Triggers are independent and modular:**

- The system is "scalable"

- Interaction schemas become easy to "personalize" for different applications

- Simple and independent rules can build a complex system more closer to real problems ("complex system" theory)

Tangible Interface: Future Work

✳ Apply "complex system" theory to tangible interfaces

✳ Apply FSM ("finite state machine") to tangible interfaces:

- "Finite state machine (FSM) or finite automaton is a model of behavior composed of states, transitions and actions"

✳ Compare and evaluate these two different approaches

Intellectual Merit of the Project

✳ **Provide a theoretical and technological model for:**

- using sounds as "boundary objects" (vs. interactive sonification, vs. auditory augmentation by location-based content)

- combining mobile and tangible computing (distributed socio-technical architecture in support of the social creative process)

- integrating multiple interaction spaces (data creation, transfer, and sense-making)

- visualizing qualitative information connected to a geographic community

- collecting "life histories"

Potential Applications

✳ Environmental and urban planning

✳ Social studies (e.g. "auditory ethnography")

✳ Collective storytelling

Good catching!