Instant Archaeologies:
Digital Lenses to Probe and to Perforate the Urban Fabric

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ABSTRACT

The paper discusses the digital artwork series *Impossible Geographies,* works that weave dynamic cartographies of invisible, fragile and hybrid spaces. *Impossible Geographies 01: Memory* invokes the memory space of a gallery, producing cracks through which past events seep into the physical present. *Net_Dérive* negotiates the space between a gallery and its urban neighborhood, creating hybrid narratives along the grooves left by participants equipped with mobile phones. The playground of *Impossible Geographies 02: Urban Fiction* spreads across the city and beyond, mixing and shifting multiple urban geographies as participants sweep along the urban fabric with advanced mobile phones. The conceptual and technological methods of 'lens-making' and 'spacing,' developed in these artworks, explore the subjective, hybrid, and migrational nature of the geographies we belonging to. By re-sculpting the fluid nature of the urban fabric the works transform the everyday urbanscape into impossible imaginary geographies.

Categories and Subject Descriptors

J.5 [**Computer Applications**]: Arts and Humanities – *Fine arts.* H.5.2 [**Information Interfaces and Presentation**]: User Interfaces – *Auditory (non-speech) feedback.*

General Terms

Design, Experimentation, Performance.

Keywords

Digital cartography, locative media, memory, mobile phone, narrative, negotiation, urban fabric.

1. INTRODUCTION

The electro-magnetic flows of information networks and mobile technologies pervasive in our everyday lives spin 'invisible cities' that in many ways remind of Italo Calvino's notion of "filigree cities to be seen through their opaque and fictitious

thickness" [3] They spin a complex meshwork whose invisible spaces and connections can only be accessed by co- inhabiting virtual and physical domains. Using digital technologies to drift through or connect to virtual spaces not only connects the two domains but also changes the nature of the physical environment, bending, cutting off, tearing apart and remixing its spaces.

The digital 'filigree city,' however, is only one of the multiple cities, invisible and visible, that we inhabit. The present is infused with threads of memories, cultural or emotional belonging that connect us to other, possibly virtual places. The imbrication of these multiple spaces has a 'thickness' that might appear opaque or invisible, yet, it is certainly not fictitious. The series of *Impossible Geographies* (*IG*) aims to alter the opacity of urban geographies and to perforate implied contact surfaces. It situates itself along the boundary between the physical and the virtual and explores the edges of spaces that are bent, cut off and split apart.

The works explore these concepts of place and belonging with technologies of mobility and localization. We aim to extend contemporary research and artistic practices in the field of Locative Media by exploring and modulating the boundary between the physical and virtual through generative processes. The evolving sonic and visual expressions create archaeologies of the instant, opening up spaces in-between, hybrid spaces from which other relations between places and subjects, yet unknown, can emerge.

The following sections discuss the conceptual and technological framework of three interactive works with respect to their specific embodiment of impossible geographies. The first installation invokes the memory space of a gallery, the second installation negotiates the space between a gallery and its urban neighborhood, and the third is a mobile installation dispersed across the city space as the basis for remixing urban geographies. They draw performative cartographies of real and fictitious belongings, memory, control and subjectivity.

2. DISPLACEMENTS, FISSURES, AND INTERFERENCES

The common motif or set of vocabularies for the *Impossible Geographies* series are the underlying generative processes that produce points of contact and leakage, lines of continuity and cracks, planes of reflection and polarization, and spaces in-between, represented acoustically and visually through digital media. The representations and behaviors of the works result

from the computational interpretations of these generative mechanisms and evolve based on the mutual feedback loops between these processes, the environment, and the environment's inhabitants (the participants). The behaviors adapt over time based on the works' history and a growing set of relations that change the interpretation of current events. The underlying generative processes become thus the building blocks of an irreproducible and fragile narrative that is intrinsically fragmentary and hybrid.

The formulation and implementation of the computational processes constitute an inseparable part of the creative process of shaping the framework in which these digital cartographies are woven. The generative algorithms, fuzzy logic inferencing, image recognition techniques, and the integration of these algorithms become the material with which the artists sculpt the digital (urban) fabric and its dynamic behaviors.

The 'contact surface' of this mixed reality consists of sensorial interfaces that enhance the physical and the digitally produced narratives, interwoven with the physical "lived space." [4] Interacting with this contact surface, the participants create displacements, fissures and interferences that continuously reshape the contact surface. They propel the underlying generative processes that mathematically interpret the transformation of the contact surface, expressing and setting forth the perforation of the virtual and the physical. Opening up gaps that cannot be sutured but are to be negotiated, the installations engage the participants in perspectives from which other relations, yet unknown, can emerge.

3. EXCAVATING MEMORY
In the first series of *IG* a gallery space is threaded with sensors that perform as the 'neural' extensions of its virtual mirror space (Figure 1). The interactive installation explores memory as a metaphor for the fluid boundaries between the physical and the virtual.

3.1. Impossible Geographies 01: Memory
Entering the exhibition space, the visitors see themselves mirrored in video projections that are layered over the space. As they move around, they perpetually cross virtual thresholds, spanned throughout the space and signified only by the beams of laser light. Traversing these invisible boundaries, they notice a subtle change –a twitch- in the mirror reflection. The more

Figure 1 *IG 01*: Installation at gallery Fabrica, Brighton

thresholds they cross, the more they disrupt and distort the image of the present space, up to the point at which it cracks. A wispy fabric of time traces begins to drip and slowly forms a spill of what the space has 'seen' in the past.

4.1.1 Interlacing the physical and the virtual
The installation traces visitors' actions, mixing them in unexpected ways with memories stolen in the physical and held by the virtual. That is to say that throughout the exhibition, those memories are captured, collected and remixed in order to create a virtually woven fabric of inhabitants' traces that grows and evolves over time. Memory here is materialized as a contact zone in which present and past, present and absent, virtual and real meet and interlace. Always flowing and neither clearly one nor the other, the 'memory space' manifests itself as a leakage between time and space. [7] The participants, touching or crossing these thresholds, interact with the joint of two spaces, merging the physical and the virtual, rather than with only a virtual data space.

3.1.2. The 'undercurrents' of memory
The collecting, filtering, mixing and leaking of memories is processed by customized MaxMSP/Jitter objects and patches. Crossing the invisible sensor thresholds of *IG01: Memory,* perturbs the gallery's memory space. This perturbation is interpreted as a crackling impact of particle droplets that carve into the video records of this space, forming a fluid collage of six stored video files at a time. Similar to a crackling impact of forces, the mirror surface (video projection) bends first before it
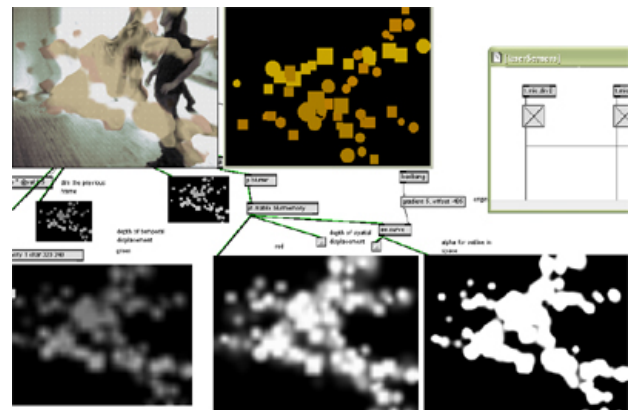

Figure 2 *IG 01*: Memories seep into the present

Figure 3 *IG 01*: The system's undercurrents

fractures and gives way to the seeping or spilling of this collage (Figure 2). The greater the activity of people that are present in the gallery, the more the seeping stream turns into a spillage mixing with the (image of the) present. [7] The degree of the memories' entanglement ('grainyness') is thus mapped to the degree of the room's perturbation or the activation of sensors over time, respectively. How deeply these memories of 'neural interruptions' move into the past (the time span) and how long it takes for the mirror's fracture to close again depends on the frequency of crossings over time. Participant's movements, that is the number and frequency of interruptions, are looked at over time and determine the 'excitement level' of each individual 'neural extension' (sensor) and, collectively, of the space.

3.1.2.1. Displacing space and time
The system's 'undercurrents,' implemented in the authoring software MaxMSP/Jitter, consist of the dynamic generation of displacement maps. Touching or crossing the neural extensions is interpreted as the accumulating effect of small, dynamic, 'crackling' impacts, producing particle-like 'droplets' along a break line that spatially corresponds to the mirrored sensor beam (Figure 3). The dynamic shapes ('droplets') deform the nurb surface of the mirror image (present). They also extract and displace previously captured images according to the different grey values of these shapes (past). The parametric settings for these droplets, such as the amount, grey values, time to 'swell' and 'ebb' and the duration of 'dropping,' are defined by current and previously stored sensor inputs ('excitement level'). The dynamically created displacement maps, then, define the various time intervals of the memories (the levels of temporal depth) and the size and shape of the memory spills.

3.1.3 Presence and Absence
Participants become increasingly aware that they are not only spectators inside this space. As they influence the presence, they inscribe the past to be presented to a future visitor. Talking to visitors and inferring from a review in the *Boston Globe*, the experience of one's own present enlaced with the presence of someone else, now absent, opens an uncertain, haunting ground. In Cate McQuaid's words, "'Impossible Geographies' enables the viewer to imagine stepping into someone else's swirling psyche and playing a bit part." [11]

4. GROOVING THE URBAN FABRIC
The next two works of the series of Impossible Geographies explore the potentials of Locative media. In contrast to the first work, they are concerned with the relations between subjects and places as they are inscribed into the everyday fabric of urban spaces by participants equipped with advanced mobile phones.

4.1. Probing, tracing and hybridizing
Ubiquitous and nomadic computing inspires application developments beyond the desktop and propels "a shift from explicit means of human input to more implicit forms of input." [1] Such implicitness can be achieved by augmenting the surrounding with embedded sensors or by attaching the sensing, transmitting and possibly processing instruments to its inhabitants (i.e. wearable computing devices but also mobile phones). Inhabiting a space that is capable of sensing, tracing and recording, the ubiquitous and pervasive concept inherently situates the participants along the contact surface between the

physical and the virtual. It produces a "hybrid space," where interaction takes place in both physical and virtual space. [8]

Probing public spaces and interacting with spaces of the everyday has been addressed by a multitude of projects that, for example, introduce artefacts into the (urban) environment [13] annotate the physical with virtual marks or narratives [17] or trace the participants' movements through the environment. [14] Proboscis, for example, has developed a public authoring and software platform for annotating geographic places with mobile devices in *Urban Tapestries.* [17] Rendering movements through the city visible in the locative media work *The Choreography of Everyday Movement*, Teri Rueb reveals "socio-political and poetic patterns of traffic flow through the urban body." [13] Misha Myers's work *way from home* is concerned with the politics of human displacement and explores the potential of wayfinding as narration by mapping sketches of a home elsewhere onto places in Portmouth, UK. [12]

The following works continue the dialogue on probing spaces and patterns of belonging, aiming to recover the subjective, hybrid, and migrational nature of the geographies we inhabit. The first work focuses on issues of authority in the creation of collective narratives. The second work further departs from the idea of annotating spaces or tracing their inhabitants by addressing the elasticity and porosity of the urban fabric itself.

4.1.1. A paradoxical playground
The socializing and spatializing practices of locative media deploy portable, networked, location-aware computing devices that involve participants in mapping processes, social networking or artistic interventions. Here geographical spaces become the virtual canvas to be inscribed with personal narratives, desires, and memories. There is, however, a double-edge to this notion of public authoring, as the technologies affording the sharing of collective location-based interventions paradoxically operate upon the same plane as surveillance. Its reliance on positional precision and the emphasis on a location-based context also critically link locative media to the arena of cartography and its hegemonic practices of mapping. According to the social anthropologist Thomas Widlok, "both a map and a GPS depend on a history of human-environment interactions [] from which the experiential aspects of the humans involved have been systematically eliminated to leave nothing but formalized, depersonalized procedures." [18] The relationship between the map and the territory shapes thus another paradoxical playground for locative media interventions. Current art practices in this field have been criticized for rarely engaging with the way in which the technologies reaffirm precise categorical location and facilitate relating strategic maneuvers. [9, 10] In the following paragraphs we deal with how the *IG* series respond to the tensions of this playground.

4.1.2. Drifting into the margins
The audio-visual language of our projects and their metaphoric spatializations, such as 'grooving,' 'excavating,' 'weaving' and 'shifting' allude to the idea of the Situationist *dérive*. The Situationist concept of the drift as a radical rereading of the city. [15] opens spaces in which to drift into hidden or disguised margins of the city. Within the discourse of locative media, the narrative of the drift that always remained open, contingent and shifting [15] is recontextualized. Stripped off its revolutionary goals, it relates contemporary urbanism to the paradoxical

Figure 4 *Net_Dérive***: grooving the gallery neighborhood**

Figure 5 *Net_Dérive***: sculpting the map**

strategies of locative technologies. Artistic interventions often play out the boundary-shifting potential of the drift, such as Teri Rueb's work *Drift,* in which interactive sounds "drift with the tides, and with the shifting of satellites as rise and set, introducing another kind of drift." [14]

Concerned with the multiplicity of temporal and spatial relations and migrational pattern of belonging, our works interpret the concept of the dérive by mixing, shifting and unfixing the dependencies between the location and its underlying grid. They create thus alternative connections that question traditional forms of mapping, able to serve as a force of diversification and not homogenization. Motivated to dwell in the spaces between binary opposites, without mapping one onto the other, we call upon Homi Bhaba's Postcolonial concept of a "third space," from which other positions can emerge. [2] Looking for such 'thirds spaces' inside the urbanscape, we find counter-spaces that are foreign to the traditional cartographic space. In the next sections we discuss how the works produce such counter-spaces.

4.2 Net_Dérive

Net_Dérive presents a hybrid between a gallery installation and a mobile artwork. It connects the gallery's space to the urban space of its neighborhood. In contrast to the enclosed controlled so-called 'white box' environment, the urban environment shows an unpredictable multiplicity of events and actors. Our approach interacts with the imbrications, hybridizations and multiple forms of belonging that emerge from this fluid fabric. Notions of surveillance, drift and instantaneous archaeology become the core motifs that shape this collective narrative.

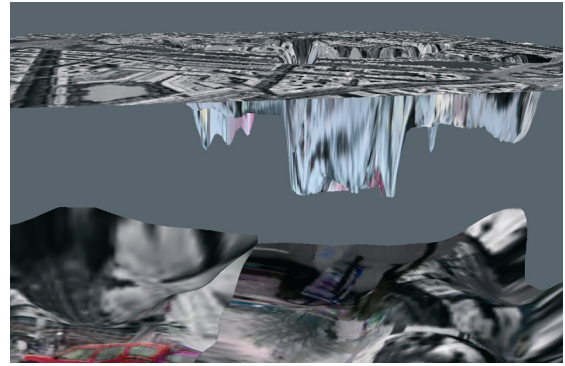**Figure 6** *Net_ Dérive***: interference pattern of participants**

The hybrid playground of this work emerges between the grooves inscribed and the spaces excavated by the mobile participants (equipped with mobile phones). A central server, connecting the participants in the neighborhood, correlates their actions, processes them and communicates the narratives to the visitors in the gallery space. The resulting subjective cartography produces "a migrational or metaphorical city [that] slips into the clear text of the planned and readable city." [5] – as well as into the white space of the gallery.

4.2.1. Drifting from the drift

Net_Dérive plays with the drift on two levels. Mobile participants (in the gallery's neighborhood) are induced to drift by vocal directions embedded in the sound tracks streamed to the mobile phones. The directions given depend on the current location of the participants and follow various 'missions,' such as joining and diverging their paths or leading them to the path of a previous participant or to a specific site. Graphics on the phones' display depict each participant in a sonar-like visualization, indicating potential interferences with other paths or obstacles (Figure 6).

The mission's goal is not revealed to the participants and can change at any point in time – it is about creating a narrative rather than following one. The second drift occurs where the participants choose to not follow the directions. It is a version of a sound walk in which the walker is not only accompanied or induced but also tracked. Whenever the 'drifter' detaches from the narrative path of the sound track, events are triggered that change the narrative as well as the performative potential of the groove left behind. The relations between paths of the acoustic narrative and the participants drifting through the city (actual paths) determine the permeability of the city's skin. As a result, the mobile participants are able to 'excavate' earlier traces, left by previous participants (Figure 4, 5). This creates an archaeology of the instant producing an interpretation of the dérive that is horizontal and vertical (Figure 7).

The manipulative potential of this drifting narrative is supported by the possibly deviating information that is perceived through the headphones and the phone's visual display. The first induces an imaginative narrative, while the latter refers to the actual narrative events and players involved. It aims for highlighting questions of power and negotiation including the potential inversion of observer and observed in the context of surveillance technologies.
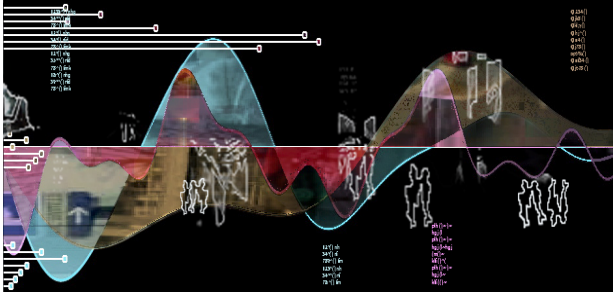
Figure 7 *Net_Dérive*: **Horizontal and vertical dérive**

Figure 8 *Net_ Dérive*: **extract from the dérive**

4.2.2. Inside the gallery space

Inside the gallery, visitors are able to witness different perspectives of these negotiations. The evolving network of interfering grooves creates the final dérive and the lens through which the mix of various layers become visible. Large scale video projections show different perspectives of the multi-layered process that carves the grooves in a map from the neighborhood (Figure 5 and 6). Extracts from this map are also sent to the phone, where participants can switch the display between the sonar-like function (4.2.1.) and a 'window' into the gallery's display (see 4.2.4.5., Figure 8). A sound system projects the evolving mix of deconstructed musical source elements injected with environmental noises, actively panning and substituting elements from other participants while preserving a coherent sonic flow. [16]

4.2.3. Framework Architecture

The project deploys networked, location-aware mobile phones. These mobile devices become the instruments involving the participants in mapping processes for artistic interventions. The development of this locative media framework took an instrumental approach, that is to say, to use the metaphor of a musical instrument, an entity distinct from a composition written for that instrument. With this framework, we seek to create an instrument out of the urban environment, also inviting other artists to imagine the kinds of pieces they may create for the city-as-instrument. [16]

In *Net_Dérive*, the mobile phones are the instruments that enable the mobile participants to groove into the urban fabric and to communicate the data with the gallery. The communication framework defines a platform on which the mobile devices run e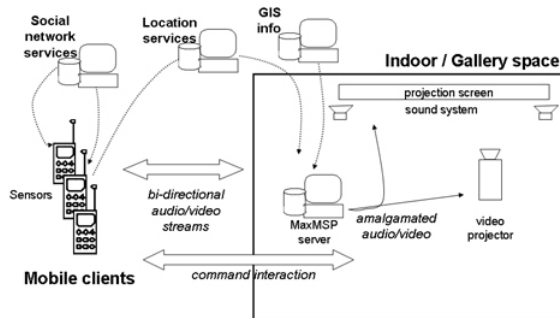mbedded Java applications to exchange media data and to communicate with the location network server via XML. The information exchange will be supported by a client-server architecture (Figure 9, 13).

4.2.4.4. Clients (Mobile Devices)

The mobile devices integrate GPRS and 3G services with multimedia capabilities including a digital video camera, a microphone and polyphonic sound. These clients operate as audio and video capture devices, streaming live audio-video streams up the wireless network to the server. They also serve as a sound/image display device, with MP3 audio decoding played over standard Walkman-type headphones and a 240x320 resolution color display. A custom Java program enables the mobile clients to read and to display audio and image data streams from the network.

4.2.4.5. Data aggregation

The data that enacts the grooving process consists of (1) location data from the GPS sensors, (2) live environmental recordings from the mobile devices, (3) control information coming from the different participants, and (4) pre-composed musical tracks. While the mobile participants interact mainly through the sensors onboard the mobile devices, they are also able to switch between different views of their grooving process by using specified control buttons on their mobile device. The system server aggregates the data sources and processes them (Figure 9).

4.2.5. Net_ Dérive's undercurrents

The MaxMSP/Jitter application on the server extracts bits and pieces of the material streaming from the devices. Processed and composed along the edges of the participants' grooves, they constantly change the dynamic map of the neighborhood. A selection of traces (transmitted images and location) is stored in a database in order to be excavated and reinserted into the current composition. Analog to the participants' experience of drifting, the system's undercurrents create relations and associations, rather than representing a one-to-one relation of geographical positions. The depth, size and opacity of the grooves are generated based on the spatial and temporal correlations between the imaginative locations (produced by the acoustic narrative) and the participants' actual paths. The resulting superposition of grooves determines the density and opacity of layers that show the map's narrative evolution.
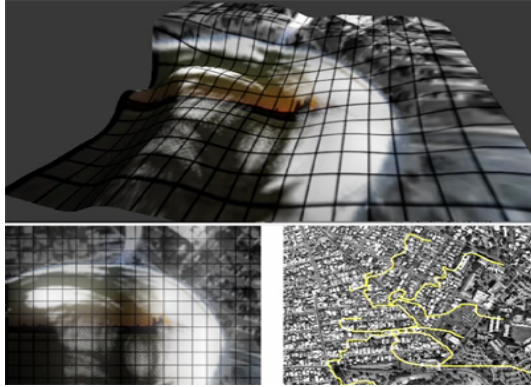

Figure 9 *Net_ Dérive*: **system overview**

Figure 10 *IG 02*: Weaving the threads of the fabric

Figure 11 *IG 02*: 3D visualization of the fabric (in Jitter)

4.2.6. Using the mobile phone to produce a narrative

Deploying mobile phones that are advanced with Bluetooth GPS sensors, rather than custom built devices, is at the core of this project. Turning this instrument of everyday communication into a narrative shaping instrument opens up the tensional space between communication, navigation and surveillance. Participants who experience both the construction of the narrative inside the urban fabric (on the street) and the different external perspectives on this reshaped fabric (in the gallery) need to position themselves in this tensional space. The construction and manipulation of this narrative not only traces the participants' position navigating in the urbanscape but also their position in the political space of the navigation instrument.

4.3. Impossible Geographies 02: Urban Fiction

This second series of *Impossible Geographies,* currently under development, builds on and extends the ideas of *IG 01: Memory* and *Net_Dérive*. While *Net_Dérive* extends the gallery space to its neighborhood, *IG 02*'s playground will spread across the city and beyond. It will be a mobile art network that weaves an alternative, virtual fabric overlaying the urbanscape. Using networked, location-aware and motion sensing mobile phones, participants will sweep and move along the urban fabric to weave a fragile virtual fiction that shifts and rewrites multiple urban geographies. It does not aim for drawing an imaginary city but rather the image of a city as it might be imagined by its inhabitants, alluding to the multiplicity of places and events they could potentially belong to.

While *Net_Dérive* is concerned with interpretations of the dérive, the series of Urban Fiction explores performative ways of cartographic representation. It uses mobile phones to probe into the urban fabric and to then experiment with the fabric's "material qualities." The fabric becomes the conducting surface that is transformed by the participants' interactions. And the mobile instruments become the lens through which to look at and modulate the fabric and its threads. The textile quality of the urban fabric will be depict the 'thickness' of its surface as a partly porous and brittle and partly elastic and fluid material. This will conduct and perpetuate the flow of events sensed and captured by the mobile phones based on the varying local conditions, remapping the cartographic relations (Figure 10, 11).

4.3.2 Writing impossible cartographies

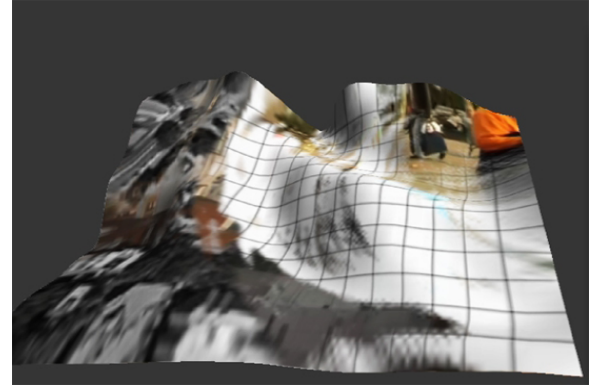Moving through and inhabiting the physical urban fabric with the handheld mobile phones, the participants will weave a fluid virtual fabric between their locations and lace this web with elements untied from local and remote places, archives and memories. In contrast to *Net_Dérive*, here it is the mobility and motion of the devices that will set up the performative tension between varying degrees of resistance, transparency and intricateness to enact this cartography where it was 'touched' and where traces have been left. [6] The result will be a fiction produced and shared between all participants and yet uncovered and accessed through the screen of the device display and the headphones.

The negotiation of this impossible geography will focus on the frictions that will emerge between two different epistemological 'readings' of the city. The first one, consisting of geographical maps and corresponding geo-referenced data retrieved from geographic information system (GIS) datasets, pertains to the allegedly 'known' and 'placed.' It will be negotiated against an unpredictable and fragile set of relations that consists of the subjective traces of the participants as they drift through, interact with and inhabit the city's multiple geographies. The confrontation of these two 'readings' will result in zones of varying degrees of elasticity, porosity, and transparency. The geo-referenced data will add weight and resistance to the (virtual) fabric, thus attenuating the laminal flow and turbulent transitions of the fabric induced by the participants.

These 'material qualities' of the virtual fabric will define the presence and intricateness of the threads to be woven in (Figure 10, 11, 12). This will enable the shifting, unmapping and remapping of the cartography both on the surface level and underneath. On the surface, the mixing of the narratives will

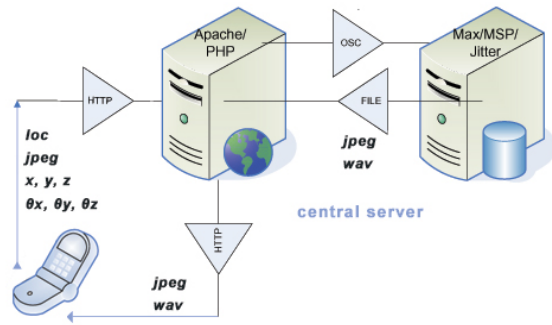**Figure 12 *IG 02*: 2D visualization of fabric (in Processing)**

Figure 13 *IG 02*: archigram

dissolve the boundary between objective and subjective views of the urbanscape. The mechanisms to transform this surface are propelled by the movements and paths of the participants, creating undercurrents that twirl, blend and weave the elements of the various locations.

4.3.3. System architecture
The communication between the mobile devices and the server will build on the framework developed for *Net_Dérive*. It will be extended in order to accommodate a wider variety of external sources, such as GIS datasets. While *Net_Dérive* utilizes 3G services to communicate with the server, *IG02: Urban Fiction* will transfer the data between the server and the clients using WIFI (Figure 13).

4.3.4. Clients
In order to enable the participants to read and to interact with the urban fabric, the mobile phones will be enhanced with additional sensors that include a global positioning system (GPS) and a 6 degree-of-freedom (DOF) gyroscopic accelerometer.

4.35. The Fiction's undercurrents
The weaving process is generated in the open source programming language Processing and rendered on the client sides in Mobile Processing. The deformation process of the virtual urban fabric is based on a dynamic representation of vector fields and the incorporation of fuzzy inference (Figure 12). The mathematical formalism of fuzzy logic will provide the machinery by which to calculate the magnitude of participation of the various captured traces of 'geographies' from vague, imprecise and ambiguous information. By modifying these membership functions, the cartography will constantly adapt. The participants' paths will determine the degree of activeness of the different vector fields (repulsing and attracting), allowing for heterogeneous connections between these nodes. The resulting play of forces formulates the mechanism to produce feedback loops between different geographies within the city and between different cities.

5. PARTING THOUGHTS
Net_Dérive and the series of *Impossible Geographies* deploy digital media and generative media processes as alternative performative modes; whether the mode is to leak the virtual into the physical world or to transform the cityscape into a map of peoples' imaginary and lived concepts and representations.

The 'hybrid' attachment of the participants in each artwork and the digital representations is heightened in intimacy by giving participants a visual, aural and tactile reach into these 'impossible geographies.' They produce novel ways of interacting with spaces as the basis for changing the participants' notion of the environment and its constituting relations. This conceptual shift away from representations as devices of communication provokes and fosters a reading of representation that preserves subjective, ambivalent and hybrid aspects of the geographies we inhabit. It introduces elements that are not typically linked to cartographic forms, such as memory, partial belongings or ambiguous links that require fuzzy interpretation.

The specific deployment of everyday communication devices as narrative instruments and lenses renders the urbanscape to a tensional space in which to explore forms of representation of territories and the constitution of contact surfaces. The artworks and associated technologies provide access, probe into and interact with the rewritable cartographies, enabling a condition of bodily existence in a space that is based upon a prosthetic that spatially and temporally connects participants to the space and to each other. The spatial and temporal relations enacting these dynamic narratives however draw a map of cultural practices, rather than geographical locations. In this sense, the works investigate the paradox of communication and surveillance technologies as a way for negotiating one's position, rather than leaving a trace or covering tracks, by mediating and influencing the reading of the probed and interfered.

6. NOTES
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7. ACKNOWLEDGMENTS

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