Syncwalk
A Framework for Locative Audio Composition

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Abstract

The way we perceive everyday space—a room, a building, a city—is informed not just by our immediate sensory input: culture, history, and other contextual cues complete our experience. With the advent of sensor-rich, highly-connected objects, our ability to interpret and refine these contextual elements, and therefore our experience of space, grows ever sharper.

Location-aware sound art has the potential to apply this new technology in groundbreaking ways, but at present such work is hampered by the lack of a widely-accessible composition platform. In this work, I survey prominent works in the locative-sound art field and propose a scale-independent software framework for composing sound in space. As a proof-of-concept and to encourage further dialogue, I use this framework to create a large-scale participatory project that will allow anyone to sound-design his or her neighborhood space.

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1. Introduction

The purpose of this thesis is to document and explain Syncwalk, a geospatial platform for sound composition. I will start off by describing Syncwalk's functionality in a paragraph or so. After this, I will talk about my motives and walk us through some prior works by myself and others, and then spend a little time situating Syncwalk relative to these other works. The intention is to form a continuum, and from this we can look for any next steps and future works that Syncwalk can facilitate.

Briefly: Syncwalk is a platform for sound-design in a geographic space. You place songs from your music library onto a map, and then you go out into the world and, as you walk from one place to another, you hear the songs you've placed along the way. I created Syncwalk because there were no comparable experiences available to me. I wanted to design and share experiences centered around, but not wholly determined by, the spaces we transit and inhabit.

More conceptually, Syncwalk is a framework for augmenting our everyday space. When we can pin a sound, or a family of sounds, to a place, we can talk about more than just the here-and-now details of a location; we can bring emotions, memories, and ideas into the experience as well. The larger discourse, currently referred to as "locative art," can be expanded and abstracted by adopting different approaches to authorship—the potential to collaborate on, or algorithmically generate, compositions in this field.

At present, locative art does not fully address the potential inherent in merging sound and space. Most contemporary works seek to involve almost exclusively visual media, situating them either directly on top of the physical world (*augmented reality,* or AR) or using points in the physical world as holding places for virtual information (*annotated space)*. The intersection of sound and space is, in a way, more plastic: by eschewing the visual in favor of more subjectively-perceivable forms of expression, we create a mesh of impressions that can be more than the sum of its parts.

One theme I will be reiterating throughout this work is the importance of bringing locative art experiences to a large number of people. Locative art promises a new type of aesthetic experience, at once highly subjective and rooted in the real world. As transformative and profound as this experience can be, it is useless if it is inaccessible to others. In making Syncwalk, I provide a solution to the problem of limited access by designing and implementing a robust set of tools that almost anyone can use to create a locative art experience. Accompanying this, I also design and implement an easy-to-use mobile application for experiencing these creations.

For now, I will stick to the short description and begin building a historical context into which we can place the work.

2. Context

2.1 Where am I? What field am I in?

I will go over many works in the following pages, delving into the elements I find inspiring, useful, unsuccessful, etc. In particular, I want to examine the constraints of each piece—the factors that limit its impact, and the extent to which those factors are intentional. These limitations represent the boundaries restricting the development of the locative art genre, and we will be taking aim at them as part of this body of work.

I will begin with a brief history of locative art and then review its current potential: which questions have emerged as fertile grounds for new works to explore, and in what directions future works might lead us. Following this, we will examine the genealogy of the genre, tracing various disciplines' relationships with contemporary locative art practices.

2.1.1 Locative Media

The "locative media" or "locative art" label seems to follow any relatively recent work with a geographical focus. "Locative" is a neologism—site-specific works have existed for ages, and what "locative" is really referring to is the involvement of an underlying technological system that each piece uses to determine its (Cartesian) position in the world. That this position can be virtual, hybrid, or shared is one of the most productive uncertainties in the field. Inevitably, the word "locative" diffuses in meaning, finding application in many site-specific works whose reach does not ultimately extend beyond their physical presence. In his documentation for *Net_Dérive* (we will visit this piece later), Atau Tanaka writes:

> Locative media is the name for a field of artistic practice concerned with geography as artistic canvas. Artists such as Janet Cardiff create imaginary audio stories that accompany the listener walking through real places. The group Blast Theory turns the city into a game board inciting groups of users to unravel a mystery. My interest is to take interactive music practice off the stage and outside the concert hall into the urban sphere.
>
> By transposing musical action from stage to street, we displace the locus of creation and creativity, not just physically, but socially. Mobile communications devices are meant to connect groups of people. Musical concerts, similarly, are situations that bring people together for a common purpose. Can we elicit commonalities to make a community-based musical process, creating a shared experience among users?[1]

Tanaka takes this final question as a point of departure: where current or traditional music practices (the concert, the recording) exist inside a series of highly-defined cultural contexts, his work posits a world in which these contexts are more pervasive, responsive to the actions of its beholders. Music escapes from its container and finds you in the street.

Many works that identify as locative art seem to have slipped off the page of another genre: Blast Theory, as Tanaka notes, expands theater into nontraditional space; Cardiff's work augments a particular landscape with a narrative; Rueb's *Core Sample* is as much documentary as it is locative artwork. This augmentation, expansion, slippage, is more than an alternative mapping or geographic canvas. This is the predominant strategy of locative art: to create and inhabit spaces of overlap and intersection between the virtual and the real.

Virtual space is not new. Contemporary notions of the virtual tend to describe an ephemeral illusion, a vision of reality as simulated or surrogated by computational means. That the real is inevitably the subject of the virtual (via simulation, modeling, and so forth: this process is commonly referred to as *visualization*) is a result of our understanding of how the virtual is created; that is, through the use of computers and their advanced methods of analyzing real phenomena. This was not always the case.

We think of the virtual as a space born out of computation, a simulation with a certain resolution and fidelity to the "real." However, the invisible realms of spirits, ideas, and the divine have been represented by artists throughout history. These virtual spaces use other media, other fictions, to shape them, and they rely on these parallel means for representation. They exist only as subjective portraits, shadows projected onto real space.

In contrast, contemporary manifestations of the virtual are highly structured, knowable entities that happen to be impossible for humans to perceive on their own. These manifestations diverge from the established meanings of an imaginary space in that they are informed by quantitative features that do not differ from observer to observer. For example, while the world of a dream is impossible to fully communicate to another, we have developed highly-detailed methods to communicate equally invisible phenomena like social connectivity, electromagnetic propagation, and migratory patterns.

These shared virtual spaces may not be isomorphic with the physical world, but they remain just as "real" in that we use them as much as, or more than, the physical world to orient and inform us. Varnelis has termed this to be *Hertzian space.* This is named after the universal unit of frequency, and used here to refer to the wide swaths of the electromagnetic spectrum that are normally imperceptible to humans but which constitute the whole space in which wireless communication occurs. Varnelis concludes:

> Hertzian space is as real as the physical world. Physicists tell us that electromagnetic forces are far more powerful than gravity (a tiny magnet holds up a paperclip against the entire gravity of the Earth). Investors find telecommunications and the Internet to be immensely lucrative. What might an architecture that actively engaged Hertzian space look like?[2]

2.1.2 Immersive Art

Immersion in art is, in a way, the precursor of "multimedia," and "media art" practices, both of which involve the mixing of media at a fundamental level. The goal of immersion can be summarized as the synthesis of a complete experience from overlapping and complementing strategies of representation. This impulse speaks to the increasing ease with which different media can be combined, as well as to the proliferation of new mechanized means of representation from the middle of the nineteenth century onwards. These means, including film, recorded sound, and even electronic lighting and rapidly-deployed single-use architectures (such as the plaster city that embodied the Chicago Exhibition of

1898), naturally lend themselves to the creation of works that take the totality of one's experience to be the end result, rather than a single object or perspective.[3]

From Wagner's theory of the *Gesamtkunstwerk* in avant-garde theater to the Futurists' appropriation of ubiquitous urban noise as a form of art, immersive tropes in art have significantly influenced new media practices of the past two centuries.[4] In particular, we see in locative art practices the same expansive, holistic approaches to the totality of an artistic experience. To address the totality of experience in this manner is to allow multiple perspectives, to have the multiplicity of meaning that those perspectives entail, and to delimit a space for these meanings to meet.

2.1.3 Public Art

Obviously, locative media must involve some aspect of location in a physical sense. The majority of locative works are situated in an urban context, and many take this context as their primary focus or point of inquiry. In light of this, we should look into the problems, opportunities, and uncertainties surrounding the field of "public art," especially as they apply to urban contexts.

The experience of coming across public art—almost always a sculpture—is at once democratizing and alienating. The experience is democratizing in that the object is accompanied by few of the traditional economic and spatial constraints that accompany publicly-owned art. However, without some measure of "specialness" or emphasis, the art object can quickly become commonplace and lose its meaning, becoming simply another obstacle in the urbanite's path.

In one sense, we're perpetually "surprised" by an encounter with public art, since the art object inhabits multiple contexts: it is part of a park, a path, a landmark, a memorial, a surrogate for the city's aesthetics and branding, and so on. These multiple purposes (and, as Whyte asserts, nothing in an urban space is single-purpose) are capable of stripping the art object of its symbolic power; by introducing alternate, even subversive, interpretations of its space, we can repurpose its form altogether.[5] For example, artist Anthony Gormley's *One & Other* performs just such an operation on the statues in London's Trafalgar Square.[6] In this space, one of the world's most famous military monuments, Gormley's hundred-day performance consisted of a series of time slots during which anyone could stand on the plinth and do whatever he/she liked. For those hundred days, the space acknowledged and welcomed its capacity to transmit multiple and sometimes contradictory meanings.

Because public art is situated as an element of a shared space rather than sequestered in a rarefied environment, it is under significant pressure to address and appease a broad range of aesthetic tastes. The danger in making or commissioning such pieces, these "sculptures in search of a consensus," Lingwood notes, is that these works have an innate "precautionary desire to insulate the work in the world outside from the harsh chill of exposure and controversy, to circumscribe its potential meaning."[7]

Art in an urban context, then, is in perpetual danger of becoming commonplace and losing its meaning in search of this consensus. "Losing" is perhaps not the right word: its meaning dissolves, taking on a multiplicity of roles and relationships to the public. That these relationships are no longer strictly aesthetic is significant; consequently, the field of "multipurpose" public art, or public art that also serves a non-aesthetic function, is quite established. In fact, almost any functional element of the city that can be designed, decorated, ornamented, or otherwise imbued with an alternate significance, can fit into this

field. A successful public artwork is "able to absorb into its framework a multiplicity of different convictions… [it] does not aspire to consensus and does not achieve it."[8]

Where, then, are the ornamentations and alternate meanings for invisible spaces? The intersection of new media practices and public art has been a fertile ground for interventions in this manner. This survey of works examines the nature of this ornamentation, a move in Hertzian space. Engaging Hertzian space and entangling its features with those of the observable world provides artists with a way to address the unstable morphology of the city itself—the public artwork no longer needs to remain static or communicate any particular consensus. Rather, we can use this extra layer, this augmented and reconfigurable space, to reflect unique and personal relationships in ways previously unavailable to public artists. Debord's *psychogeographic contours* here blur with the real-but-invisible Hertzian topology of the urban environment, creating new spaces for intervention and dialog.

2.1.4 Sound Art

While music is one of the oldest forms of human expression, "sound art" owes its origins almost entirely to the advent of mechanical sound recording equipment. Although many early works in this genre do not make use of such equipment, the relationship between the mechanical and the "noisy" is described in Luigi Russolo's *Art of Noise*:

> Ancient life was all silence. In the nineteenth century, with the invention of the machine, Noise was born. Today, Noise triumphs and reigns supreme over the sensibility of men. For many centuries life went by in silence, or at most in muted tones. The strongest noises which interrupted this silence were not intense or prolonged or varied. If we overlook such exceptional movements as earthquakes, hurricanes, storms, avalanches and waterfalls, nature is silent.[9]

Sound art is connected to the leading edge of technology—in a sense, it pursues and portrays the sound of the future. However, the genre's most prevalent strategy is not inherently technocentric: it is the act of re-framing one's everyday experience in order to bring the background into focus. That this re-framing coincides with a larger movement towards Conceptualism is no coincidence—some of the works in the next section that most directly address the project of sound art are contemporaneous with the rise of Conceptualism in the 1960s.

Within the field of sound art, the works I discuss will focus more closely on exploring the presence and nature of sound in space. Max Neuhaus' *LISTEN* and Rolf Gehlhaar's *SOUND=SPACE* both aim to expand the participant's aural field by positing a new set of relationships between an environment and its sonic characteristics. However, neither piece provides the participant with any one clear next step or direction for future inquiry. Both are at a terminus of sorts, unavailable to a larger audience of composers and participants, each developing at the pace of a personal project rather than an aesthetic movement.

2.1.5 Conceptual Performance

It is impossible to speak of everyday art, or art-in-situ, without acknowledging a connection to the Conceptual movement in the late 1960s. In particular, the movement's interventionist tactics and its rejection of formalism both resonate strongly with the motives of locative art.[10] I will look at the

Conceptual aspects of several works (mainly Cardiff, Neuhaus, and Vawter) and focus on the influence of Debord and the Situationists and how that relationship has developed over time.

Syncwalk's approach to architectural space and authorial intent is heavily rooted in Debord's practice of the *dérive*, an abstracted set of instructions for traversing an urban environment with no particular agenda.[11] It is telling that almost all of the locative works described later in this chapter can be said to take the form of a guided dérive. I use the word "guided" to refer here to either a strategic limitation of choices (a predetermined route, a set of actions to be performed by the user) or an emphasis on one particular dimension (sound, electromagnetic fields, invisible infrastructures).

The guided dérive is an oxymoron—its intent is to transit a city in a manner determined by unanticipated impulses, so the idea of shaping or directing this action is contradictory. How to reconcile these competing messages? Several works in our survey will address this issue by re-imagining the space in which a dérive occurs as an invisible or normally-undetectable layer of reality. The guided dérive is a conceptual dérive, one not necessarily situated in physical space.

Oliver Grau summarizes conceptual influences on new media practices, laying out a frame of reference in which "the work of art is no longer a sort of encoded or enciphered message, viewed from the inside of production, to be deciphered by the observer using a repertoire of keys. Instead, it is an arrangement of possibilities; ...an ensemble forms of organization, where many are entrusted with the initiative of the interpreter."[12]

In the following survey of works, listed chronologically, I will briefly describe each piece and find its place in the continuum of works relevant to Syncwalk. Following this, I trace the development of several of my own works as they relate to the thesis platform. Finally, I will synthesize these surveys into a set of attributes that Syncwalk will embody.

2.2 Works by others

2.2.1 "LISTEN" by Max Neuhaus, 1966-1978
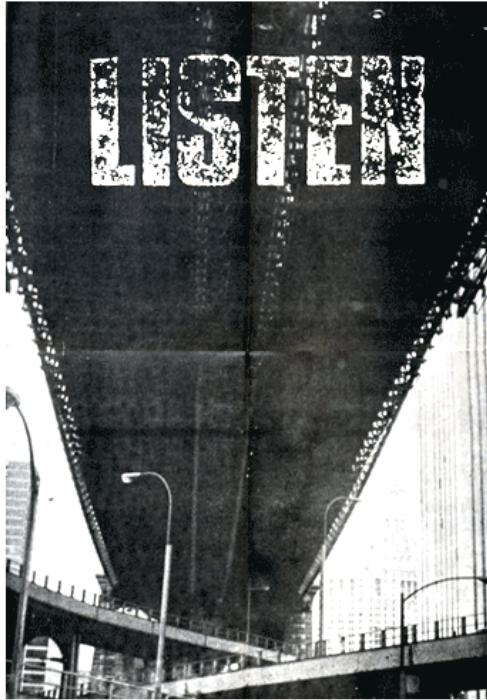
Photo © Max Neuhaus

One of the earliest and most minimal interventions in the field of urban sound walks, Neuhaus's performances (which he has alternately called "Lecture Demonstrations" or "demonstrations in situ") consist solely of a pied-piper style guided dérive conducted in silence.[13] Neuhaus leads the audience as they exit the building and begin wandering, making an ephemeral map of the city's sonic character. The intent, Neuhaus asserts, is "to use the word LISTEN to refocus people's aural perspective." This choice of words, with its inherent optical and poetic meanings, aptly fits the hyper-sensual nature of the walks.

After touring with this piece for years, Neuhaus eventually published a do-it-yourself guide to the practice. This guide was simply a postcard-sized decal with "LISTEN" printed in open letters; the instructions simply stated, "to be placed in locations selected by its recipients." Neuhaus' decision to allow the practice to perpetuate without his direct intervention is emblematic of a strategy we will see recur in these works: an expansion past the purview of one composer, one version of the work. The decision to make the work "open," especially when motivated by a desire to increase the work's potential for greater impact, set a precedent for participatory art projects in the coming years.

If you could lead others on a guided dérive, to anywhere you like, where would you take us?

> **This piece does not require special equipment.**
> **This piece can happen anywhere.**
> **This piece requires you to follow a pre-set route (determined by Neuhaus, later left to the participant).**

2.2.2 "SOUND = SPACE" by Rolf Gehlhaar, 1984-ongoing

SOUND = SPACE system diagram and installation
Photos © Rolf Gehlhaar

From Gehlhaar's introduction:

> *SOUND=SPACE* is an electronic musical instrument that is played—by one person or several at the same time—by moving around in an empty space. It consists of a system of ultrasonic sensors—an ultrasonic echo location system—that very accurately picks up the positions and movement of people within the space, linked to a computer and a synthesizer and/or sampler that produces sounds accordingly. The effect is like walking or moving some part of your body across imaginary keyboards which are spread around the floor of a room.

This work constitutes the opening volley in the nascent locative art dialog. In a model later colonized by numerous other artists (we will study one such artist, Jon Hassell, in a moment), Gehlhaar's work begets work: rather than presenting the participant with one experience, the piece is a framework for such experiences. The Conceptual approach to this platform-as-artwork allows for many more uses and meanings, as well as allowing for the platform itself to mutate and evolve. The artist explicitly casts the work as multi-purpose and makes it clear that the experience is within reach of all:

> There are many ways in which *SOUND=SPACE* may be used:
> I. as an interactive creative musical environment for music and movement workshops with musicians, children, the disabled;
> II. as a fixed or mobile installation in a museum context, an interactive acoustic / visual environment in which visitors to the museum may explore this exciting and unique high-tech creative experience;
> III. as a highly versatile interactive installation for the acoustic/musical animation of exhibits within a museum, either consciously controlled by the visitors (e.g. for information retrieval) or functioning in the background, acoustically (visually) illustrating the exhibit areas;
> IV. as a musical environment for dancers, creating in real time the music to which they are moving;
> V. as a virtual instrument for performers, controlling a variable host of electronic

musical instruments and ancillary equipment (e.g. light, real-time computer-generated images, QT video, etc);
VI. as a teaching resource for musicianship skills (ear training), composition, performance and computer music programming.

Reading descriptions of different *SOUND = SPACE* mappings was one of the first impulses that lead to the creation of *Audio Orienteering*, which we will cover later in this section. Gehlhaar's ongoing work is particularly relevant to this overview, as it combines the "classical" aesthetic foci of Conceptual and Sound Art practices while engaging the state-of-the-art in locative technologies and sensing methodologies: the space circumscribed by this hybrid practice will prove fertile ground for subsequent works to explore.

SOUND = SPACE created one of the first technologically-augmented platforms for mapping sounds into three-dimensional space. What sounds would you place in a platform like this, and where?

This piece requires special equipment.
This piece can happen anywhere.
This piece does not have a pre-set route to follow.

2.2.3 "Audio Walks" by Janet Cardiff and George Bures Miller, 1991-ongoing

Audio Walk in New York.
Photo © Andy Dayton

Janet Cardiff and George Bures Miller's *Audio Walks* series may be the most frequently-cited and thoroughly-discussed works that fall into the "locative art" category. Cardiff and Miller have deployed versions of this work across the world, at each juncture composing a different directed route and narrative voiceover.[14] Often, the narrative will describe the surroundings as they were "when I [Cardiff] was last here," and speculate what might become of the place in the future. By continuously highlighting the changing nature of the participant's surroundings, the works recall the "transformative nature of time" and position the participant in flux, unpinned from time and space, wandering through the "sonic fiction" of the piece.[15]

Many vital connections exist between this relatively old series of works and the state of the art in locative media. *Audio Walks* are one of the first artworks to ask its participants to take technology out into the world, introducing the metaphor of the artist's hardware used as a probe or compass to guide the participant through everyday space. We see further echoes of Cardiff and Bures in the continuing emphasis on the narratives contained by or interwoven with these everyday spaces. Examples that follow this model include *Core Sample*, *34N 118W*, and several works by Blast Theory.

Despite its continued relevance and vitality in the field, *Audio Walks* are relatively difficult to experience —several walks exist in permanent collections but due to their site-specificity, the work cannot travel. If you could make an *Audio Walk* for your neighborhood, where would you lead me? What stories would you tell?

> **This piece requires special equipment.**
> **This piece is tied to a specific location.**
> **This piece requires you to follow a pre-set route.**

2.2.4 "Solid State" by Jon Hassell, 1997-ongoing

Solid State in performance, 2006.
Photo © Jon Hassell

This installation activates the three-dimensional space of a room by carefully modulating the perceptual quality of the sound at each place.[16] An array of speakers faces inward, playing different pure tones that collide, cancel, and reinforce at different places in the room. I admire this piece for truly rewarding the user's urge to move around and explore the space by literally moving his or her head to as many different spots as possible. Users tilt, rotate, and incline their heads to get a full sense of the "directions" they can proceed from any one point to another. Hassell's moving tones also create a strong sense of development over time, beating differently as they shift pitch, revealing an unfolding metrical structure to the space.

This approach to the sound/space relationship is fascinating: the participant's experience takes the form of a multidimensional path through a physically empty/ordinary space. Transcription or recording of this experience is almost impossible without re-creating the work entirely.

> **This piece requires special equipment.**
> **This piece is tied to a specific location.**
> **This piece does not have a pre-set route to follow.**

2.2.5 "Electrical Walks" by Christina Kubisch, 2003-ongoing

Electrical Walks, Sendai, 2004
Photo © Christina Kubisch

In Kubisch's *Electrical Walks* series, participants don custom-built headphones and explore the environment around them. The headphones contain a simple sonification circuit that directly couples the headphone output to the electromagnetic fields. The resulting sounds are described by the artist:

> The sounds are much more musical than one could expect. There are complex layers of high and low frequencies, loops of rhythmic sequences, groups of tiny signals, long drones and many things which change constantly and are hard to describe. Some sounds are sound much alike all over the world. Others are specific for a city or country and cannot be found anywhere else.[17]

This is a fascinating form of engagement with Hertzian space—the participant's motions literally trace the invisible field lines in an act of direct authorship of the experience. Kubisch's work takes the form of a tool, a strategy for interrogating this ubiquitous property of the built environment. Rejecting the "conceptual performance" aspect of the series, Kubisch instead posits them simply as "a walk in a city with headphones."[18] The potential for casual play is highlighted by a lack of specific instructions for the user: you are free to delve as deeply as you like, re-figuring the city as a space for exploration and discovery rather than one of commercial and political exchange.

Electrical Walks are included in this survey in part because they represent an experience that lies beyond the current capabilities of the Syncwalk platform. However, the strategy of directing the participant to

explore an invisible dimension of the city resonates strongly with Syncwalk's core values. In particular, the notion of a group of people sharing a Syncwalk experience that has no human author becomes an interesting prospect: a new form of high-bandwidth communication, a deep dive into a real-time dataset.

Interested in the ways that the experience of *Electrical Walks* might be shared with more people, I asked the artist about the difference between the collaged "Electrical Walks" recordings she releases (available for purchase online) and the walks themselves (which relatively few people will experience). She replied that they were two entirely separate things, and that "the first is composition, the second is life experience."[19] The potential inherent in framing this "life experience" as an art experience is powerful: in one act of sensory transposition, we reveal another, previously-invisible form of the everyday environment.

Electrical Walks successfully enacts a hybrid space, simultaneously real and virtual, embodied and bodiless. The headphones are no longer being manufactured, and it is unlikely that the reader will be able to experience this piece for him/herself. What other invisible axes of the city would you make real?

> **This piece requires special equipment (custom headphones).**
> **This piece can happen anywhere.**
> **This piece does not have a pre-set route to follow.**

2.2.6 "34N 118W" by Jeff Knowlton et al., 2003

34N 118W in situ, Los Angeles
Photos © J. Knowlton

From the project description:

> Imagine walking through the city and triggering moments in time. Imagine wandering through a space inhabited with the sonic ghosts of another era. Like ether, the air around you pulses with spirits, voices, and sounds. Streets, buildings, and hidden fragments tell a story. The setting is the Freight Depot in downtown Los Angeles. At the turn of the century Railroads were synonymous with power, speed and modernization. Telegraphs and Railroads were our first cross-country infrastructures, preceding the Internet. From the history and myth of the Railroad to the present day, sounds and voices drift in and out as you walk.[20]

History-as-layer is one of the more popular tropes in Augmented Reality, in part due to the experience prototyping done by Knowlton et al. In this work we experience history spatially: we are drifters, explorers, and, simultaneously, browsers through the work of another. This work of another, an archive of each place's histories, forms the bulk of the content of our experience. As the link between the urban space and the invisible histories we explore, the technology itself becomes totemic, symbolic of the power to annotate and mediate this experience.

The natural consequence of carrying this totemic object is self-consciousness: it is almost impossible to imagine oneself walking around with the Tablet PC and feeling unobtrusive. Fortunately, Knowlton's narrative overlay provides a useful motif for the experience: the Tablet as an explorer's tool, a probe. However, the mere bulk of the equipment precludes a whole category of experiences integrated seamlessly into the everyday routine.

34 North 118 West is particularly interesting because it is one of the only works that comes with a downloadable software platform, the "Interpretive Engine," for creating "generative narratives." However, links to the software are dead as of Spring 2010. What if you could experience this piece now, without having to carry a Tablet PC?

> **This piece requires special equipment (tablet computer).**
> **This piece is tied to a specific location.**
> **This piece does not have a pre-set route to follow.**

2.2.7 "Soundwalks" by Stephan Crasneanscki, 2003-ongoing

Bronx Hip-Hop Soundwalk map
Image © Soundwalk.com

Soundwalk is an iPhone application that allows its users to hear site-specific sound mixes composed by celebrities or persons of note who are associated with the site. This was one of the first mobile applications to offer a museum-tour audio guide for entire neighborhoods and, later, whole cities.

Soundwalks are commissioned and curated by Crasneanscki and his associates, and the range of works they select is quite varied, from hip-hop in Jazzy Jay's Bronx to a 24-hour minimal composition in Paris by Philippe Starck. The application charges about US$6 per walk, although the application itself is free to download and includes two free walks.

On one hand, the Soundwalk approach deserves praise for its openness—some walks are available for free, and their system allows for multiple interpretations of the same site. However, in Soundwalk we see firsthand some of the limitations of a commercial approach to locative media experiences.

However, these applications appear to be made with the intention of "transposing" spaces rather than annotating and/or augmenting them. That is, the layer placed over the city is flat, affording no interactivity or plasticity within which the participant may play. Additionally, Global Positioning System (GPS) data does not seem to be used, and a route is imposed on the user. Instead, the model is of a museum tour that has been expanded to include the entire city.

Soundwalks are one of the more popular and pervasive locative media applications for the iPhone. What if anyone could make one? What if the route was up to you?

> **This piece requires common equipment. (iPhone)**
> **This piece is tied to a specific location.**
> **This piece requires you to follow a pre-set route.**

2.2.8 "Ambient Addition" by Noah Vawter, 2006
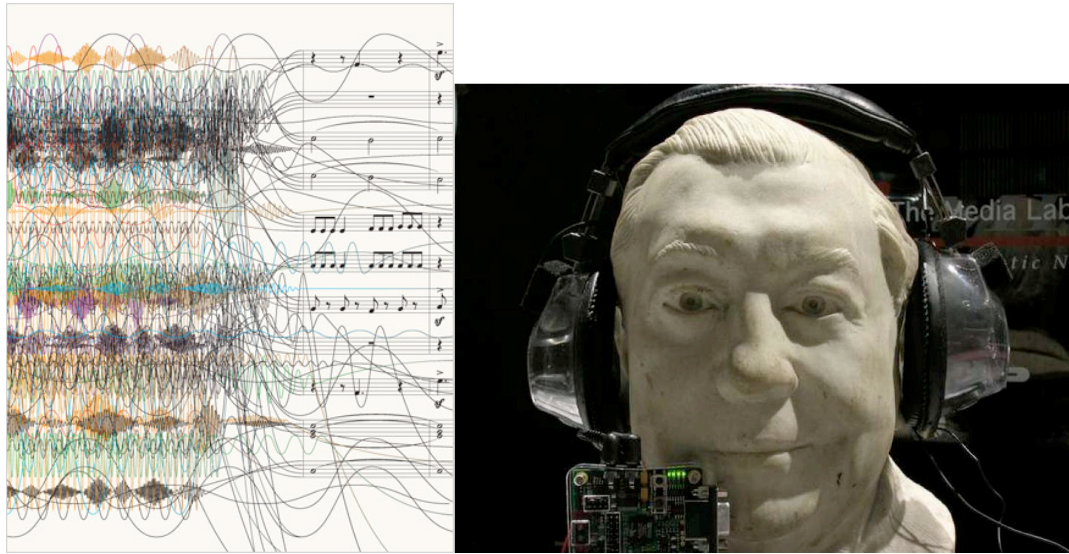
Conceptual diagram and bust with Ambient Addition hardware
Image © New York Times, Photo © Noah Vawter

Noah Vawter's *Ambient Addition* opposes Cardiff's model for the sound walk, sampling only sounds in the immediate area and using various Digital Signal Processing (DSP) techniques to harmonize and and apply rhythmic motifs to the incoming audio stream. Vawter's piece rewards the user exactly where Cardiff's system would fail—at the point where the participant decides to linger or deviate, a *dérive* into which one may slip and sample at will. Vawter notes that the tight feedback loop between the participant's surroundings and the system's output inspired an urge to "to play, hearing the results immediately for comparison, as opposed to singing along with a tape, in which hearing one's own voice is difficult."[21]

This feedback loop serves a number of purposes. By allowing us to compare the processed and unprocessed sounds almost simultaneously, we get a sense not only of the harmonic structures the piece is introducing, but also the extent to which the harmonies are an artifact: we are measuring our digital shadow. At the same time, the tight coupling between input and output allow us to loosen our structural, strategic engagement with what is happening and instead focus on a series of locally-connected impressions and impulses. This inversion, privileging a momentary and superficial engagement over a gestalt sensibility, serves as a refreshing and empowering approach to immersive/ locative artworks.

Ambient Addition represents one of the most technically sophisticated and engaging locative artworks of the last five years—its compelling concept and elegant execution place it at the top of my short list of artworks I have had the opportunity to experience firsthand. What if everyone could try it?

> **This piece requires special equipment.**
> **This piece can happen anywhere.**
> **This piece does not have a pre-set route to follow.**

2.2.9 "Core Sample" by Terri Rueb, 2007

TERI RUEB
Core Sample
Spectacle Island and the ICA

Spectacle has been home to casinos and hotels, a horse rendering plant, city dumping, and to families who lived and worked on the island. Now active parkland, Spectacle's two prominent man-made drumlins were shaped with excavated material from Boston's "Big Dig" and planted with 28,000 trees, shrubs, and grasses.

Teri Rueb's *Core Sample* is an interactive sound walk inspired by Spectacle's complex history and recent reclamation. Borrow headphones from the island's Visitor Center and then roam the island to experience a landscape of sounds activated by GPS (please see map). Discover unique combinations of natural and processed sounds – including voices of the island's former residents – that correspond to Spectacle's many subterranean layers, as well as its present soundscape.

Core Sample includes an interactive sound sculpture in the ICA's Founders Gallery—opening onto a panoramic view of Boston Harbor— that offers another way to experience this audio piece.
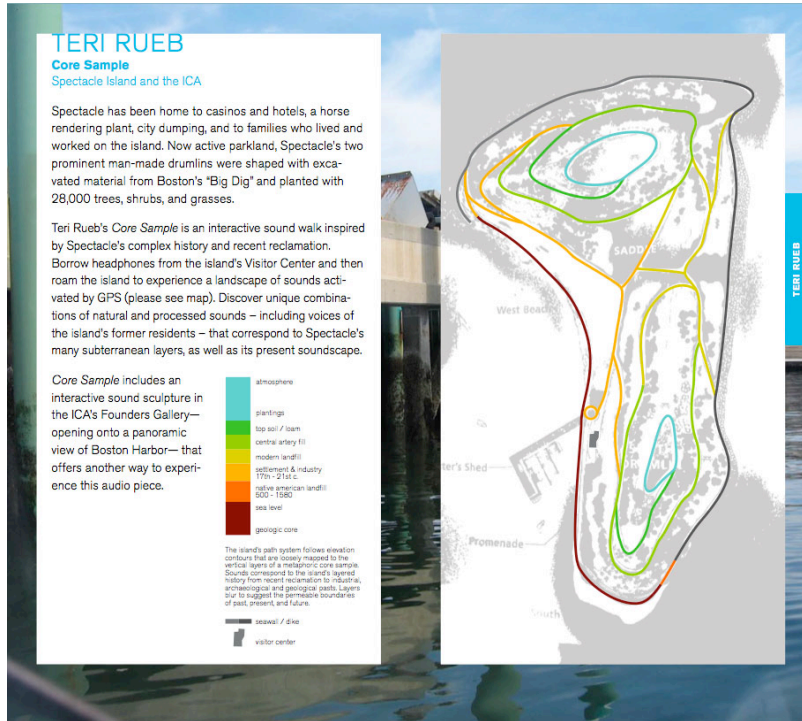
Image © Teri Rueb

Rueb's *Core Sample* takes place at the Institute of Contemporary Art in Boston and, simultaneously, on Spectacle Island in Boston Harbor. On the island, participants receive custom GPS-enabled audio devices that play different audio samples corresponding to the participant's position on the island. Rueb envisions the piece as an "interactive sound walk and corresponding sound sculpture that evokes the material and cultural histories contained in and suggested by the landscape of Spectacle Island."[22]

Turbulence.org critic Jo-Anne Green reads the work as a hybrid form, conjuring the histories of performance art, land art, and historical narrative in her description before finally deploying the term "locative media."[23] In this context, we can see her struggle to highlight the work as existing outside of any established practice—in a sense, she is using the "locative media" label to describe a she uses the latter term to describe Rueb's approach to realizing the piece, rather than as a body of work to which Rueb is adding.

Core Sample applies the latest technology to Cardiff's prototype for sound walks, freeing the participant from a set route and allowing the mapped sounds to relax their narrow, narrative focus. At the same time, Rueb's approach requires as much, if not more, willingness on the part of the participant to travel out to a remote location and experience it. What would you make if you had her tools? Where would you make it?

> **This piece requires special equipment.**
> **This piece is tied to a specific location.**
> **This piece does not have a pre-set route to follow.**

2.2.10 "Rider Spoke" by Blast Theory, 2007

Left Photo - author's experience in Linz, 2009.   Right Photo © Blast Theory

Rider Spoke is a collaborative game for cyclists in an urban area. From the group's website:

> The audience can take part either either on their own bike or borrow one supplied by Blast Theory. Following a short introduction and a safety briefing you head out into the streets with a handheld computer mounted on the handlebars. You are given a question and invited to look for an appropriate hiding place where you will record your answer. The screen of the device acts primarily as a positioning system, showing where you are and whether there are any hiding places nearby. The interface employs imagery drawn from Mexican votive painting, sailor tattoos and heraldry: swallows flutter across the screen to show available hiding places, prefab houses indicate places where others have hidden.
>
> Once you find a hiding place (a spot previously undiscovered by any other player) the device flashes an alert and the question. The question is one of a selection authored by Blast Theory that asks you – alone, in an out of the way spot – to reflect on your life. You then record your answer onto the device. Each hiding place combines two properties: the physical location and the electronic location as reported by the device and, for this reason, position itself is slippery and changeable. This is especially true as the University of Nottingham has designed and built a system that uses WiFi access points to determine the position of each rider.
>
> The other aspect of the game is to find the hiding places of others. When you find one, the device alerts you to stop and then shows you the question that that person answered and plays you their answer. The recordings that people make are only available in this context: played to a player, alone, in the place where they were recorded.
>
> As you roll through the streets your focus is outward, looking for good places to hide, speculating about the hiding places of others, becoming completely immersed into this overlaid world as the voices of strangers draw you into a new and unknown place.
>
> The streets may be familiar but you've given yourself up to the pleasure of being lost.[24]

I had the opportunity to try this out at Ars Electronica 2009, and the experience was a surprising disappointment. While the conceptual basis of the work is intriguing, the actual implementation was a tedious combination of difficult-to-use equipment, dangerous and disorienting instructions, and trite storytelling.

The interactions I had with the software on the Nokia recalled some of the first multimedia web experiences: long load times, looped audio instructions, and a very palpable "flatness" to the set of options. I was one of the last people to use the system before the exhibit closed, so all the hiding places near the Blast Theory site were used up. However, I enjoyed the realization that I was riding through other users' traces, and that as a group we were truly exploring a form of Hertzian space, pushing at the edges of the known map.

The interaction with the recorded voices was tedious, but the questions were very interesting. The first one was, "Tell me the last time you told a lie." After recording my answer, I was allowed access to other users' hiding places—the more answers I left, the more other answers would be made available to me. The other answers I heard were quite intimate and fascinating, and encouraged me to be similarly open in my answers; this was a good feeling of anonymous reciprocity.

This part of the experience was very interesting, although there seemed to be artificially few responses left by other users. I later asked the staff and found that not all answers are made available, only those selected each day by Blast Theory. This hidden edit rankled with me, as I had "bought into" the game based on an understanding of reciprocity that I later discovered to be illusive.

Altogether, *Rider Spoke* proved to be an interesting and engaging work that failed to live up to its promise. What if anyone with a bike and a phone could play this game, anytime and anyplace?

> **This piece requires common equipment. (Nokia N900 and bike)**
> **This piece is tied to a specific location.**
> **This piece does not have a pre-set route to follow.**

2.2.11 "Net_Dérive" by Atau Tanaka, 2006
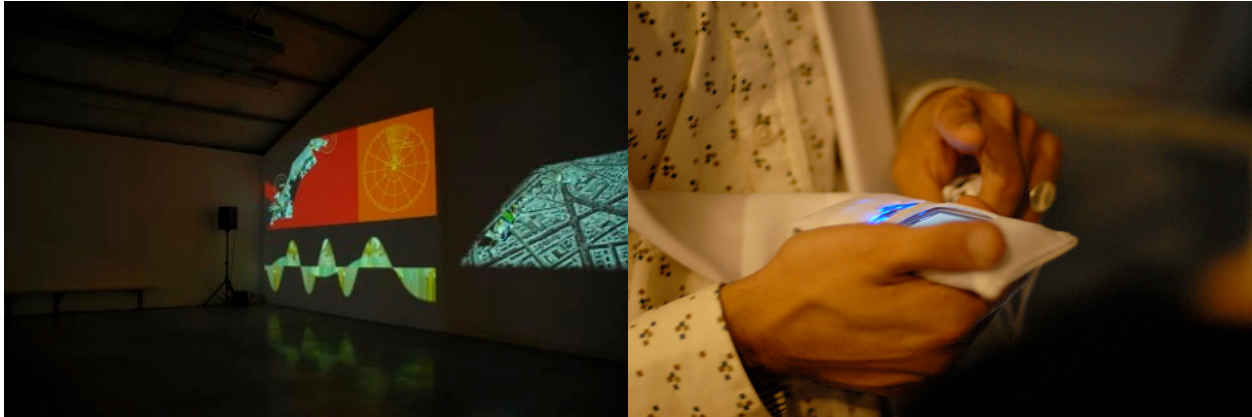
Net_Dérive gallery installation and wearable interface
Photos © Walter Kim

In this work, two groups of participants collaborate in a process of searching, uncovering, and exploring the urban environment. Some participants, equipped with wearable mobile interfaces, roam the city, "induced to drift by vocal directions embedded in the sound tracks streamed to mobile phones."[25] Another faction remains in the gallery space, surveying the actions of their counterparts.

Tanaka's take on the role of narrative in the drifters' experience complicates traditional storytelling relationships: drifters receive constant updates and directions, orders emanating from a game whose objectives and rules may change at will. The result is that the drifters must actively construct a narrative framework for their role, rather than merely enacting a pre-determined story. This collaborative construction of narrative seeks to fully involve the piece's physical situation into the emergent story. As drifters progress through the neighborhood, they uncover the traces, or "grooves," of previous travelers. These grooves accumulate and result in the visual displays seen inside the gallery space. Tanaka's conception of the underlying software framework as a "locative media instrument"[26]. Tanaka's work "connects the gallery space to the urban space of its neighborhood."

If you had eight million potential collaborators, what shape would your *Net_Dérive* take?[27]

> **This piece requires special equipment (wearables with two phones and one GPS module).**
> **This piece is tied to a specific location.**
> **This piece does not have a pre-set route to follow.**

2.3 Works by AKA

In this section I will outline four prior works of mine (I use the pseudonym *AKA* in my work) that directly contributed to the concepts behind Syncwalk. In each case, I will look at the aesthetic intentions of the piece, reflect on its success or failure, and connect it to the larger trajectory leading up to this thesis.

2.3.1 Early Syncwalks (private performance practice), 2004-ongoing
2.3.1.1 Summary

The name of my platform, "Syncwalk," comes from a performance practice I began in 2004, and which I have practiced intermittently since then. The original Syncwalk was what I was calling a "private" performance—I would arrange to meet a friend at a certain place and time, with a pre-composed playlist of songs already loaded on to two listening devices. We'd start them at exactly the same time and begin walking. The rules for a Syncwalk are outlined below, as excerpted from an artist's statement at the time:

> *Syncwalks* are a conceptual exercise for you, a friend, and a place. Here are the instructions:
>
> - Find a collection of beautiful/interesting/secret spaces within walking distance of each other.
> - Find the music you would most like to hear in these places. It is okay to make your own music.
> - Decide on a route and a playlist through these spaces and sounds.
> - Burn all these songs into one long mp3 file, and put the file on two mp3 players.
> - Go with your friend to the starting point, don good headphones, and press "play" together.
> - Lead your friend through your walk. Your friend will hear everything you're hearing.
> - This is a secret you share. Move through the space in knowledge of this secret.

2.3.1.2 Contextual Background

The work's rigid set of instructions attempted to isolate the essential variables that comprise a Syncwalk. Initially, there was a risk that the practice would become too casual: walking with friends and listening to music are quite mundane, everyday tasks, and I wanted to be sure that participants were in the right frame of mind. By explicitly engineering the situation and marking it as an aesthetic experience, I was able to highlight what I felt was important, in much the same manner as Neuhaus' *LISTEN*. Because the participant(s) were being guided by me, they were relieved of the need to think about what music would be next, or where we were going. Instead, they were free to explore their experience and derive their own meanings and stories.

Part of the reason this work began in 2004 is due to the proliferation of personal music devices such as the iPod or Creative Nomad, as well as the low cost of USB flash drives for transferring large numbers of

songs. Another factor that coincided with the practice was my move to New York, an enormous new space that I was excited to begin exploring.

At the time, I was not aware of locative media as a corpus in and of itself. My interests were focused on relationships between sonic structures and urban/architectural morphologies. To this end, most of my Syncwalks from this early period deployed abstract electronic music at sites of intersection or confluence throughout the city. The goal was simultaneously to find music suited to a particular trajectory throughout the city, and the opposite, to use an advancing playlist to guide my movements through the built environment.

After a few trial walks, I noticed that the practice was seeping into my everyday life: I began thinking of the music I was composing as happening in space as well as time. When I walked to work, I would change my route and think about how that change would influence the music I would like to hear along the way. I began to integrate compositional elements I had previously not considered, like making sure a Syncwalk happened at the right time of day, or incorporating local sonic interruptions (ongoing construction sites, places where traffic jams were likely) into the planned course.

2.3.1.3 What I learned

Even in their labor-intensive, highly-customized form, the first Syncwalks were very rewarding. Often, these walks would occur with friends I was currently collaborating with on other performances or time-based works. I found this to be a particularly high-bandwidth and useful way to communicate complex ideas about movement, patience, listening, and improvisation. Not coincidentally, these elements are all essential parts of what I believe comprises a successful performance. In my Syncwalks, I found that the sense of connection and understanding between the two participants is highlighted by their "secret" alternate soundtrack to the space. Even a gesture as simple as walking in sync with the song's beat becomes a powerful symbol of inclusion when not everyone in the space can hear the music.

Another powerful aspect of the walks was the placement of songs and transitions—Syncwalks were a good way to introduce visitors to my favorite elements of, places in, and paths through the city. Using the conceit of the walk-as-performance, I found I had more expressive freedom to highlight these characteristics in nonverbal ways: a wink, a pirouette, a strut. The space we walk through becomes inseparable from the music, enmeshed in our private performance.

I decided that this special experience of transiting through another "layer" of space (a notion I would later learn was the same as Debord's *psychogeographic contour*) should be shared with more people—my compositions, tastes, and travels imposed an unnecessary limit on the work's scope.[28] Said differently, I saw the ephemeral details of my particular situation as an interesting set of compositional tools and motives in this process, and thought that others should have the chance to author a similarly intimate experience. However, it would be several years before I was in a position to move this concept forward.

The notion of composing music experiences in space as well as time became one of the driving forces behind the further development of this work. This novel form of musical enjoyment, tied not to a particular place but instead to a circuit through a space, was also particularly amenable to sharing: taking someone on a Syncwalk for the first time is a revelation, like showing them a new color, or revealing a hidden room in their own house.

The Syncwalk that comprises my thesis work is a direct descendant of this early practice—the mobile platform expands the notion of an aimless-yet-guided walk and significantly lowers the barrier to participation by putting the composition tool online, and using commodity hardware to perform playback.

One element missing in the current version of Syncwalk is my presence: the ability to wink, change course, or highlight a passing detail. I miss this ability in the current version, and look forward to finding ways to reintroduce this feature; potential forms this might take are addressed in the "Open Paths" section.

2.3.2 Audio Orienteering (3D audio environment), 2008-2009
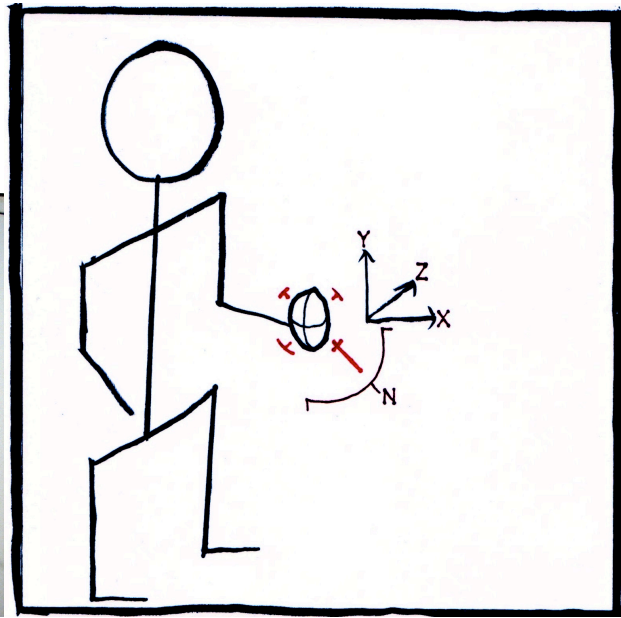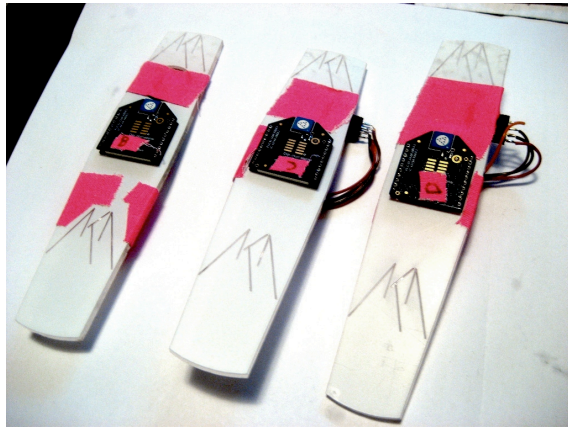
Audio Orienteering hardware and conceptual drawing
Author's photo, 2008.

2.3.2.1 Summary

This is a collaborative performance environment in which physical tokens are used to navigate an invisible sonic landscape. The token functions as a probe: when the probe is inside an element of the sonic landscape, that element is made audible. When inside an element, the yaw, pitch, and roll of the probe can be modulated to change the characteristics of the element's sound.

2.3.2.2 Contextual background

This was my first in-depth attempt to make a piece that allowed a participant to interact with invisible spatial structures in a consistent and repeatable way. The piece is in part a reaction to my having recently discovered Debord and the theories of psychogeography. In parallel, I was investigating other spatial, sculptural, and dynamic examples in sound art and immersive technologies—these investigations suggested that an environment in the style of *Audio Orienteering* was both novel and technologically realizable.

My work leading up to this was focused on the relation of body-in-space to an audio source—this application uses a group in close quarters (probably in an area roughly equivalent to that of a squash court) and focuses on the use of an object not only to alter the sound directly (by changing the object's location in the room) but also to influence the sound based on similarities or differences in orientation relative to others in the group.

In this way, each probe functions not only as a token whose position in the room maps isomorphically onto another, invisible space, but also as a point of inflection around which these real and imaginary spaces may pivot.

Here the metaphor of an audio terrain becomes useful— whereas a song is a one-dimensional progression from beginning to end, *Audio Orienteering* presents a multidimensional map of sonic possibilities upon which its users are free to improvise and explore.

While not an instrument in and of itself, the work facilitates a new mode of interaction between a participant and the space's music, complicating the relationship between composition and remix—each user's trajectory through the space endlessly reconfigures a complete-but-asynchronous original composition.[29]

2.3.2.3 What I learned

The interface proved to be a reliably engaging method of exploring consistent-yet-invisible relationships between space and sound. Most users had a two- to three-minute period of initial confusion while they moved the probe, unsure of the resolution at which their movements were being sampled as well as of the invisible layout of the sonic terrain.

Generally, once the user was acclimated to the resolution of movement (the system sampled position 30 times per second, and was accurate to about a centimeter), the act of probing the space for sonic features became enjoyable: players would hold the probe perfectly still to understand the nature of the sound at that point, and then move the probe one dimension at a time to determine the mapping at that point. After a few minutes of this, many users tried simple gestures in space and small trajectories—one tester admitted she was simply pretending the probe was a miniature spaceship, and she maneuvered it around as such.

It was satisfying to see such a quick progression from exploration to play—many of my past experiments had demanded significantly more acclimation time before true play could occur. Repeatability proved to be extremely important to the familiarization process. Because the features to be manipulated were invisible but attached to real locations in space, it was important to ensure that the system was accurate enough to reliably reproduce the same results given identical inputs. This realization proved extremely useful when designing features for Syncwalk: the question of whether or not sonic regions should be able to move or change shape was heavily influenced by *Audio Orienteering*'s example.

Group play using *Audio Orienteering* was particularly rewarding, as several prototype sonic terrains were designed specifically as multi-player improvisation environments. Several testers remarked how important it was to watch a colleague move carefully and mindfully to create a particular sound, and how this visible engagement facilitated a more intimate improvisation. Further work with Syncwalk will pursue this line of inquiry and investigate ways to engender similarly intimate connections across a greater distance.

2.3.3 Four Loops (transposed walk), 2009
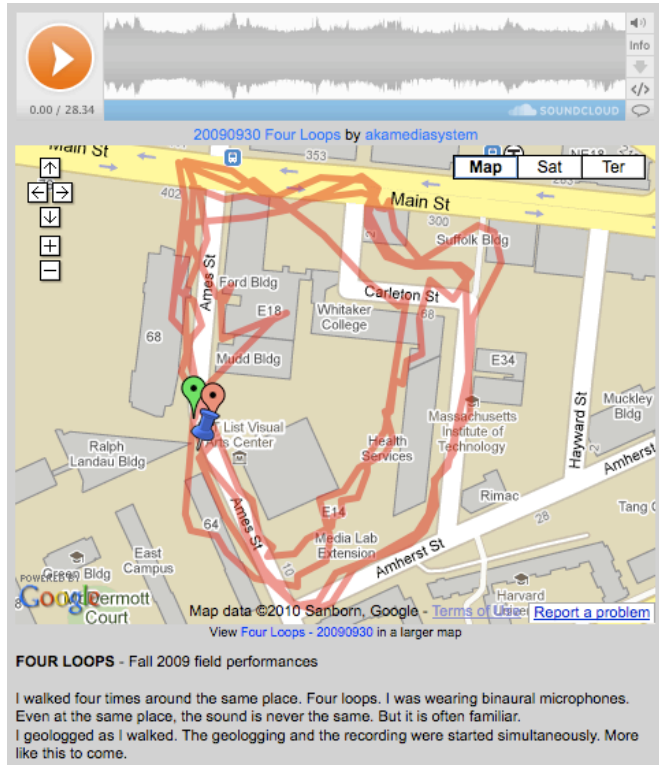
Four Loops documentation, from the author's website, 2009.

2.3.3.1 Summary

For this piece, I recorded the sounds of a walk I took. I walked around the same block four times in a row and recorded the sounds using a pair of binaural microphones. The walk is presented to the observer as a webpage: in one frame, the GPS path is visible in Google Maps, and in a second frame the user can play the uncut recording while browsing the map.

2.3.3.2 Contextual background

The purpose of the experiment was to explore relationships between spatial and musical forms. I chose the loop because it is one of the simplest interventions available to contemporary composers, as well as one of the fundamental building blocks of electronic music. Similarly, the loop's circularity is appropriately anonymous: it renders the spatial notions of origin and destination irrelevant and draws attention to the recurrence of elements rather than the elements themselves.

Four Loops also plays on the phenomenological tension between sound and space—the friction between an ephemeral, time-based impulse and the physical space it circumscribes. By looping in space rather than time, I wanted to capture and map the sonic residues of architecture, the persistent but non-visual architectures of a space.

2.3.3.3 What I learned

I frequently return to this recording, as it produced some surprising results that helped guide my thinking about subsequent works.

One of the first sounds audible in the recording is the unique interference pattern caused by the GPS radio on my mobile phone, a factor that I had not considered when planning the piece. (That this interference pattern is strikingly similar to the predominant rhythm of "New Jack Swing," a short-lived genre coinciding with the onset of cellphone ubiquity, is a discussion best left to other venues.) I am pleased that the interference is present, though, and not simply for the line it draws to Kubisch's works (although combining the practices, and making a series of abstract geometrical paths through the city, mapped by sonified EMF, is intriguing).

The erratic path of the loop itself is a result of varying qualities of GPS lock—this was a good reminder of the limitations of the Global Positioning System and reinforced the need for a design approach to Syncwalk that could accept inaccuracies and interruptions without failure.

The recording as a whole is highly spatialized: after listening to it several times, I was able to tell roughly where in the loop I was by listening to the changes in sonic properties along the way. Some spaces had a quite distinct reverb, while other parts of the path seemed almost to be bandpass-filtered. I realized that I was listening to the sound of architecture, and wondered what other spaces and other routes might reveal.

2.3.4 Rumble (ambient urban notification platform), 2009
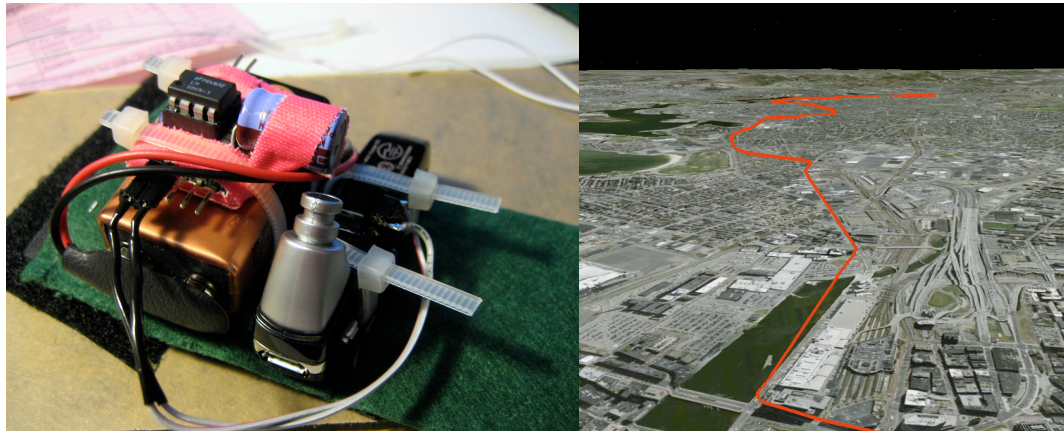
Rumble prototype hardware, left, and sample infrastructure map, right.
Author's images, 2009

2.3.4.1 Summary

Rumble is an ambient notification platform for learning urban infrastructures. A background location-updating service resides on a mobile phone and activates a wearable peripheral when the user is near a point of interest. The peripheral I prototyped was a bone-conduction wristband that vibrated when actuated—pressing the wristband against your head caused the vibrations to coalesce into an intelligible audio message about the point of interest, audible only to the wearer.

Part learning game, part urban tool, *Rumble*'s aim is to expand the concept of what it is to be one of the locals. *Rumble* was my final project for Prof. Hiroshi Ishii's "Tangible Bits" course at the MIT Media Lab.

2.3.4.2 Contextual background

Rumble facilitates the creation of a new type of "mental map" focused on invisible resources in a city, such as subway lines and free wireless access points.[30] I was inspired by Beck's redesign of the London Underground's track map, famous for its emphasis on the topology of its nodes and edges rather than its stations' geospatial relationships.[31] Because Beck's design is optimized for "pull" interactions where a user queries the map to answer a question, I wanted to invert this idea and experiment with a mapping that gradually exposed spatially-situated but invisible phenomena to the everyday user.

Rumble aims not to answer a one-time request for information, but rather to reveal sites of opportunity over time. By pushing notifications into the background, Rumble avoids loading the user with too many inputs.[32] The gentle vibration of the wristband is easy to ignore, and the user can choose to engage more deeply by holding it to her head to hear more information. Over time, the user internalizes the aggregated impulses in the same manner as their visual counterparts—gradually he or she grasps the structure uniting the two.

The name "Rumble" comes from the ambient cue I often receive that lets me know there is a subway line nearby—the ground literally rumbles as the subway passes by underneath.

2.3.4.3 What I learned
2.3.4.3.1 The software needs to vanish

The software architecture for *Rumble* is very similar to that of Syncwalk—in fact, because I intend to continue exploring issues in ambient mapping, I made sure that the Syncwalk platform can accommodate a *Rumble*-like peripheral notification behavior. This was my first encounter with the Android operating system (OS), and my initial application suffered from performance issues common to mobile platforms: the constant GPS polling drained the battery, and threading the application to run reliably in the background proved a significant challenge. Early awareness of these pitfalls helped tremendously when designing the Syncwalk application.

### *2.3.4.3.2 Special hardware must be special*

In everyday use, shortcomings evident in the physical affordances of the wristband also became apparent. It wasn't easy to wear every day, and the prototype I had constructed limited my ability to use other features of my phone (most significantly and much to the amusement of my colleagues, telephone calls also had to be conducted using the wristband).

Further works with *Rumble* will explore improvements to the hardware: more comfortable and invisible wearables, dedicated Bluetooth circuitry, and improved battery performance.

2.4 Summary / a Clarion Call

The works I have discussed each carry a certain forward momentum: as Cardiff's works establish a vocabulary for subsequent locative media experience, Rueb captures this energy and channels it into a more technologically advanced form; as Hassell blurs the boundaries between what it is to hear and what it is to move, Tanaka builds on this entanglement, exploding Hassell's tuned space into the Hertzian architectures of the urban domain with his "city-as-instrument" strategy.

Locative art has at its core a powerful subjectivity, an inherent polysemic formlessness: this is the beauty of a work that is entirely a "sum of possibilities,"[33] escaped from the gallery and instead imbricated with the rhythms of the everyday. But with this subjectivity comes the limits of the individual: we can only explore a composed set of these possibilities if they are made available to us. In the following diagram, I have defined a space in which I have situated existing work based on two criteria: the amount of space the work can occupy, and the amount of agency a participant has when experiencing it.
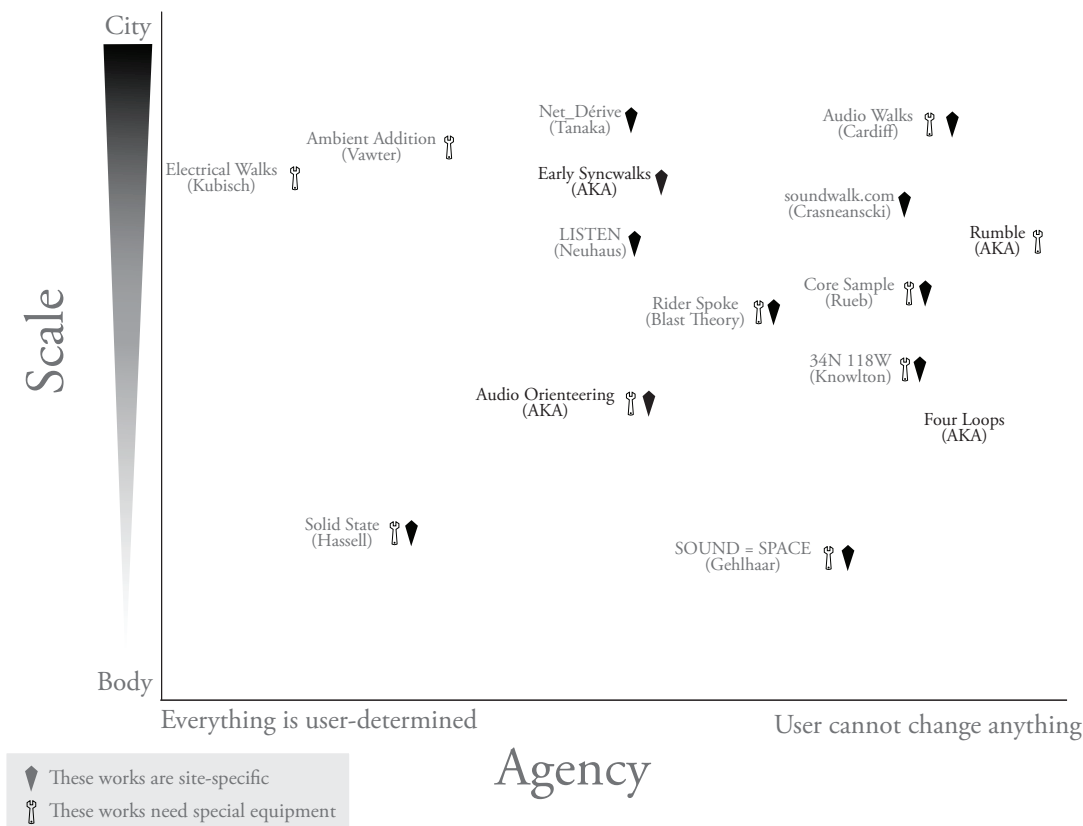
It is extremely important to note that all the works listed above are unavailable to you, the reader, right now. Each piece is now off-limits, because the hardware is rare or custom-built, or because the piece is site-specific, and so forth. Ideally, my platform will encompass the entire space outlined above: each past work would be repeatable in its entirety using Syncwalk.

It is another critical endeavor entirely to delve into the problematic realm of performance documentation, or to explore the possibility of ever fully capturing the experience of one beholding what Eco would term an *open work,* tending to encourage "acts of conscious freedom."[34] As is, we suffice

to recognize the problems inherent in communicating experiences of this type in indirect ways. So, how to bring these experiences to the world as a whole?

In his analysis of an early experiment in linking Hertzian and real spaces, Varnelis concludes that "more than ever, we need to radically reconsider the already-existing" and proposes a "telematic dérive, with each portal becoming what the Situationists called a *plaque tournante*, a center, a place of exchange, a site where ambiance dominates and the power of planners to control our lives can be disrupted."[35] Similarly, in the face of a new breed of open works, the phenomenon of "pervasive gaming," theorist Nicholas Nova addresses the problem by examining the extremes:

> The first one is a bit too utopian: it's thinking that technologies are seamless, hardware and software robust and that no problem occur. In that case, one can envision über-cool location-based networked games running on cell phones everywhere everytime. Although this seems unlikely, one can at least think about this possibility.

> At the end of the spectrum, I mention the worse-case scenario: the "laser-game" model in which the game can only be played in a specific time and place. This is what happened in planned games or exhibits (see for example what Blast Theory did with *Can You See Me Now?*): in this case the game was played in various cities, controlled by the game designers. One can also think about fixed places, as with laser-games, in which horde of players would come and play.

> A mid-point on this spectrum would be to have an approach to combine the two. And I quite like the skateboard metaphor for that matter. You can do skateboard freely in lots of places (streets, parking, etc.) and also go to skateparks. In the former, the infrastructure of the everyday environment constrain the skateboarding tricks whereas in the latter the skatepark design is meant to allow certain tricks. What is interesting as well is that in street skating, there is a pleasure associated in finding nice and relevant spots, whereas in skateparks, things are more under controlled.

> So, to get back to the topic at hand here, what would be the equivalent if the skateboard practice with regards to pervasive gaming? I think it may correspond to designing for both targets in minds: both the daily and everyday environment (with its constraints, problems, issues) and for the "laser-park" equivalent in which the control of certain parameters would allow to go beyond the daily environment. And what would be a good candidate (as a device) for that? What corresponds to the skateboard?[36]

Designing for both targets is precisely the approach to adopt, even if it means creating an interface not perfectly suited to either task. My intent with Syncwalk is to absorb the strategies outlined by the past works I've described and build a platform that removes many of the barriers preventing the rapid design and iteration of locative audio experiences. Syncwalk pursues a series of design objectives and standards of interaction, listed below, whose aim is to increase the rate at which new works emerge.

The ideal platform:

- Integrates into a lifestyle with as few constraints and burdens as possible—creation must be simple enough to have almost no learning curve, but complex enough to provide surprising results.

- Requires no unreasonable equipment—if you are on the mobile web, you can participate.

- Has no required time or place—the time is anytime, the place is anywhere.

- Rewards reflection and continued play—users form a new vocabulary to describe their experiences.

3. The Platform

We have arrived at the meat of this discussion. In this section I will dissect version one of the Syncwalk platform, laying bare its mechanics and the logic informing their design. To acclimate you to the terminology and conceits specific to Syncwalk, I will first provide a high-level description of how the platform is to be used.

3.1 How A Syncwalk Gets Made

A participant goes online to syncwalk.com and creates an account. Once she has identified herself to the site, she uploads a file containing the metadata for all the songs on her mobile device (the process for doing this is outlined on the site). Once uploaded, the participant is presented with a map and a list view of her music collection. She clicks on a song in order to add it to the map; once she clicks, a small icon (the *marker*) appears in the center of her map. The icon is surrounded by a square region—within this region is where on the map the song will be audible. The icon is

Marker

draggable, so once it is on the map she is free to drag it to another location or grab the edges of the polygonal region and re-shape them. She repeats this process for as many songs as she likes.
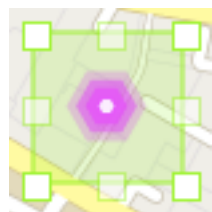
Marker with Region

If she so wishes, the user may place more than one song at a particular location. To do this, she drags one marker on top of another, and the site combines the two markers into one playlist. To indicate that the marker contains more than one song, a different icon is displayed. For clarity, I call this type of feature a *stack* (as in, a stack of songs on one spot) rather than a

Stack

marker.

At any point, the user can click on a marker or stack and see a dialog box displaying the title of each song, its artist, and its duration. A small "x" button allows markers, stacks, or individual songs within a stack to be removed from the map.

When she is satisfied with her map, she clicks the "Export" button and is prompted to give her Syncwalk a name. Following this, the Syncwalk is saved to the site's database and made available to her in condensed form (Keyhole Markup Language, the standard format for displaying geospatial data); she can now access the Syncwalk directly, by downloading it to her computer, or via her mobile device. If she does not already have the Syncwalk application on her device, a download link for that is also supplied at this time.
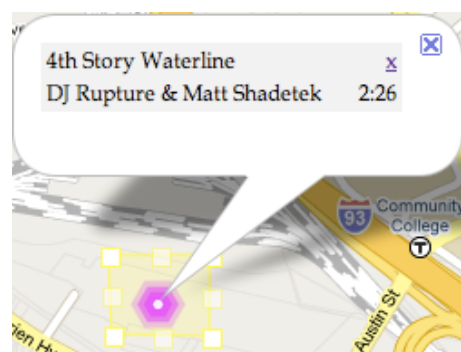
Marker, Region, and Information Window

An indeterminate amount of time now passes, and the user is preparing to experience the Syncwalk. She starts the application on her mobile device and selects from a list of Syncwalks she has composed. Once she has made her selection, the application immediately begins polling the GPS system for its location every five seconds. If she is inside a region she defined on her Syncwalk, the application plays the associated song; if she is standing within multiple overlapping

regions, she hears multiple audio streams at once. As she moves through her map, she travels through the regions of sound and silence that she has composed.

3.2 Scenarios and Use Cases

To focus our design process, we propose three use cases that together encompass the current and future potential applications of the Syncwalk platform. These scenarios cannot possibly anticipate all future uses of the platform, but will serve as a useful reference when thinking about how the platform should interact with its composers and users.

3.2.1 Compose for others

The goal in this scenario is to have others experience your Syncwalk. The motivations behind this might be as simple as sharing a new kind of mixtape with your friends, or as complete as an art/performance work. *Core Sample* is a good example of this approach, with its intricately determined boundaries and carefully researched audio content. To this end, the creation of the Syncwalk is expected to be detailed and complex, and the watershed area described by all songs could be quite large.

3.2.2 Compose for yourself

As a lifestyle element, Syncwalk's role is more tactical than strategic: the goal in this scenario is to use Syncwalk casually to augment your everyday environment with contextually-significant sounds. At the extreme of this approach lies the relatively open field of aural augmented reality. This field imagines a more seamless integration of Hertzian and physical spaces, an experience of effortless connection and interaction with the ubiquitous web. Here Syncwalk can function as a casual experiment, a replacement for other music-playing devices or applications, allowing each user to explore the unknown potentials of and connections between her music preferences and the built environment.

3.2.3 Compose collaboratively

This more abstract scenario envisions the city as a communal aggregator of individual paths and residues, a container into which individual Syncwalks and walkers may dive deep, or merely skip along the surface. One form that a collaborative composition might take is a series of simple pivots: turn this corner, and suddenly you're accessing a different set of annotations, another set of motives. Stand still for long enough and you can listen to them overlap and interfere. Collaborative interventions with Syncwalk offer a means of querying the density of the Hertzian datamesh at any particular point. Find holes and fill them, or, if the model is truly that of an ecology and predation or destruction are allowed, rip a hole in the mesh and re-figure it to your liking.

There is a fascination inherent in the seemingly random traces of others—Baudrillard describes this as a process of seduction, of "being absent...no more than a mirror for the other who is unaware."[37] Collaborative or shared approaches to Syncwalk embody the potential to walk in these traces, to palpate the boundaries of a stranger's experience.

3.2.4 Conclusion of Use Cases

In describing the potential roles Syncwalk may fill, some tensions arise: we want an effortless composition process to facilitate casual, frequent compositions. Alternately, we want to offer depth and plasticity to the composer at the level of a traditional instrument.[38] To make our work on this instrument as useful as possible, we must follow Nova's lead and create an interface that "designs for both targets." Let's get started!

4. Interface Elements

4.1 Web Interface

Because most users' first introduction to Syncwalk will likely be via the web, we need to make sure that the web experience correctly orients the first-time user, letting him or her quickly grasp the ideas behind Syncwalk and determine whether he/she would like to participate. For design reference, I looked for websites that encourage users to make (and share) maps online. Some of the top contenders were Google's "My Maps" service and Leo Bonanni's *Sourcemap* project.[39]

4.1.1 What it is for

The Syncwalk website serves two functions: to introduce and explain the concept of a Syncwalk, and to facilitate composition. As such, the interface's main "modes" will exist before and after the login process. Before login, I assume that the viewer is an initiate, coming to the platform for the first time. The site should provide graphics and text that explain the concepts behind Syncwalk and the process of composing. After the visitor has created an account and logged in, I assume that the intention is to create, edit, or share Syncwalks. Here, the site takes the form of a simple map interface for composing.

4.1.2 How it should act

In order to facilitate easy adoption into a user's lifestyle as represented by the "Compose for Yourself" scenario described above, we need the process of creating a Syncwalk to be effortless: users should not feel that creating a map of ten to twelve songs is going to take a long time or a great deal of focus. I chose this average number of songs casually, as it is about the same number of songs as a conventional CD, and, at about 70 minutes of total duration, covers roughly two square kilometers at average walking pace.

In circumstances when the user *does* have ample time and focus, we want Syncwalk to offer sufficiently deep capabilities that allow users to explore every aspect of Syncwalk. Software relevant to this scenario has only recently moved online and remains experimental; more familiar examples might be found in Apple's Final Cut Pro, Adobe's Photoshop, and Ableton's Live. These are platforms designed for highly-detailed compositions that are the result of more than one authoring session. Because this scenario is characterized by long periods of time spent using the site, we need to ensure that all operations are intuitive and easy to repeat. To this end, I will attempt as much as possible only to ask the user for input that cannot be automated: if data can be obtained once and saved by the site thereafter, it shall be.

Two main factors can cause a web interface to slow down: either it is performing computations that strain the capabilities of the client or host processor, or the interface is waiting for data to be transferred to or from the client. To address the first cause of slowness, I will (of course) try to write efficient code. In light of the other cause of slow performance, I will also design the site so as to minimize the amount of data transfer between client and server. This strategy will also be able to handle large numbers of simultaneous users much more gracefully than a more server-side application.

In light of the continuing legal danger associated with digital rights management (DRM) and more general intellectual property issues in the United States, it is necessary to identify and address potential liability as an additional factor informing the design of the Syncwalk platform. In addition to the real potential liabilities (to me or the user) that may arise, we must also be sure to address the user's perception of liability: to this end, the system will not ask you to upload any potentially-protected media. Rather, we will use a compressed description of the media, metadata, to populate song information in the web interface.

4.1.3 How it should look

Visually, the site's appearance should not distract or fatigue users who are composing for long stretches of time. At the same time, a certain amount of consistency and polish in the visual style is necessary if we are to attract and retain visitors, or if the site is to propagate in the art and design worlds. A rendering of the current layout is in Appendix A.

- Easy Readability
  The site must not fatigue users who spend large amounts of time on it, or access it frequently for short, casual composing. To this end I will observe the commonly-held conventions of readability including large-font instructions in the form of short, friendly sentences; serif font families; and the use of colors to communicate meaningful properties of the text they decorate.

- Flat hierarchy
  No navigations or menu access should be required for the user to perform most tasks. It should be clear from the state of the page what actions can be performed at any particular moment, as well as how to perform them.

4.1.4 Summary of goals, factors, and guidelines

To summarize, we are looking to design a web interface that performs two functions:

- Initiate new users

- Facilitate composition

With these in consideration, we determined the following design factors to consider:

- Should not have to upload any media to the server (this is to reduce bandwidth, save time, and avoid copyright issues).

- Should be able to cater to both use cases: the casual user, and the exacting composer.

- No tasks should be repeated—no constantly logging in or resubmitting resources.

- No terrifying permissions should be asked for: no editing the user's hard drive, no email addresses or personal information. However, there may be the potential to opt-in to email services to facilitate sharing in future versions of the platform.

4.2 Mobile Interface

4.2.1 What it is for

The mobile component of Syncwalk is responsible for the execution of pre-composed works. It must also handle related tasks, including standard playback commands and the provision of an interface allowing the user to select which Syncwalk to play. On top of these requirements, the software must respect the constraints that accompany mobile applications.

4.2.2 How it should act

Music application design for mobile platforms can be very complex—when I first began using a phone capable of playing audio files, it took me several days of use before I felt comfortable with the interface. Even so, I later discovered extra functions that were not apparent at first use: the ability to create playlists, show synchronized audio-visualization graphics, or set certain songs as ringtones or notification sounds. A great deal of this complexity arises from the numerous and dissimilar modes of use that might occur: the application attempts simultaneously to be a media browser, playlist editor, music visualizer, preferences setter, and actual music player. The dilemma of multiple functions is exacerbated by the limited resources available to the mobile platform, which affords very little screen size and fewer processing resources in comparison to analogous software intended for non-mobile devices.

Here we catch a break, by luck or design: our mobile application has significantly fewer features it needs to offer to the user. In fact, when embarking on a Syncwalk the user has essentially only one choice to make: deciding which Syncwalk to explore. All the complexity involved in the creation of a Syncwalk has been shifted to a platform more suitable to the task: a more powerful computer with a comparatively larger screen, faster processor(s), and (presumably) placed in an environment suited to longer authoring sessions and increased focus.

With this single functionality in mind, we can look to approaches that help hide other potential sources of complexity from the user: for example, certain behaviors should simply be automatic, like the interruption of the walk by other mobile notifications, such as an incoming call or calendar alert. Other factors unique to mobile devices should also be considered.

One key vulnerability in any mobile platform is a reliance on wireless connections for network and GPS data exchange. When weather factors, architecture, or other interruptions render any of the device's connections unstable or intermittent, our interface must do the best it can to fail gracefully. To this end, Syncwalk's use of wireless data is limited to essentials and built for redundancy.

Syncwalk uses very little network data in the course of normal operation. If necessary, the application can run without any network access at all—the only difference is that the user's map screen is blank. When network connectivity is available, Syncwalk avoids making recurring calls to the server; instead, it downloads and caches user-related data (such as all Syncwalks the user has ever created online) on the mobile device's external SD card.

Because Syncwalk relies heavily on the GPS system for location information, interruptions in GPS signal present a more formidable challenge. To mitigate this risk, two behaviors are implemented: the

software will not play anything without an initial GPS lock, and it will continue "coasting" along the last known path if GPS drops out temporarily.

4.2.3 How it should look

Since Syncwalks are not conceived of as having a visual component, most of visual design guidelines will focus on presenting the user with an intuitive means of selecting and starting a Syncwalk. This means we need a good way to browse through the available list of Syncwalks, be they online or stored on the mobile device. After the Syncwalk starts, we will need to provide some indication of the locations of the composition's regions and focal points.

4.3 Choice of Supporting Platforms

In deciding which infrastructures will be used to support the platform's core functions, a number of factors were considered: ease of use, inbuilt user familiarity, and popularity among developers.

4.3.1 Web Protocols

Only one alternative to Google Maps was viable at the time of writing—Open Street Maps.[40] Ultimately, the depth of Google Maps' API documentation and its significantly larger development community prompted me to use it for the prototype platform. Once the decision to use Google Maps was made, the choice of supporting languages became easier. JavaScript, the lingua franca of Google Maps, became the default scripting language for the web side of the Syncwalk platform. PHP and SQL were selected using the same logic. It should be noted, though, that the Syncwalk composition platform online is only one implementation of the Syncwalk model—other implementations are entirely possible and will probably follow as Syncwalk matures.

4.3.2 Android

I chose to develop on the Android platform without a great deal of consideration at first. I knew I would be developing the framework alone, and needed to stay on familiar turf regarding the programming language that would be required. Android was an attractive option because I had been studying Java for the past few years, in contrast with my relative unfamiliarity with C and Objective-C, the main languages needed to program for iPhone.

I was attracted to Android for other reasons that cemented my choice: Android is both open-source and supported on more than one wireless carrier, two important potential barriers-to-entry for other developers. Moreover, Android is deeply integrated with Google Maps and Google Earth, both of which save the developer significant time in writing location-aware applications. Finally, Android is capable of running more than one program simultaneously, which is necessary for Syncwalk to run as the "background" application it was intended to be.

4.3.3 iTunes

The requirement that uploaded music libraries be in iTunes format is almost surely the most unreasonable and inconvenient aspect of Syncwalk creation thus far. I chose to take this shortcut based

on the understanding that many of my acquaintances who might be able to make significant contributions to the platform's development would not mind having to use iTunes initially. However, in user testing, the reliance on iTunes was one of the most-frequently voiced concerns about the composition experience.

Initially I felt a little proud of my appropriation of the iTunes Music Library description file for my own purposes—it seemed like an interesting way to circumvent many of the legal dangers associated with music file transfers, the likes of which iTunes itself is designed to thwart. The approach eliminates the need to actually give the Syncwalk server the file (rife with the DRM/bandwidth issues mentioned above), and instead uses the metadata already put in place by a dominant system.

In a brief conversation with noted technologist Walter Mossberg, we discussed the need for non-DRM solutions to sharing music experiences.[41] Mossberg was very enthusiastic about the potential for Syncwalk to transform the average person's urban experience, and agreed that the current system for reconciling songs using iTunes-generated metadata files was as good an approach as any.

But this conceptual move is nothing without results, and the results showed that iTunes should not be needed to make a Syncwalk. Subsequent versions of the platform will offer support for other metadata formats, and will additionally offer a desktop-based, no-metadata-needed shell script that culls ID3 info from the media themselves.

4.4 Degree of Flexibility / API access

One of the challenges of designing a platform, rather than a specific work, is determining what tools to provide to other developers who may want to extend the platform or integrate it with their own. At present, there are two main ways in which developers can address the platform: Android's inbuilt "intents" framework and the open composition format.

The Android operating system allows applications to publish *open intents,* which are essentially function calls that are available to any other applications running on the same device. For example, open intents are what allow users to visit a web page by clicking a link in an email: the email program recognizes the link and sends a message to the web browser program when the link is clicked.

Open intents can be used by other applications to inform the content of a currently-running Syncwalk by passing data to the Syncwalk app. This data can be almost anything: activity level, social networks, sensor readings, and so forth. This approach is discussed further in section 7.3.
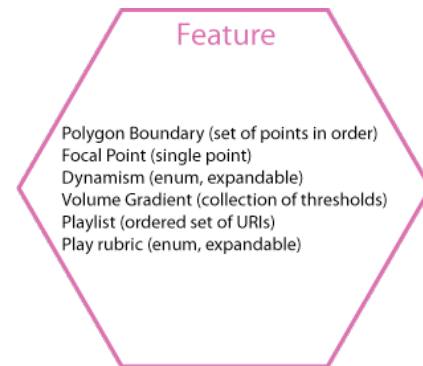
Because the composition format already adheres to the widely-used XML and KML standards, there are a wide range of potential alternative platforms for displaying and creating Syncwalks. Other online interfaces, desktop-based versions, and collaborative systems are all discussed in section 7, "Open Paths."

5. Architecture

5.1 Features

Features are the basic building blocks of a Syncwalk. Features are regions in space whose boundaries, focal points, and associated media are defined during the composition process.

Feature

Polygon Boundary (set of points in order)
Focal Point (single point)
Dynamism (enum, expandable)
Volume Gradient (collection of thresholds)
Playlist (ordered set of URIs)
Play rubric (enum, expandable)

Each Feature has the following properties:

- Polygon Boundary
  This is an ordered set of coordinate pairs describing the boundary region of the Feature. Editing this property in the current web interface is as simple as dragging a vertex into place. Each time a vertex is moved, the software generates two new vertices, each one halfway between the just-moved vertex and its neighbor. This functionality easily affords arbitrary complex boundary shapes while minimizing the number of redundant elements in the Polygon Boundary array. When a Polygon Boundary is generated, the software chooses the size of the boundary by calculating the distance it would take to hear the associated song when walking at an average pace.

- Focal Point
  This is a single coordinate pair that functions as the main method of positioning the song in space. The Feature's Marker appears at this point, and can be moved by simply dragging it to a new location.

- Volume Gradient (collection of thresholds/knees)
  This is similar to the knees on a compressor. We define two proportions a and b, one near the boundary and one near the Focal Point, and proportionally scale playback volume between these two thresholds. Please see the diagram below for more information.
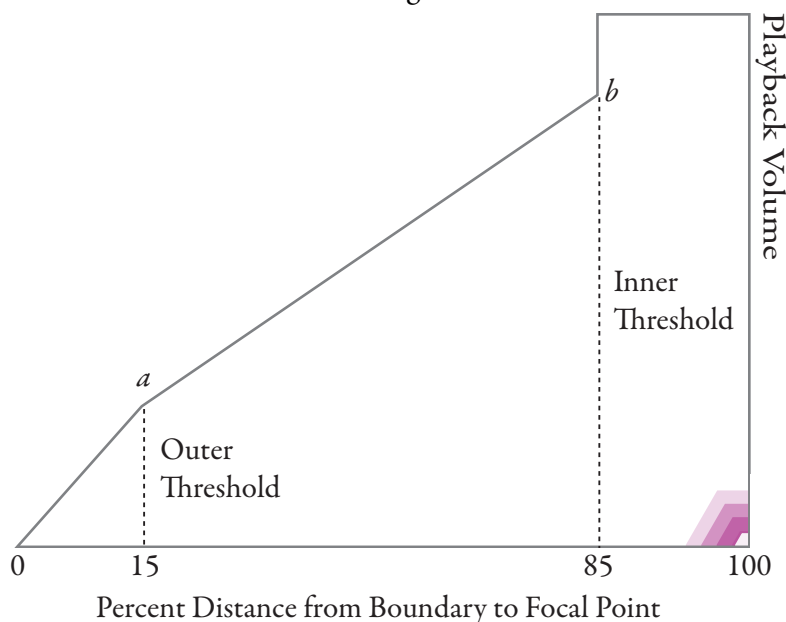
- Dynamism (implemented in framework but not on web UI)
  This is an enumerated property of each Feature that describes the circumstances under which the Feature can be activated. Currently, the three possible values are:

  - *ONLYWHENMOVING*
    This means the Feature will only activate if the Actor is moving.

  - *ONLYWHENSTILL*
    This means the Feature will only activate if the Actor is not moving.

  - *DISREGARD*
    This means the Feature will always activate, regardless of Actor state.

- Playlist (ordered set of file addresses)
  This is an ordered list of each Song object associated with a particular Feature. Each Song object contains the following properties:

  - Song Name (self-explanatory)

  - Song Duration (in milliseconds)

  - Song Artist (self-explanatory)

  - Song Filepath (the local address of the song in the phone's filesystem)

  - Song ID (a unique identifier for each file)

- Play rubric (implemented in framework but not on web UI)
  This is an enumerated property of each Feature that describes the how to choose which song will play when an Actor enters the Feature. At present, there are only a few options, but this is one of the most intriguing and open areas for development.

  - Play all songs in order, looping when we reach the end

  - Play all songs once, without looping

  - Play the least-recently heard song in the Playlist

  - Play the songs in random order without replacement

  - Split the day into as many sections as there are songs in the Playlist; play the song corresponding to the current time of day.

  - Order songs by energy or tempo and play the song most fitting the Actor's observed pace or activity level.

- Stack threshold distance (implemented in framework but not on web UI)
  When a Focal Point is placed within this distance of another Focal Point, the two points are consolidated and their playlists are combined.

5.2 Actors

In the thesis version of the software, there is only one actor: the person taking the Syncwalk. However, the software is written such that I have abstracted the role of the Actor to allow for future versions to explore the potential of multi-user Syncwalks —these could be as simple as a master-slave relationship, where one person's exact audio experience is shared with others (a riff on Neuhaus's *LISTEN*), or it could involve complex behavior models and dependencies (more akin to Tanaka's *Net_Dérive*).

Each Actor has the following properties:

- Movement information
  This information can vary within the family of Android handsets currently available. Currently-available movement sensors in these devices range from simple accelerometers to determine the orientation of the device, to more complex gyroscopic or magnetic sensing capabilities that provide compass heading and rotational speed.
  To account for the varied forms that movement data might take, the Syncwalk platform will provide a way for available movement data to be abstracted to more qualitative parameters such as pace and average level of activity.

- History
  This is a log of the GPS locations previously visited by the Actor. Every time the platform gets a GPS reading, it is stored in the log. This information can be analyzed to extract a number of useful parameters such as "straightness" of path, distance traveled, mean heading, deviation from normal patterns (or example, determining if you were on your regular commute to work, or on a random errand elsewhere in the city), proximity of other Syncwalkers, and so on. Like many of the other Actor attributes we have covered, this represents an open and fruitful area for other developers and users.

- Identity
  This is a yet-unpopulated attribute, so its format is not known. The intent is for this field to uniquely identify a Syncwalker and potentially tie into a number of other platforms, such as Last.fm, Echo Nest, Foursquare, and Layar.

- Friends (list of other Actors)
  Like "Identity," this is another unpopulated area for future development. The intent is for this field to contain a list of other Syncwalk users that the Actor has chosen. This attribute, combined with the Identity field, allow for a wide range of interpersonal interactions to emerge as the platform matures.

Actor

Sensor information (gyro/accel/camera)
History (GPS log of prior movements)
Identity (undefined)
Friends (list of other Actors)

5.3 Composition

A composition is a set of Features and Actors. For the purposes of exchange between users, the set of Features (and any rules for Actors) is written out in XML-compliant markup and saved as a KML file and can be viewed in Google Earth or other geospatial mapping software.

6. Evaluation / Feedback

6.1 Web User Interface

In a series of informal interviews with colleagues from MIT, I walked each participant through the process of composing a Syncwalk using the web UI.

6.1.1 Qualitative Impressions

Overall, testers were able to use this interface with little guidance. The creation process was segmented into enough distinct steps that it was always clear from the state of the screen what action should be performed next. During testing, there were no instances of unexplained failures, code errors, or other things "breaking" in one way or another.

While solidly functional, one area where the interface needed to guide users more was the introduction page. All testers felt that the introduction page should offer several different features that would give users more background information about what they were about to create, and how the process would work. I am currently developing some large graphics that will address this request.

Several testers had not experienced locative media works before using the Syncwalk composition interface; those that had experienced locative works had never composed for them. This inexperience with the medium was useful, as the majority of targeted users of Syncwalk will have similarly little experience. This presents a challenge when designing the composition interface, as it would be cumbersome if each user's experience with Syncwalk needed to begin with a briefing on the history of locative media experiences. Until locative experiences become more commonplace, I will continue to work on ways to quickly communicate the necessary background to Syncwalk users.

6.1.2 Actionable Results

- The randomized coloring of Regions is confusing—users need to understand why the colors change; this is especially confusing when two successively-created Regions randomly get the same color.[42] Suggestions included starting at one color and gradually moving along the spectrum, or linking color of region to the Feature's dynamism. In order to emphasize which Region is associated with which Marker, they should both become highlighted when either the Marker or the Region is moused over.

- Almost unanimously, my testers admitted that they were not reading any of the written instructions on the composition page. Two years heading up a tech support department have taught me to expect this behavior, and that users are not wrong to ignore instructions. The solution must be to make much larger, graphical diagrams that convey the same information. Currently I am working on two such diagrams: one explains the way you add a song to the map, and the other explains the significance of each Marker, Stack, and Region.

- There should be a way of auditioning songs before and after you place them. Several people suggested this, and I agree with them—the complexity involved in playing client-side media from the interface kept this feature out of the first release. However, it is one of the most important

features to add going forward, because the only current means to preview a Syncwalk are quite involved. As one tester remarked, "it's like having to print to tape just to watch an edit."[43]

- Users should be able to drag a song onto the map rather than clicking the song to have it appear in the middle of the map. This is another feature I had long envisioned as being key to the UI's usability. Unfortunately, the Google Maps API does not natively support drag-and-drop functionality yet; a custom workaround is being developed in the next version.

- The "Export" workflow needs better explanation. Users were not sure what to do with the exported KML file. Some clicked on the link, which in some browsers takes you to a text readout of the file rather than downloading it. After downloading, users were not sure where in the phone they should place the file. The next version will incorporate these suggestions, using graphics to illustrate the next steps and adding scripted behaviors that ensure the file is automatically downloaded to a convenient place (for example, the script could determine if the phone's hard drive was mounted on the user's computer, and save directly to the phone's application folder by default).
A parallel remedy for this situation is to have the user's phone download all the user's KML files upon Android application launch. This appears to be a simpler and more intuitive workflow that hides the most possible complexity from the user, but it requires the user to provide his or her username and password the first time the application is run.

- The map layer of the UI should be desaturated to help markers and region stand out. This suggestion arose when a user was trying to make a dense arrangement of Features in a small area, and the colors of the map made it difficult to determine where overlaps occurred.

- In addition to drag-and-drop, users should be able to draw a region and then drop a song into it. One tester in particular felt strongly that he would like to compose by first dividing his space into regions and then determining what sounds were appropriate for each. This makes sense, and I agree it would be very useful. However, I am wary of introducing two equivalent but separate means of composing in one interface—it is a tricky design problem that I continue to work on.

- The Syncwalk-in-progress should be cached so that page reloads do not cause you to lose your work. This will be implemented by the beginning of May.

- Finding the correct XML file to upload is too hard. Describing the process of locating your mobile phone's music folder *and* making an iTunes playlist out of it is too lengthy and complex. There is a possibility that external ID3 tag decoding APIs such as those made by the EchoNest, Songbird, and FoxyTunes will radically simplify this process, and I continue to investigate these as candidates for inclusion in the next version.[44][45][46]

6.2 Mobile Experience

I enlisted the assistance of several artists and musicians in testing the overall Syncwalk experience. The testers were given a pre-configured Android phone and asked to create a Syncwalk online, experience it in real life, and write about their impressions.

Jace Clayton is a writer and musician living in Brooklyn. His essays have appeared in the *Washington Post*, *Abitare*, and *n+1*, and he is a regular contributor to *Frieze*, *The Fader*, and *The National*. The *New York Times* calls Clayton "a thoughtful pipeline for music from countless distant and obscure outposts." He has given lectures and artist talks at Harvard University and other cultural/educational institutions in Germany, Spain, Peru, the Netherlands, and Brazil.

Clayton performs internationally as dj/rupture. The turntablist and producer has toured in over 30 countries, released records on Soul Jazz & Tigerbeat6, DJ'ed in a band with Norah Jones, done two John Peel Sessions, and was turntable soloist with the 80-member Barcelona Symphony Orchestra. His dynamic live sets simultaneously party-rock and suggest complex political undertones. His recent album, Uproot, was named one of the 10 Best Albums of the Year by Pitchfork.[47]

6.2.1.1 Comments

Clayton's interest in Syncwalk was fueled by an earlier collaboration in which he composed a three-dimensional terrain for *Audio Orienteering*. With this experience in mind, we began to talk abut the possibilities that an expanded interface might involve: longer timescales, greater distances, and more participants.

In the course of several discussions, Clayton posited some new forms of group play and coordinated action that could be facilitated by Syncwalk. Here are some excerpted comments from Clayton that explore these ideas:

> "take a Nettle [Clayton's improvisational ensemble] album and slice it up and lay it across a city, with one or several Jace-taste-optimized routes yielding the 'best/more finished' experience while other routes will give you radically divergent sounds (like just a violin, an infrequent sound)"

This approach combines the augmented-narrative approach of Cardiff and Bures, while retaining a degree of plasticity: participants can experience this Syncwalk multiple times and make different decisions at each juncture, with each decision affecting the resulting narrative. This is a particularly interesting approach when one considers larger forms of group authorship. For example, if your path along a particular Syncwalk was processed as a vote in favor of that branch of a narrative, the overall accumulation of votes and paths could be seen as a collaborative creation, a form of "crowd-sourced storytelling."

> "group audio performance where people all come and play the same syncwalk— composing pieces for multiple speakers & the GPS slippage you mentioned"

The GPS slippage I mentioned is the same phenomenon identified in *Four Loops*—the craggy, drifting pattern caused by lower-accuracy GPS readings. Composing specifically for this non-deterministic property of the system's location updates is an interesting approach to the medium, especially when multiple actors are experiencing this effect simultaneously.

"syncwalk version of my radio show—certain songs hang in zones for a month or season or whatever."

Distribution and sharing strategies for Syncwalk were a recurring topic in our conversations. Syncwalk allows for a variety of different ways to share an experience: synchronously or asynchronously, in a group or alone, live-generated or pre-composed. Exploring these choices and developing new approaches will be a focus of further work on the platform.

> "from 'movies' to 'walkies': spatially-mapped radioplay/episodic sci-fi (from the world of Baby Kites and Nokea)[characters in a futuristic narrative Clayton is developing]— sound design and weird 'speculative urban' narrative composed of music, actors reciting stuff or reading voice"

It is interesting to consider the difference between a science fiction narrative overlay and a historical one. Both genres involve the participant in an act of imagination that posits alternate versions of the surrounding environment, but science fiction fills that environment with forward-looking potential rather than a focus on what has already occurred. The "speculative urban" narrative Clayton refers to (the term is a nod towards Manaugh's *BLDG BLOG* practice) casts the Syncwalk he proposes as a survey of possible futures mapped onto present space.[48] Again, this direction becomes even more interesting when the potential to collaborate with other authors is introduced.

6.2.2 Noah Vawter (testing in Somerville, MA)

Engineer and musician Noah Vawter is best known for inventing *Ambient Addition*, the *1-bit groovebox*, *PSPKick*, and combyop synthesis. In each of these musical instruments, he combines math and design ideas to illuminate the situation around music, encouraging the democratic notions of freedom and cooperation. He is currently a Ph. D. candidate studying with the Computing Culture Research Group at the MIT Media Lab.

6.2.2.1 Comments

Vawter's account of his first Syncwalk is as follows:

> As this program [Syncwalk] was getting released, and I was preparing my list of songs for Syncwalk, a friend helped me restore my bicycle into working order, so after a brief test ride in which I discovered the brakes to be only marginally safe, I decided to tighten them up as best as I could and make my Syncwalk on a bicycle!

> I chose the last full album of music I had recorded before enrolling at the Media Lab as my listening material for the ride. I was very familiar with the music -acoustically-, having listened to it 100's of times on different speakers, headphones, earbuds, stereos, in cars, in different apartments, etc. Today though, I was able to experience it in a different different way - triggered periodically as I pedaled along the Minuteman Bike Path. That might seem like a purely geospatial experience, but as I discovered, my personal organization of the territory in question led me to interact more subtly with the path.

Beginning the walk as awkward, as much headphone music can be, because my neighbor whom I hadn't seen all winter, was outside, and had a lot to talk about. I always feel bad putting my headphones on immediately after walking away from somebody, so I waited until I had walked my bike out of eyesight to put on my headphones and at that point, I had cleared the zone where the first album track gets triggered!

Then, as the first track in the playlist that I would actually hear finished :), I realized I hadn't configured the map to allow time for the entire thing to play. I had tried to use the default length, suggested for walking, but I should have stretched it out bigger. But that's okay, because what i found interesting was that the song seemed okay ending at the particular point. In writing that album, and in my music in general, the endings are always a bit weird for me. But now I had a piece of indirectly-naive-self-acceptance-evidence proving that the song could end there without transitioning into the second movement I'd written in.

At this point, I made more connections between what I'd drawn and the space in which I found myself. The bike path heading east is on a slight, continuous incline, and this being the first time in many months I had ridden my bike, I found myself panting at the top of a hill, and realizing that while the SyncWalk software produced only silence in-between the current set of way-points I had programmed in, it would be simply fine if I were to ease up on the pedaling exertion a little bit.

So, sublimating the guilt I felt for missing an important celebration honoring Barry Vercoe, I casually rode, allowing memories of the bike path to overcome me. I won't gush about them here, but when the music returned, it sounded to me like a triumphant report on medieval trumpets! The disjoint between my intending to listening to this song, and its eventual reproduction allowed just enough distance for me to recognize the song untainted with my own expectations. This effect lessened as the song continued, but I was able to, at least musically, maintain the perspective of the victorious open fanfare throughout the duration of the song! Only this time, it didn't end as smoothly as the previous song! Although it, too, seemed to fade out (a function of the software?), I was left hanging, overly aware of my own breathing. It was like suddenly going deaf 3 minutes into a fugue. I realized that particular song needed the resolution which had originally been written into it, but which my pedaling had stricken. [Vawter is referring to the size of the region encompassing this song. Because he is on a bike and not walking, he is leaving regions before their songs are finished.]

So, now, another pause gratefully-received on the part of my physical body in-between songs, although I feel the resilient anxiety of an intense, unresolved swell.

And when the music returns, I recognize the same feeling of alertness as before, when my music sounded to me like an hither-bound English hunting party. I sonically scan the overtones of the song quickly for overtones, mostly simple intervals, staccato hits, sounding again like an announcement. I figure that's just the way my music is written, and it recalls what I wanted to do long ago, when I first started hearing C64 cracktunes, but that's a story for another day.

Re-emerging from the shady bike path into the sun, my thirst redoubles, and I breeze into a hip, new coffee shop for an ice chai latte. I hope for a minute that the current song will continue playing because I remain inside the perimeter. It's a nice, long, and I rather would like to go through all of its transitions.

Vawter's experience is in many ways ideal: he has made a space in the day for a Syncwalk to occur, and is intentionally receptive to the dérive-like nature of the walk. I am especially pleased that Vawter has used his own music for this Syncwalk, and that this personal connection with the music seems to have guided his thoughts during the experience.

6.2.3 Conclusion to Mobile experience testing

I encountered far more difficulties communicating with the artists than I did with the platform itself. In subsequent testing sessions, I will require face-to-face contact between tester and facilitator to ensure that the testers are oriented properly. This face-to-face orientation will also provide valuable information about how to design Syncwalk to reach a larger audience by allowing me to identify the core set of questions to answer and ideas to put forth when describing Syncwalk to newcomers.

Despite the setbacks I encountered, it was very rewarding to share the Syncwalk experience with artists whose work I respect—unanimously, their reactions to the idea of the Syncwalk were excited and positive. With this in mind, and with the lessons learned from the fist round of testing, I look forward to more comprehensive testing sessions and the development of a wider base of beta testers.

7. Conclusion / Open Paths

With version one of the Syncwalk platform complete, I'd like to describe a few directions for future development. Some of these directions are features or behaviors that, for one reason or another, did not make it into version one; others are directions or strategies that presented themselves in the course of the first version's development.

7.1 Self-Evaluation

7.1.1 My Experiences
7.1.1.1 Repeatability/Lifestyle integration

I was surprised at how many times I could enjoy the same Syncwalk. One particularly re-playable composition, "HiDensity-April," (a map of this is available in Appendix B) was experienced more than ten times. Similarly, my main walk-to-work Syncwalk yielded interesting observations the more I used it. For example, it became a game with myself to see if I could remember exactly where a boundary between regions was, and to test this guess by walking along what I thought to be the edge. I would also speed up and slow down the pace of my walking when I neared a boundary if I thought changing my pace would result in a more fortuitous timing for the mix.

7.1.1.2 Moods and multiple maps of the same place

I started out by making multiple Syncwalks for the same neighborhood. I thought that I would then select from these walks based on my mood, or the amount of time I had available. However, I never actually made a selection based on my mood: instead, I was much more likely to select a random Syncwalk. I'm not sure what led me to indulge in this way, but I was satisfied enough such that I never stopped a walk in the middle and switched to a different one. This phenomenon was interesting to me because it wasn't as though I was removing "mood" as a factor of influence in my Syncwalking, I was merely allowing that factor to influence me in an unanticipated way. I didn't consciously choose to go on a "sad" or "nostalgic" Syncwalk (even though I *did* choose to compose a Syncwalk with those moods in mind), but when I did, I found myself thinking about what about it held or communicated the mood. Especially with songs that were emblematic of other periods of my life, I found myself diving deeply into details of the song and its corresponding region, making ad hoc connections that had not been manifest in the composition process.

7.1.1.3 Crossfades

I had always intended to add beat-synchronizing functionality to the Syncwalk platform, although for time reason, this feature had to be left out of the thesis version. I was surprised, then, that when I first began testing Syncwalk, I did not particularly mind that overlapping songs were not synchronized. I don't intend to let this finding derail the set of features I hope to add, but it is interesting the extent to which I was able to tolerate and even play with the irregularities, discordancies, and tensions that appeared in the overlap between songs.

Understandably, I am not in a position to be impartial about my experiences using Syncwalk. However, in the months spent making the platform I had ample time to imagine to myself what the experience of being on a Syncwalk might be like. The differences in experience, the surprises I set up for myself, were overwhelmingly rewarding and exciting. I use my platform almost every day and often set aside more time to enjoy a longer Syncwalk than I would normally spend recreating or relaxing. My hope is that others will find Syncwalk to be an equally beneficial addition to their aesthetic and everyday practices.

7.2 Commercial Potential?

7.2.1 No!

When discussing future application scenarios for the Syncwalk platform, many participants and collaborators acknowledged the latent commercial utility of a widely-installed locative media platform. For example, the platform could behave in such a way as to keep the participant in the vicinity of a store, or it could alter playback attributes in a manner that encourages the participant to travel towards the store. To an extent, the passive, seamless manner in which Syncwalk can be activated or deactivated during the day discourages this practice—unlike television or other time-based media, the audience is not captive. Past studies indicate that locative media users categorically resent any commercialization of their experience, citing the loss of a feeling of "ownership of their communications with the surrounding world."[49] While it is impossible to prevent commercial promotions, sponsored Syncwalks, etc, my hope is that commercial entities wishing to leverage the platform will essentially have to work like anyone else, creating a valuable experience that people actively want to continue.

7.3 Alternative composition strategies

7.3.1 Generative

We don't have to have the composition of a Syncwalk be expressly in the service of an authorial/curatorial impulse; generative or autonomic processes can inform the creation of regions and the selections of songs (or sounds) that fill them. To experience such a Syncwalk, one created automatically, implicates the city itself in the creative process: the participant's role expands beyond the confines of a curated "set of possibilities" and into a realm of emergent patterns. Subjectively, the participant is still free to make meaning, narrative or otherwise: the logic informing this sense-making simply becomes removed from the realm of express intent.

7.3.1.1 Syncwalk as data visualization

The city is a prime site for innovations in the field of data visualization—there is perhaps no space more measured, studied, and iterated than the urban sphere. Using this data to inform the automatic creation of Syncwalks is a logical next step. Here are some approaches that might be of interest:

- Sociometric and population data used to represent the state of the city in sound.
  This approach uses any and all available location-based data provided by the city to inform the

placement of songs and the size of those songs' associated regions. Examples of useful or interesting location-based data include: crime reports, pollution measurements, traffic sensors, noise level meters, census data (income, population density, etc.), social media "hotspots," and so on. These data are then reconciled with or mapped to more qualitative content-description tags from various music analysis services like Last.fm or Echo Nest.

- Local sensing modules used to create constantly-updating Stacks
  This approach leverages the increasingly-popular use of local sensing platforms like Tweet-a-Watt and Weather Underground's home meteorology setups. These datafeeds, the locations of which are known, are represented as Stacks; these Stacks choose different content based on changes observed in the data measured by each setup. For example, an increase in wind speed could cause a Stack to begin playing faster-paced music. Similarly, sunlight intensity might be mapped to the "mood" quality often described by the music analysis services described in the previous example.

7.3.1.2 Music-fitting models

This approach envisions a Syncwalk made to fit the anticipated pace of your walking, using urban density and density of attractions (things that would make you linger or tarry, like a bar or a high street area). One such implementation might employ a predetermined array covering the city that morphs from one genre to another, similar to Lillie's *Music Box* system, but projected onto a physical geography.[50]

7.3.1.3 Ambient Addition version

In a more mature version of Syncwalk, we can imagine the platform informing any number of generative or reactive processes. A system like this affords users the potential to experience phenomena that were previously unavailable to Syncwalk, such as the EMF sonifications of *Electrical Walks* or the diegetic real-time remixing of *Ambient Addition*. the simple addition of a microphone or analog sensor might make such potentials real. With these new dimensions of input, we can imagine Syncwalks that map regions that corresponding to different Ambient Addition settings (in this region we switch to minor keys, in another we are overcome with stutters, etc) or different dimensions of interest.

7.3.2 On-the-fly

This feature would allow participants to create one large Syncwalk automatically, by recording the location of the phone whenever it plays an audio file. This accumulation of songs and the places where they were played has the effect of mapping a "watershed" area of activity in space and sound. Two modes for this on-the-fly composition style immediately present themselves: the first, an automatic process we have just described; and the second, a mobile version of the the user-directed composition process afforded by the web interface.

7.3.3 Plugins to compose on other platforms

Composition need not be limited to the current website. In fact, several factors we identified as complications or inconveniences in the process can be circumvented if we move the process of composition out of a web interface.

Several existing applications for visualizing and manipulating geographical information systems (GIS) data may be suitable candidates for Syncwalk composition, the most widespread of which is Google Earth. Earth is particularly suitable because of its tight integration with the existing google Maps-based composition platform and the Android-based mobile application. It is not difficult to envision a Google Earth plugin that could significantly streamline the Syncwalk composition process while simultaneously facilitating additional features.

Some quick examples of the extra features and benefits made possible by moving the composition process offline are: quicker save times due to the lack of waiting for data transfer, the ability to preview audio files to test the experience, the ability to virtually "walk through" a trial Syncwalk, and so forth.

Finally, Syncwalk's ability to move to other platforms will prove useful as other technologies become available: we may enjoy yet-unknown features or benefits from experimental interfaces such as large-scale multi-touch displays, or innovative multimedia interfaces like Leithinger's *Relief*.[51]

7.4 Better affordances for sharing mixes

Currently, sharing a Syncwalk from one person to another is not as easy as it should be:

1. Create a main folder that will contain your .kml and audio resources.

2. Find all the songs used in the Syncwalk on your hard drive and copy them to the main folder.

3. Copy the .kml to the main folder.

4. Open the copied .kml in a text editor.

5. Find the "<filepath>" tag for each song.

6. Replace the contents of each <filepath> tag with the current filepath of each respective song.

7. Save changes and close the text editor.

8. Compress the folder, if desired.

9. The user transfers the file as necessary (e-mail, web post, physical transfer).

Almost all of these steps could be performed much more quickly and accurately by a shell script or similar low-level executable program. I decided not to include this program in the current version for several reasons. Most importantly, time was limited enough that I was concerned about the added complexity this third layer of software might introduce. In addition, I believe there is a different level of trust required to agree to test experimental software that lives on a user's main computer, rather than an interface on the web or an application for mobile phone.

The appropriate workflow is:

1. From the phone's "Select a Syncwalk" dialogue or from the main composition page on the web, the user selects a "Share" option.

2. The user is presented with a single, zipped file that contains all the necessary resources. (If we must, here we will include a pop-up message that warns you of the risk that, by sharing your composition, you will become embroiled in a copyright suit of dubious legal validity.)

3. The user transfers the file as necessary (e-mail, web post, physical transfer).

As the general public gains familiarity with Syncwalk and locative media in general, my hope is that this perception of danger from a desktop application will dissipate. Work has already begun to bring such a desktop application to fruition, but it lies outside the scope of this thesis.

7.5 Record a trajectory

From Syncwalk's inception, I have identified the trace of any particular Syncwalk as a subject of interest. The trace's importance as a form of documentation should be obvious. Less obvious, but still powerful, is the importance of this documentation's incompleteness: by making work out of these traces, we intentionally circumscribe the personal and phenomenological impact of a Syncwalk, instead focusing on its conceptual or structural aspects. For example, what is it to create a Syncwalk that is impossible to exhaust, impossible to finish? Similarly, what might it be to experience the exact sound of a Syncwalk, excised from its surroundings and instead made stationary?

Excision or reduction-to-absurdity are but two strategies immediately suggested by the concept of the Syncwalk. To afford further dialog focusing on the conceptual "move" in art-space that Syncwalk represents, it would be helpful for the platform to allow easy recording of the final audio stream.

8. Last Thoughts

In the course of this work, I have designed a novel means of authoring locative art experiences and sharing them with others. This system makes accessible to many a generic set of tools and practices that were previously confined to the relatively small realm of mobile media artists and programmers.

What we need now is more: more locative artworks, more opportunities to experience them, and more talk about those experiences. Syncwalk is an early step in the process of radically expanding the audience for such locative works, both in creation and consumption. That the platforms enabling Syncwalk are already in the hands of a large segment proportion of the population is significant, as this is a field that needs a well-rounded body of contributors, not just a league of academics or researchers.

In making this system, I reflected on the dual nature of my endeavor. I believe passionately that locative art experiences can yield meaningful results unaccessible to other artforms; I want to make experiences that explore this. At the same time, I believe that the best I can do for this field and at this moment is not to make any one particular artwork—instead, I have the opportunity to significantly expand the dialog surrounding locative art by allowing almost anyone to realize and share their ideas.

One unanticipated benefit I enjoyed while working with locative art was the simple act of taking time to experience something new. I cannot overstate the importance of this: taking time on a regular basis to simply try something new, or to try something old in a new way. Several testers also remarked on the positive effect that a Syncwalk had had on the rest of their daily routines.

Like other new media practices, the ascent of locative media works closely follows the consumer electronics products facilitate them. As computational power and network access saturate our spaces, we will drop the term "locative" in favor of an implicit locality to all our interactions—like the "digital natives" before us, we will be "locality natives." Locals.

As we quickly approach this moment of computational ubiquity, traditional barriers to locative art will disappear and conventional approaches will seem bulky. We will not need to loan out custom hardware to those wanting to experience our works.

Once we have a critical mass of locative art composers and compositions, the field can permeate other aspects of our urban existence, informing the rules and standards we use to mediate our daily interactions with the city. When taking a Syncwalk, or playing a citywide game, or engineering a serendipitous encounter becomes commonplace, we can begin asking a new round of provocative questions: What does it mean to design the Hertzian space of a city? How can physical aspects of the urban infrastructure facilitate new forms of play, locative and otherwise? How can we re-use old forms for these purposes, and what should new forms look like?

Syncwalk is one of my first full-scale locative media works, and in the process of testing it I had a series of realizations that might sound trite to a seasoned reader of locative media research papers. Using the platform made me physically enact the things I had read about, almost as though I were testing their claims. Computation is indeed ubiquitous and invisible. Hertzian space is as real as daylight. Any place you can access can become a site of inquiry, a hiding spot, or space of play.

A poetry professor once told me that he saw prayer as "a means of getting the body to lead." He meant that to believe something, you must act as though you believe. Your performance-of-belief and your actual belief are not different.

Taking a Syncwalk is a performance-of-belief. I walk and listen, and act as though I believe I can perceive, map, react to, and change the psychogeographic contours of a place. That I did, in fact, make this map and wander through it is, to me, an example of this miracle: the word becomes flesh, theory becomes practice, and what you learned becomes what you know.

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Appendix A - Web Composition Screenshot

Appendix B - Screen capture of a sample Syncwalk ("HiDensity-April")
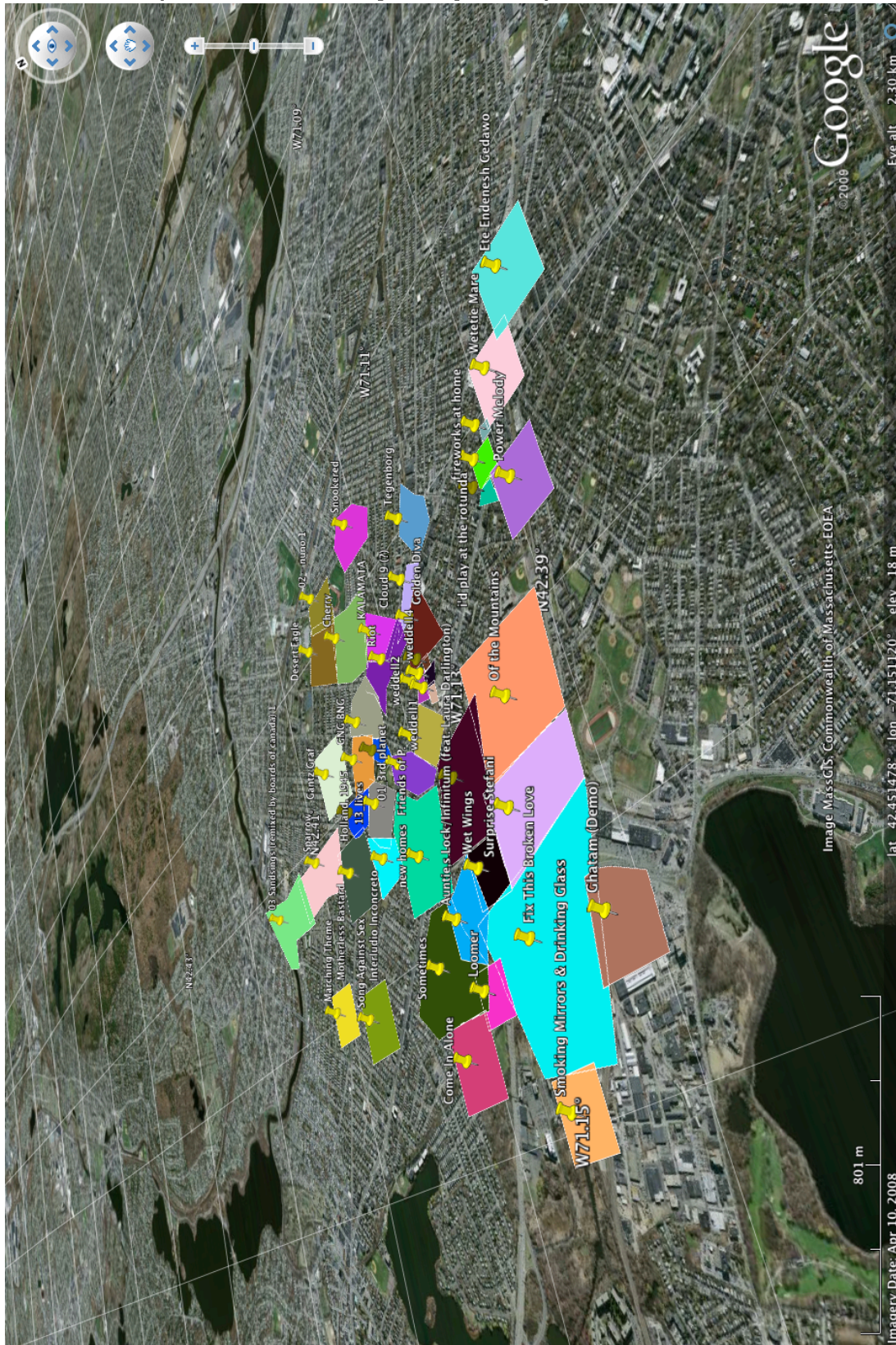
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