

# Towards location literacy: Finding and documenting preliminary guidelines for designing location-based audio

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## *Location, location, location*

Several reports indicate that a rising number of users are doing most of their web surfing from a mobile, hand-held device (see, *e.g.*, (Smith, 2012). These are devices with many sensors, among them positioning systems. Positioning systems for laptop computers are also becoming widespread. Gunnar Liestøl has called this the rise of sensory media (Liestøl, Doksrød, Ledas, & Rasmussen, 2012). We believe location-aware web sites will be common, and that more knowledge on how to write “situated texts” is needed. This paper is an attempt to gather some experience with location-aware texts in the form of simple guidelines for authors working in location-aware web services.

## *Earlier research*

Research on location-based systems (LBS) has largely been centered on a few genres: Mobile guides, assistance for transport, location-based gaming, and assistive technology (including quite a few systems for the visually impaired). Among these, mobile guides for travel and museums are the most researched (Raper, Gartner, Karimi, & Rizos, 2007). Lev Manovich (Manovich,

2001) suggests the term *augmented space* as a common label for all such systems. Most of these works document how different systems were designed, and some initial user testing to document that the systems actually worked and were effective. The emphasis is on developing new technology for positioning, and on user interfaces guiding the user to the different augmented spots.

Simple positioning systems now work with most major browsers and platforms (Fagerjord & Løvlie, 2011), so web authors can now turn to developing LBSs, but very little has been written about the effectiveness of the actual texts and images presented in a LBS. A notable exception is Jon Dovey and Constance Fleuriot (Dovey & Fleuriot, 2011), who conducted a series of interviews with artists working in locative media. From these conversations, they have constructed a set of dimensions aLBS can be mapped on: Immersion, Site-specificity, Linearity, Time (fixed or open running time, specific or unspecific, permanent or one-of), Data depth, Sociality (privat or public, solitary, shared or collaborative), Producer expertise, and Relation to existing experience (augmentation or new experience).

#### *Method: Reviews and user testing*

The guidelines presented below are based on three sources: (1) Reviews of 22 location-aware internet services, in the genres of mobile guides and artworks augmenting space in different ways (cf. Fagerjord, 2010). A team of researchers tested the systems on site, and discussed their effect afterwards. (2) User testing of location-aware systems made by the authors (see (Fagerjord, 2011) for some early results) both in the form of observations of test users and questionnaires. (3) Reviews of earlier research literature. Tests and reviews of systems were first done from a usability perspective: Were users able to use the system as intended? This involves at least three different aspects: User interface and controls, navigation in space assisted by the system, and comprehension of the information given in the augmentations. Then we attempted to discuss the effect on the user, in terms of information value, and what Dovey & Fleuriot calls *pleasure* and *immersion* (Dovey & Fleuriot, 2011)

## *Guidelines for augmenting space with audio*

Most of the systems we have tried are mobile guides, a subset of education and information genres, where we believe they should be easy to use and understand. What we have found is that they often are not. The more artistic web sites we tested were also meant to be easy to navigate; the intended effect was that of a “parallel world” that was “meaningfully mapped” to the site (Dovey and Fleuriot, 2011 pp. 102, 106) We present here some guidelines that can help authors of augmented space location-based web services sites learn from earlier experience.

### *1. Adapt to common behavior at the site.*

It is more probable that a text will be liked and used if your text respects normal behavior, and does not bring the users in conflict with what others do at the site. The principle of adapting to the place is a basic insight from the long tradition of participatory design (Asaro, 2007; Krippendorff, 2006). In the Church Music in Rome application, this was an important concern, as Churches are wholly places, where there are strong norms for what is accepted behavior.

### *2. Compensate for the difficulties at the site.*

Screens are difficult to see in bright sunlight, and sound is difficult to hear in noisy places, as we have experienced in testing Situated Simulations in Rome (Liestøl, Doksrød, Ledas, & Rasmussen, 2012). Metal constructions may cause the compass to fail, as we have experienced with the *Tour Eiffel* app for the *iPhone*, where the guide to the panorama at the top of the tower failed to position itself. Some interesting places (“hotspots”) may be hard to find, or not accessible at all. Simple user testing will reveal such problems, but a lot of commercially available systems have weaknesses of this kind.

### *3. Allow the users to take in the site. The place is often interesting than your text.*

The users are present, and can see, hear, smell, and feel everything that is on the site. Inside a magnificent temple, a tiny screen, however bright and high definition, cannot compete with the beautiful art and architecture, so sound is a better option than photography. This was an early finding in studies of locative media (Bellotti, Berta, de Gloria, & Margarone, 2002; Bornträger et al., 2003; Ciavarella & Paternò, 2004; Oppermann & Specht, 1999), and can be convincingly explained by the theory of dual coding

(Sadoski & Paivio, 2004). Conversely, it is probably a bad idea to rely on sound in headphones if you want your readers to listen to the atmosphere at the site.

*4. Limit the site.*

Users are able to follow descriptions with fewer misunderstandings when the site's boundaries are easy to find. This is rarely a problem inside a building. Out of doors, users find it easier to follow instructions on a small square than from viewpoint overlooking a whole city. When we tested audio guides to Rome, we found that they were very easy to follow in Piazza Campidoglio, which is a square with large buildings at three sides, and a large staircase on the fourth. At viewpoints overlooking the Roman Forum from the Capitol hill and towards the Palatine from the Colosseum, we were quickly lost, and did not understand what of all we could see it was the narrator was talking about.

*5. General statements are easiest.*

For the same reasons as above, it is easier, both for reader and for writer, when texts that refer to the whole scene. That way, the information is relevant wherever the reader looks (or listens). Standing in the boxes in the Colosseum, a text explaining the use of the whole building is readily understandable, as it does not relate to any feature in particular.

*6. Choose an effective viewpoint.*

Texts written for systems where the user's position is known quite precisely tend to be easier to follow. We have found that locative media systems that lead the users to "hotspots" by installing signposts, benches, and other physical features to lead the users, or find spots where the landscape or buildings lead users predictively, tend to give more immersion into an augmented space. In Warsaw, marble "Chopin benches" are placed at places central to the composers childhood and adolescence. They contain loudspeakers and a button that will start a recorded talk about the place and an excerpt of Chopin's music. The sound is indiscernible only a few steps away from the bench, so the designers have been quite certain as to where the listeners will be.

*7. When describing, anchor the readers' eyes, then lead carefully.*

Readers are more likely to be able to follow a description when the text begins with the mention a large feature that can't be missed. Then they can be

led by a clear pattern to left or right. In one application, users became lost when the text described something «next to the large Japanese cherry tree», as many readers did not know what a Japanese cherry tree looks like.

#### *8. Point to interesting things nearby*

Many of the texts studied did not mention to the reader that he or she could move quickly to another hotspot, or even just turn around to see something that was featured in the system. In an audio guide to a retrospective exhibition of Andy Warhols' works in the Astrup-Fearnley museum in Oslo, the narrator explained a paintings relation to another painting, which was mentioned by its title and the year it was painted. The narrator did not mention, however, that this other painting was placed at the opposite wall, so the listener could actually stand at the end of the room and look at both canvases at the same time. This weakened the effect of a location-aware system: It did not feel very aware of the location.

#### *9. Synaesthetic parallels cause immersion*

We have found that the dreamlike state of immersion described by Dovey & Fleuriot (2011) can be achieved by augmenting a site with music of a suiting mood. To claim that a place has a certain mood, or that music has a certain mood, will probably always have a strong subjective element. To claim that the two share a mood is probably even more subjective. Still, it is common to find adjectives used on both pieces of music and buildings or places. There is often a remarkable agreement between different writers of what the mood is. Another way of matching artworks to a site is to find structural similarities between architecture on the site and structure in, *e.g.*, a poem or a piece of music.

#### *10. Make use of the "aura" effect*

Walter Benjamin described how the "aura" of an artwork only can be experienced in the presence of the work, and that the need to travel to the place where one can experience the original work is part of this aura. Our design experiments indicate that this effect can be put to use in locative media. To point out that the readers or listeners now is exactly where something famous or historically significant happened can make them feel the aura of this historical event as part of the location, which they report as being exciting.

## Discussion

Of the nine guidelines, the first eight are aimed to make location-aware web sites usable. If we are to achieve any effect of a location-based text, the user must be able to understand what is being said, and relate it to the surroundings. These are important guidelines, however, and fill the position guidelines (or heuristics) of this kind normally take, in guiding future designers to avoid repeating mistakes from earlier systems.

Guidelines four through six imply a modification of Dovey & Fleuriot (2011)'s dimension of site-specificity and meaningful mapping. Augmentation of a site is not just more or less site specific, but it can be more or less granular. Some meaningful mapping is meaningful to the whole of a large site, some pertains to a detail within the site.

The last guideline points in the direction of further research: What are the known, possible aesthetic effects of location-based web services? More research is needed to map these effects, both in the form of analysis of existing systems, and in the form of experiments.

This brings up a question of method. The guidelines we have presented here have been developed during development of a location-based system. First, we tested a large number of existing systems, and made notes of our experiences. Within User Experience Design, this is called usability inspection, where an experienced practitioner applies all experience in evaluating a new product. As scholars from the humanities, we thought of what we did as textual analysis, however. We read closely and critiqued the texts for aesthetic and literary effect, as is common fare in most of the humanities, and the basis of a large body of literary theory, film theory, cultural studies, *et cetera*. From this review, or inspection, or critique, we have derived most of the guidelines given above.

In our own design work, we have done several rounds of formative evaluations of paper prototypes and early versions of the system, and the two first guidelines, on respecting the site and its difficulties, is largely based on this work. In our latest round, we performed a usability test with five users, both as a think-aloud/critical incident study, and a short survey after the test. These tests are obviously important to make a new system work, as, again, the user needs to get to use it in order to experience anything beyond frustration.

Some writers hold the view that these tests are nothing but the everyday work of design, and nothing that could merit academic publication. Hartson and Pyla, for example, categorically state that formative evaluation never should be shared outside the design team, and that only rigorous summative

evaluation can be used for science (Hartson & Pyla, 2012, p. 430-32). A *summative evaluation* is a test of a system after it is finished, and *rigorous* means that it is performed as a controlled experiment in a usability lab, an “[e]mpirical benchmark study based on formal, rigorous experimental design aimed at comparing design hypothesis factors with a large number of respondents, testing for one or a few usability factors at a time.” What is typically used is an “m by n factorial design with y independent variables, the results of which are subjected to statistical tests for significance.” (Hartson & Pyla, p. 430). These tests are undoubtedly scientific, and can surely produce interesting results, but there are situations that complicate these matters, also in my own research. Some research projects may be so new and innovative that the design process yields results that may be valuable additions to the knowledge base. Furthermore, Hartson & Pyla’s view of science seems to be one where only statistical evidence matters. Many disciplines use other methods and other kinds of evidence. Qualitative results may be the only possible results, or the only valid results, from several experimental projects. It stands to reason, for example, that a location-based project must be tested *in situ*, and not in a usability lab, if one wish to get to the very heart of the location-based experience. Localities are by definition local, so local variation is part of what must be taken into consideration in locative writing. Only when many such site-specific considerations are summed up, can one hope to formulate theories of general principles of site-specific texts, which can be the basis for testable hypotheses.

There is also a pragmatic element to these guidelines: Although they were gathered in the pre-production and production phases of a project do we think that they contain some experiences that can benefit other designers. We strongly believe location-based audio systems will be better when these guidelines are followed than if they are broken. Of course we may be wrong in this, but a demonstration of that, either in theory or in practice, will be a research result in its own right. That kind of knowledge is arrived at much faster if we disseminate our results now, as it allows more research teams to test our principles. And, to be frank, it is more likely that others will find our mistakes than that we should realize them ourselves.

So to the ninth and tenth principles, on “synaesthetic parallels” and “aura.” This was the very idea of my own media design research project from the outset. It came from my own interest in music history. As a tourist in Rome and other old European cities, I constantly found myself thinking about what kind of music was performed when a building was built and put to use. Modern mobile media makes it rather simple to bring the music back to a

place. A modern phone can use its positioning devices to find which building I am in, and download the proper music files from the Internet.

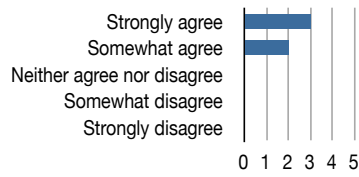
In the MUCH project, we built this service, to test how bringing historical music back affects a visitor. We wondered if the combination of music and space with the knowledge that the two were historically linked would give an experience of “aura” in Walter Benjamin’s sense. A special feeling of being in bodily contact with this art—even if the performance of the music is not present.

The preliminary results seem to support this idea. Our five evaluators were asked to rate the service on a survey where they judged 11 questions on a 5-point Likert scale.

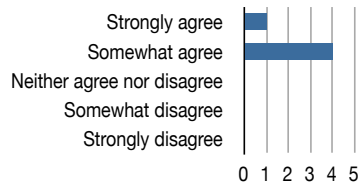
What was most striking was that they all gave a 5 (strongly agree) to the statement "It was exciting to be present where the music was first played". Five users are not a lot, but we in the design team felt this as a strong encouragement to continue the project. There were less unison feedback to questions about the combination of music, music history, art, and architecture, but as all the users were positive towards the service, we have interpreted this to mean that the synaesthetic parallels work as intended.



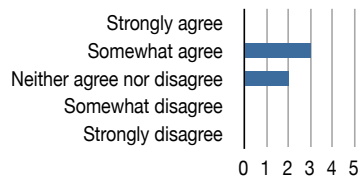
**«The music made me experience the church differently»**



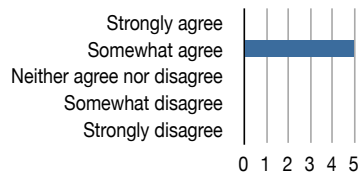
**«The narrator's comments made me experience the music differently than I otherwise would»**



**«I feel I understand the history of the church now»**



**«I learned something about music history»**



We also conducted qualitative interviews with our evaluators after the test, and also in these conversations was it the “aura” effect that was brought up. The testers had really felt that it had an impact on their experience that we played music that composers wrote to be performed at the very sites we were on.

Still, I can't get rid of a feeling that we might just be looking for indications that the users liked what we hoped they would like. That they have similar tastes as we do, and that the system we are proud of can be considered a success. But popularity is not success in research, knowledge is. I believe, however, that we need other methods to learn more. In the following, we will devise more experimental testing, do more semantic testing, and open for peer review.

In the initial version, we have put much work (perhaps too much) into making good texts, bringing a radio genre of classical music communication into locative media. As the first narrow prototype was successful, all the texts have been made following this template. For later tests, we will change this,

and make the texts more different. If we can analyze our own texts and find their rhetorical figures, then we can construct texts that are systematically different, and test their effect with evaluators. When we, in St. Peter's cathedral, point out the structural similarity between Michelangelo's architecture for the church and Palestrina's phrases, we could in other churches avoid such similarities. Researching this will not only test whether one is better than the other, but also if listeners are able to discriminate between the two kinds of writing. Will they notice a difference? It is also a question whether Likert-scale surveys are a sufficiently fine instrument to capture such nuances. It might be that it is only in qualitative interviews that we can find if there were different experiences and what they were like. Another question to be considered is whether we should ask the same users to test several texts, or if this only will wear them out. Maybe will also the experiences of the first text bleed into the second, so the results become less precise. If we use different evaluators for different texts, on the other hand, it is a question if the differences between the texts are larger than the differences between the evaluators, or if some will say they like one version, while others like the other. Likert scales are often used to compare across test sites and testers, but I have my doubts whether we will be able to validate a survey attempting to measure such fine nuances as these.

Krippendorff (2006) has, in his argument for a science of semantic design, argued for *interpretative validity* as a support for design claims. He argues that designers should use a combination of qualitative methods to enquire into stakeholders' (for example, possible future users of a product) concepts and motivations. Which words are they using to describe what they appreciate? Which narratives do they construct when describing what they would like to do or experience? These concepts should be analyzed and should inform the design process. When evaluating a product, the words used to talk about the prototype can be compared to those in the initial study. It would be an indication of success if the concepts found in the two studies are similar. These ideas can be expanded on in our tests. After users have tried out the system, can we ask them to describe the system and how it felt to use it. These stories can later be analyzed to find indications of the effects of different locative texts.

The third way of evaluating is the simplest and oldest. We can ask other designers of locative audio, and experts of the topic area, music history and architecture in our example, to evaluate our system, much like we have done in our survey of other systems. This is how novels are made, when authors submit manuscripts to critique from editors in the publishing house, and all

academics are used to peer review. This should be used for location-based systems also, as designers and scholars have experience both in seeing what is effective and what is not, and in expressing differences in location-based systems.

### *Conclusion*

This paper has presented ten guidelines for location-based audio, resulting from a mix of different research methods. Qualitative methods have proven important when we have considered the relative merit of these and other methods. Quantitative, experimental methods are the gold standard in many design disciplines today. For medium design, however, dealing with texts and human meaning, are qualitative methods from the humanities an absolute necessity, if we are to gain any deeper knowledge than assessing that a system “works,” meaning that users are able to listen to and understand sound clips at certain places.

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