

Mapping Fabrics to Music: Lessons Learned

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Abstract: The original aim of the Interactive Quilt project was to create an intuitive tangible interface, which was at the same time a beautiful object. The idea was to create a patchwork quilt that worked as a jukebox; the fabric of each patch being mapped to music genres to give the user a clue of what type of song would be played when touching a patch. From several user tests we found out that mapping fabrics to music is hard to do due to the highly subjective qualities involved. As a result, this forced us to leave our initial, HCI-oriented view behind to instead explore the qualities of ambiguity and calm technology. This gave the project an entirely new angle, and resulted in many new insights regarding the comprehension of fabrics and music, the qualities of exploration etc. In this paper we present our entire design process and our findings.

Keywords: Ambiguity, slow technology, tangible interface, the Interactive Quilt, fabrics, music.

1 Introduction

Various quilting techniques are a part of the cultural heritage in many different cultures. The history of quilting evolves from 3000 B.C. into the 21st century. Quilted objects have been used in lots of different contexts; as altar hangings made in patchwork style out of votive gifts, as padded shirts worn as an undergarment beneath chain mail to prevent chafing, to create fashionable effects in clothing, as folk art to create everyday objects, as Civil War mourning quilts etc.

Hence, to sew a patchwork quilt of old cloth and fabrics is a traditional way of preserving memories. Every patch contains and may trigger different memories when you look at it or touch it. Within the Interac-

tive Quilt project we wanted to keep these qualities but instead of using old fabrics, already containing memories, we used new ones, wanting them to contain different songs and music as a new way to create emotional relationships to a piece of fabric. To achieve this, we turned to modern technology.

1.1 Enabling Tangible Interfaces: Ubiquitous Computing

The concept of ubiquitous computing, also known as pervasive computing, was founded by computing pioneer Mark Weiser in 1988. (Weiser 1993). He foresaw a future where each person owns, uses and accesses many computers in his or her daily life, mostly without



Figure 1: Testing the Concept in a Wizard-of-Oz-test.



Figure 2: The Final Outcome; The Interactive Quilt.

thinking about it. These computers could, and should communicate with each other, and gather input via sensors etc, to be as easy to use as possible; in Weiser's vision computers would disappear, becoming an extension of the human mind. Computational power should be everywhere; quiet, calm, disappearing, automatically within reach when needed. In practice this means taking the computational power out of the computer so to speak, putting it into almost any kind of item; toys, houses, clothes, art etc. – even quilts.

As a consequence of this Weiser and Brown (1996) introduced the concept of Calm Technology, which has the ambition to smoothly integrate digital information into everyday objects, continuously feeding us with information in the periphery without demanding anything from us, not even conscious effort.

As for the historical quilted items, they were – and are – not only used for practical use, but also for expressing emotions and creativity. The fabrics used in the quilts reflect when and where they were made, and perhaps by whom. Thus, the quilts communicate a lot of information – but it is not easy to grasp. How can such subjective and fuzzy qualities be incorporated in a streamlined, user-friendly interface? Or, do they fit within the boundaries of Calm Technology? Perhaps not, but isn't there a need for these kinds of expressions in the computer technology of the 21st century?

1.2 Slow Technology and Ambiguity as a Resource for Design

Hallnäs & Redström (2001) have introduced Slow Technology; a design agenda for technology aimed at reflection and moments of mental rest, rather than efficiency and performance. They claim that since computer-augmented objects are leaving the science labs to become a part of our everyday environment, there is a need for objects that challenge our intellects if we want to be challenged; if not we might still use them or simply ignore them, but one of their main purposes is to stimulate reflection, thought and exploration. In this sense, Slow Technology is the opposite of Calm Technology.

Gaver et al (2003) present a similar line of thought when arguing that ambiguity in a system may be a virtue, when the goal is to create designs that are engaging, inspiring and/or thought provoking. They claim that ambiguity may occur as ambiguity of information, of relationship and/or of context, the latter alluding to when items can be understood using different contexts, each suggesting a different meaning. One way to achieve this is to create objects that are not clearly one type of object but rather a merger of two or more, making it impossible to classify it as being one or the other.

2 Concept

The main focus for the project was to investigate what it would be like to build some everyday technical functionality – e.g. recording and listening to messages, playing music etc – into something soft and cozy. It was still supposed to be very intuitive, and in addition we wanted it to have a pleasing appearance. We decided to work with music in combination with a patchwork quilt, since a quilt traditionally contains information like memories, and can be beautiful in addition.

However, an interactive quilt can be used in lots of different context. To narrow down the scope we decided to focus on a quilt hung in public spaces, like a café or a waiting room. The basis for this decision was that both textile decorations and background music are common in such places.

It was important that the quilt could be customized and personalized, since one of the main ideas is that the quilt is going to reflect its owner or the place where it is hanging. The collection of songs could hardly be the same in a waiting room in a hospital as in a hip café. Also, the quilts could have different shapes and different combinations of fabrics.

This resulted in the Interactive Quilt, which is an alternative jukebox. Made out of pieces of different fabrics, framed and hung on the wall, with two obvious loudspeakers connected to it, it is an inviting, somewhat mysterious decoration in a public space. It lacks visual buttons, lists of songs etc. Instead, the type of fabric, and/or its color, and/or its tactile qualities are used to give a hint of what sound the user may expect to hear when pressing a certain patch.

3 Design Process

The design process of the Interactive Quilt started with trying out how to map different fabrics with different genres of music. Thus, we performed a test where eight people individually were asked to associate twelve different fabrics to musical genres. They were also encouraged to touch the fabrics to feel the structure of it. They only agreed significantly on two fabrics; a piece of denim (jeans) that was said to represent rock, and a brown-white, somewhat fluffy fabric which reminds of cow skin and thus was associated with country music.

We also conducted a second test with six additional fabrics, where another four participants again were asked to associate freely after which they were presented with a number of categories and were asked to pick out the fabric they thought fitted best.

To test the concept of touching a quilt hanging on the wall, we ran a Wizard-of-Oz-test (see Figure 1 on the first page). Nine square pieces of foam rubber were

covered with the fabrics most significantly associated with a certain genre of music; this was to give an impression of soft resistance and that the patches were pushed inwards. They were then mounted on a wall with loudspeakers next to them. The test was conducted with four people, one at a time. They were told to imagine that they were sitting in a café, trying the Quilt out. Whenever they touched a patch the Wizard started playing a song corresponding to the genre.

From this test we learned that different fabrics seemed to be more appealing than others; for example a white fluffy one seemed to be very tempting to touch. Often the participants were a bit restrictive at first but when they understood how the quilt worked they kept pushing every patch at least once. However there was great confusion about the connection between musical genres and fabrics. Not all users understood that the fabrics represented genres. Many of them pressed the same fabric a number of times, trying to build a conceptual model of what the quilt was "doing". In addition the users' perceptions and conclusions highly depended on which songs that were randomly played in each category.

3.1 Final design decisions

The results of these tests were somewhat disappointing. Yes, we had found some fabrics that were quite strongly mapped to a music genre, but most mappings were unclear and ambiguous. For instance we had a fabric that had imprints of round, water polished stones. Some people clearly associated this with water and beaches and proposed genres like ambient music, instrumental music etc, whereas others related to the stones per se, thus suggesting hard rock, industry rock etc. Another problem was that the fabrics that worked best from a mapping point of view didn't look or fit very well together.

We struggled for quite some time with this problem, experimenting with semi-covering the fabrics, giving different patches different sizes or putting them as lone "islands" on a larger, neutral, piece of fabric etc. In the end we decided to make the quilt more of art by turning it into a framed picture, and in addition go for a vulgar and kitschy impression instead, using a heavy golden frame and golden loudspeakers decorated with plaster angels. If we couldn't make it beautiful, why not go all the way and make it very, very ugly?

3.2 User testing the Interactive Quilt

Two tests were made with the full working prototype (see Figure 2 on the first page). First the Interactive Quilt was put in a hallway at the IT-University in Gothenburg where the music drew people to the site,

and where they willingly interacted with it. After this, it was displayed at a regular café in the centre of Gothenburg. Here, people were looking and seemed interested in the quilt, but would only come up to try it out when we asked them to.

From both of the test situations we found that it seemed to be a surprise to the users that the quilt played music. After a while they discovered that each patch contained several songs, which astonished them. They also noticed the connection between the fabric and the different styles of music. Although it still wasn't obvious to them which fabric was associated to what music, but it didn't seem to matter, instead they explored it. They often pushed the squares to change songs. A few users touched a fabric, listened a few seconds to the song, and if it was acceptable to them, they backed a few feet and stood listening and looking at the quilt.

4 Construction

The Interactive Quilt is a quite solid construction, having most of its components mounted upon a solid board. The only loose parts are the loudspeakers and a computer. It consists of nine patches, which are not sewn together; in practice they are simply large buttons. Each patch is made out of the actual fabric, mounted on a plexi glass plate with a thin layer of foam rubber in-between to give a nicer feeling. The plexi glass is there to divide the pressure, so that it doesn't matter which part of a fabric you press – the plexi will transfer the pressure and make it even.

Each such "package" rests on a number of foam rubber cubes that add some resistance when pressing a fabric, and keeps the "package" from touching an underlying switch, unless pressed by a user. These switches – one for each patch – are connected to a BX-24 micro controller that sends data to a Visual Basic program in a computer. This program picks a suitable song and plays it. The songs are placed in nine folders, one for each music genre, i.e. patch. If a patch is pushed before the end of the current song, a new song is played immediately.

The construction is very stable. It has survived several exhibitions and demonstrations and has been up and running for several months at its present location.

5 Discussion: Lessons Learned

As mentioned several times already, we had problems when it came to mapping fabrics to music genres. Another problem that suddenly surfaced when we were

hunting for songs to the various genres we had chosen was that we ourselves had different opinions on which songs belonged to which genre. This gave us a clue to why the users had such problems with understanding that the fabrics symbolized music genres. It was clear that the three subjective dimensions involved (the comprehension of songs, genres and fabrics reflectively) worked together to create a highly ambiguous interface, something that we perhaps should have foreseen. Another lesson learned was that of creating a beautiful object. We should of course have considered factors like beauty when choosing the initial fabrics, as well as making sure that they all matched each other. However, this interfered with our attempts to create clear mappings. In addition this would have left us with *four* subjective dimensions; adding the comprehension of beauty to the list; a complex equation, to which it would be hard to find a generally applicable solution for any one HCI-expert.

Initially we had been very determined on clear mappings, but in the end, the ambiguity and the “slow” qualities of the Interactive Quilt turned it into a much more interesting object. Apart from the subjective qualities of the fabrics and the music, it also fulfills another of Gaver et al’s (2003) suggested ways to attain ambiguity; it is a merger of two objects, being neither a jukebox/stereo nor a quilt but a mixture of both. It definitely has slow qualities in the sense that its users have to – and wanted to – explore it to get to know it; discussing it with each other. *We* saw it as a problem that the mappings didn’t work, but none of the *users* complained about this. They just happily played on! This was a huge reward for us and made us feel that we had managed to create a good interface, however not as intuitive as we aimed at from the start.

It should be mentioned that most of our observations have been made in rather artificial test situations, which may have affected the users’ behavior. For instance, they pushed the squares often to change songs. This may have been because of the test situation, but could also be an indication of curiosity; which song would be played next? Later, rather informal observations during parties and gatherings in the space where the Interactive Quilt is presently hanging indicate the latter.

If we were to build a second version of the Interactive Quilt today, we would probably focus more on its appearance, rather on the mappings, since they didn’t work out very well, however not abandoning them altogether. The thoroughness of the mapping needs to vary depending on where the Interactive Quilt is to be used; if being someone’s personal quilt it could be

extremely customized, but in a more public place semi-logical mappings might still be preferable.

A good idea might be to have the fabrics and songs represent emotions rather than music genres. Other ideas worth exploring is to use fabrics of only one color, but with different structures, or having patches of different sizes or other shapes than squares, the form of the Quilt itself etc. Another possible change would be to have the Quilt play all the songs belonging to a genre in a randomized order, so that it doesn’t have to be pressed again as soon as a song ends. This would definitely be preferable if the Quilt is hung in someone’s home, serving as an alternative stereo.

6 Conclusions

We have built the Interactive Quilt, a framed quilt that serves as a jukebox; whenever a patch of the Quilt is pressed a song is played. Our original idea was that this interface should be natural to use in the sense that the fabrics should communicate quite a clear notion on what music would be played. However, this did not work out very well due to the highly subjective dimensions involved; the comprehension of fabrics, songs, genres etc. On the other hand, it turned out that the ambiguity of the interface became a strength; encouraging people to use, explore and reflect upon it. We are satisfied with the project and its outcome.

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