ILLUMOODINATION

Digital Representation of Ambience

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This report describes the process and results of redesigning an existing situated information system for Studenterhuset, which supports digital representations of the mood of the bar at any given time.

This includes collaborating with other groups designing desktop and mobile founded systems respectively. The approach of the project focuses on designing and evaluating different designs, preferably in-situ.

The primary findings of the project is the creation and use of a framework. The framework consists of a three-dimensional cartesian coordinate system with three parameters: Crowdiness, Atmosphere and Activity. It is from these parameters we define and understand the mood. From this framework we have build a system that takes these parameters and turns them into light according to a color representation. Thus, representing the current mood digitally.

Preface

This project is done by the project group B501a on the 5th semester Informatics study at the Department of Computer Science, Aalborg University. The project period stretches from the 2nd of September to the 20th of December 2011. The theme of the project is Emerging Technologies.

The report introduces the task and scope of the project, followed by a somewhat cronological description of the developmental process. Finally, it reflects upon the process and findings, and puts the project into a perspective, in order to determine the feasibility and possible future of the concept developed.

Citations are given using the Harvard system of referencing. The source code for the microcontroller and the scripts used in the final design can be found at `http://theheat.at/source`.

We would like to thank Studenterhuset for their cooperation in conducting this project, and for allowing us to use their facilities in our design and development process.

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CHAPTER 1 ─────────────────────────────

─────────────────────────── INTRODUCTION

1.1 Introduction

With this project we intend to tear down some of the boundaries between the *virtual world* and the *physical world*. We want to weave these two realms seamlessly together and allow our users to traverse them effortlessly. We find this a very interesting topic to work on, because it is not an easy task to translate something manifested in the physical into something virtual [Vetere et al., 2005].

In this report we will be working on digitally representing the current mood at Studenterhuset, a local bar intended for the students in Aalborg. In doing this, we will be exploring how to make a correlation between both the physical and the virtual world, and test how users perceive it. Furthermore, this system will be a subpart of a bigger system, with the intention of being part of a digital ecology[1]. Other parts of the ecology will consist of a mobile webpage, a desktop webpage and a projector situated at Studenterhuset. All of these systems will be relying on each other to create a uniform experience across the different platforms. The goal is to make the users feel like they are a part of Studenterhuset, no matter the context they are currently in.

We intend to work very dynamic and adaptively with the development of the system. This means that we will be developing in a quick and dirty manner, with emphasis on gaining contextbased user feedback early on. The testing and refinement of this system will all be done *in situe*. Testing and designing the system at Studenterhuset means that we, hopefully, gain a deeper understanding of our users and it allows us to design for specific situated interactions, that would be impossible to recreate in a lab. Furthermore, this dynamic approach to design gives us the ability to adapt quickly to the users and the various conditions that may apply to their context [Paay and Kjeldskov, 2008].

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[1]A concept presented by Jesper Kjeldskov in the aHCI course, further explained in section 2.1.1.

1.2 Study regulations

According to the study regulations[AAU, 2011], this project should introduce the concept of working with new and emerging technologies, including developing interaction designs, in order to be innovative.

The project will make use of the teachings in the course: *Advanced Human-Computer Interaction* (aHCI).

At the end of the project, the goal is to be able to show:

- How use and development of new technologies affect IT development in general, including interaction design.

- The challenges regarding use of new technologies in IT development.

- The considerations and use of techniques, when designing with new technologies.

- The considerations and use of interaction design, when designing with new technologies.

1.3 Problem statement

As stated by the study regulations, this project is about designing and working with new and emerging technologies. The initial task was defined as: "Redesign the mood system at Studenterhuset". The mood system is the product of a master thesis and it uses a variety of parameters, set by the bartenders, to give a representation on how the current mood is at Studenterhuset [Christensen and Møller, 2011].

With this in mind, we will not just be modifying the existing system, but instead design a completely new system, utilizing new technologies, which will be fulfilling the same purpose as the old. Therefore, a logical starting point for the project seems to be the research questions defined by the project group behind the master thesis [Christensen and Møller, 2011]:

- How can ambience be represented and conveyed digitally and what can such a representation facilitate in regards to user experience?

- How can humans be the providers of contextual information about ambience to context aware systems?

Furthermore, the task includes collaboration between the three project groups, with each group focusing on a different part of the overall system. This project focuses on the situated representation of the mood. To represent the current mood at Studenterhuset, the overall system will be combing both the physical room of the bar and the virtual room

of the developed systems.

Studenterhuset is not your average bar. It supports a wide range of uses besides just drinking and listening to loud music. Both people looking to socialize, and people just wanting a cup of coffee while they study can be found here. It can therefore be assumed that the mood may be more divergent than in regular bars and cafes.

When combining the initial research questions with the limitations of this project, the following question comes into mind:

> *"How can an IT system utilizing new technologies be designed and developed for the location of Studenterhuset, in order to show the current mood at the bar?"*

Therefore, given this problem statement, key issues of this project will be:

- What is "mood"?

- How will users interact with the system?

- How will the system converge with the systems of the other groups?

Thus, answering these questions will be an important consideration, along with the creation of an interaction system design using new or emerging technologies.

CHAPTER 2

METHOD

2.1 Introduction

This chapter explains how we intend to work with the problem area and describe the different tools and techniques utilized in this project. It is heavily influenced by the fact that we have not previously worked with emerging technologies or worked closely together with other project groups to achieve a common goal. The goal being to implement a series of systems, which together plant the seed of a digital ecology. Because of this, many of the results presented in this report are a product of an *ad hoc* approach. Because of this, we anticipate that miscommunication or other problems may arise, which is why we dedicate a section in this chapter to explain how we intend to work together with the other groups to ensure that potential problems will be kept at a minimum.

2.1.1 Digital ecology

In the aHCI course, Jesper Kjeldskov introduced a new concept referred to as *Digital Ecologies*. In our understanding, the term covers a growing tendency among software developers. Jesper introduced us to companies such as Google and Apple, who no longer develop systems in a vacuum, but rather develop them to be an individual part of a bigger system portfolio. When used in conjunction these systems facilitates the emerge of an ecology. For us, this further emphasizes the need to work together with the other project groups and it stresses that we cannot create a digital ecology, only facilitate the creation of one.

2.2   Development

In this project we work with emerging technologies and by that definition, we assume that there is not yet a best practice on how to work with them. As of such, we do not follow a predefined approach in this project but rather try out a lot of different techniques to find one that suits our needs. Furthermore, we are working together with the three other project groups to support a digital ecology, which is also something we have had no previous experience with. Our developmental approach will seem somewhat unstructured, as it has to be highly adaptive and dynamic to take into account that our understanding of the problem area can change from one moment to another, as new problem areas become apparent.

Because of the undefined approach, we structure our work around three criteria that have been set by the semester coordinator at the beginning of the project:

- Get something down there fast

- Study it in context

- Redesign accordingly

Therefore, our work throughout this entire project revolves around getting something set up in context and then see how the users respond to it. Instead of investing a lot of time theorizing about the users' perception of the system, or the different ways they might interact with it, we simply set it up in the right context and then observe the users and their interaction with the system. We will use these observations and the feedback from the users to determine whether or not the concept is working. This is a very important point in this project, as we emphasize on trying out a lot of different concepts in context to get feedback. When we find a working concept, we will begin to augment it in context, based on the data collected from the users. We intend to work very dynamic and want to be able to make changes to the system in an instant, to accommodate new additions to the system or to abandon features that are not working. Even though we intend to work in this way, we will still be following distinct phases to provide at least some structure to the project. These phases are not to be seen as independent and will not be used in a specific order. Rather, we will be incorporating them at any time in the developmental process.

2.2.1   Concept development

This is the idea phase of the concept development. Here we make use of different tools to explore new concept possibilities or work on already established concepts that need tweaking or reworking. We will be combining both context dependent techniques as well as inexpensive, rapid developmental techniques, which are all described in section 2.3, to quickly come up with ideas and concepts that we will be able to test *in situe*. This

idea generating phase will provide us with plenty of paths to explore and serves as the foundation for further work. Most times this phase will not start from square one but rather from some working parts of other concepts.

2.2.2   Evaluating and augmenting the concepts

The developed concepts will be taken to Studenterhuset to see how they are perceived by the users and to see how they interact with them. We will gather this information from the users through the means of interviews and observations. It is on the basis of this information that we intend to find out whether or not the concepts are working, and if the users are even able to understand them. If we find that the users are not getting what we are trying to do, we will analyze the problem to discover exactly where we went wrong, and if there is at least some part of it that is working. This analysis will take place in real time at Studenterhuset, as opposed to taking all the data back home and work on it there. Being present at Studenterhuset, while analyzing the potential problems of our concepts, allows us to quickly make adjustments, and fine tune accordingly, which gives us the freedom and highly adaptable developmental process we want. The idea is of course that the concepts or parts of the concepts, which users respond well to, are moved to the next developmental iteration, thus starting the process again.

2.3   Tools

This section describes the different tools and techniques we utilize in the project. Additionally, we explain why these tools have been chosen, and what we intend to use them for.

Body storming

Body storming is a brainstorming session that is being conducted in a specific context relevant to the problem area [Oulasvirta, Kurvinen and Kankainen, 2003]. We make use of body storming to come up with ideas, that take the context specific problems into consideration, and to get a deeper understanding of the environment, in which our system has to operate.

Sketching

We use sketching to quickly visualize ideas and to explore new possibilities. These sketches allows us to crank out an abundance of different design and concept ideas for the system, quickly and inexpensively. As an added bonus, the sketches are open for interpretation, which may lead us to yet unknown designs and ideas [Olofsson and Sjölén, 2011].

Paper prototypes/Mock ups

Sketches we find interesting are turned into paper prototypes or mock ups. These enhancements of the sketches aim to give every member of the group a common understanding of the concept and to add more information about the concept than is possible with a sketch. The prototypes make the concepts more tangible, thus allowing us to gain further insight about it [Ehn and Kyng, 1991].

Association board

To help generate ideas, we make use of association boards, which are walls or blackboards we fill with pictures and small decriptions, that we associate with a specific topic. The association wall serves as a source of inspiration and it helps us get a broader understanding of the problem area. Furthermore, the association board provide us with a steady stream of paths to follow and concepts to explore throughout the project and it is our guarantee to never run out of steam. An example can be seen in appendix B, which illustrates a concept we were introduced to at the GoTo conference in Aarhus.

Workshops

Because we are designing a system that is to be a part of a digital ecology, we will attend workshops where we collaborate with the other project groups to help combine our different ideas into a common theme, that is visible throughout the entire ecology. Also, these workshops will be used to get a common understanding of the entire ecology and insight into what the other groups are working on.

Interviews

We will use interviews to gather qualitative data on how the users perceive the system. The interviews will also be used to get information about which parts of the system the users repond well to, and which parts that need further tweaking or a complete reevaluation.

Observations

We will be observing the users and their interactions with the system at Studenterhuset, to further deepen our understanding of both the system and the users.

2.4   Collaboration

This project is not just about the techniqalities of creating systems, it is also an exercise in collaborating with other project groups. The other groups will be working with a mobile website, a desktop website and a projector, which will be stationed at Studenterhuset. The plan is to integrate all these coherent systems into one big system; one might call it a system of systems. One of the key points of the project is to make these systems integrate seamlessly, in order to create the feeling that these systems are indeed meant to operate together, and each of them should provide some useful functionality to the users. That is, even though the systems will be covering different use situations and operate on different platforms, we still want the users to be aware that they are not just using four different, independent systems but rather small facets of a larger system, a digital ecology. To help achieve this goal and avoid these systems being created independently of each other, we want to make sure that the communication and coordination between the groups are working optimally. This section describes how we intend to organize the work and how we will be coordinating with the other groups.

2.4.1   The blog

We have agreed with the other project groups to utilize a blog to keep each other updated on the work currently being done in the different groups. Whenever new discoveries are made or breakthroughs are being done, we will make a post on the blog and discuss it with the other groups. Furthermore, the blog will make it easier for the coordinators to keep track of what the groups are currently doing and how the systems develop, which in the end will help them, help us. We were initially presented with the option to use *Moodle* as the platform to exchange information with the other groups. However, we discarded that idea, because the blog provides us with more options to embed pictures, videos and hyperlinks, which will make it easier for us to explain and show our ideas. Finally, the blog provides us with a greater deal of flexibility and has more customizable options, which we find attractive. The interested reader may find the blog at `http://www.inf5blog.tk/`.

2.4.2   Meetings

Even though the blog provides us with informations about the work of the other groups, we still regard it as a secondary way of communication. We do not believe that it is possible to catch all of the little details, or get a precise image of what the other groups are trying to do, with the blog alone. To make up for this, we will have a series of meetings, each with their own specific purpose.

Cross group meetings

These are meetings that will be attended by all of the four project groups. Their purpose is to discuss where we currently stand and what we should be doing next. At these meetings we will be coordinating the work in the project groups, and especially the work

that needs to be done across the different groups. The meetings give us the ability to present our current ideas to the other groups and allows us to discuss them. Furthermore, the meetings will be used to coordinate work that spans across the group and to discuss how we should integrate parts of the different systems into each other to create a sense that these systems are part of a larger whole.

Internal group meetings

To coordinate the work internally in our group, we will start each week with a monday meeting, where we will set some goals for the following week. Then each friday we will evaluate on the work that was done and discuss whether or not we have reached all of our goals. In previous semesters we have been working with the agile development paradigm. We are trying to draw upon some of their practices to structure our work. Because we intend to be working very dynamic and highly adaptive in this project, we believe these meetings to be necessary in order to keep track of progress and tasks that need to be done.

Joint meetings and workshops

As the projects develop, the project groups will be attending workshops held by the project coordinators. These workshops aim to give a common understanding of the digital ecology that is forming and to streamline the different design ideas so that they complement each other. Additionally, the workshops will also be used as think tanks for new design ideas, use situations and interaction designs. Joint meetings between the project groups and the coordinators will also be held and these will be used to keep track of progress throughout the different groups and to discuss potential problems.

CHAPTER 3

DEVELOPMENT

3.1   Introduction

In this chapter we will be describing the developed ideas and concepts for the situated system, which have been suggested and worked on throughout this project. As we delved deeper into these ideas, our understanding of the problem area changed and this understanding eventually lead to the construction of a framework for the project, which our final system is based upon. To emphasize the importance of this framework, we will start out by explaining what it is and how we ended up using it. In order to draw a complete picture of the entire design process, we will then describe the different suggestions that came before the creation of this framework and explain how our understanding of the problem area was at that moment in time. We document it in this way in order to help the reader get a better understanding of how each of the suggestions have added to our final understanding of the problem area, and how each explored idea have moved us forward, towards the final framework and system.

In addition to describing the different ideas we have been working with throughout this project, this section also explains how we have been collaborating with the other groups and how their ideas have impacted ours. The initial ideas of the digital ecology of the overall system was expressed in a couple of sketches at the first joint workshop in the middle of September, as shown in appendix A.3. The spontaneous ideas of how to use each part of the overall system is shown in the sketches of appendix A.1.

3.2   Framework

3.2.1   Introduction

We will now introduce the colour framework. We start out by presenting the framework in its latest, finalized form. Afterwards, we walk through the development process that came before it chronologically. This idea of summarizing our work into a framework came quite late in the project process. It is quite interesting to see how all the work throughout the project actually draws upon the framework, even though it was first developed at the very end. This, we feel, can only be explained by a mutual implicit understanding of mood, shared across the group. With this in mind, we looked back at all our work, and saw how the framework slowly manifested itself in our different design ideas. For each of the concept ideas we will describe how they contributed to a further understanding of the framework. It is essential to understand that the framework draws inspiration from Jesper Kjeldskov on how to define mood as a colour.

3.2.2   Model

The framework model is a three-dimensional coordinate system, which uses the parameters: Crowdiness, Activity and Atmosphere. The original framework used in the master thesis, uses five parameters to define mood [Christensen and Møller, 2011]. These can be seen in figure 3.1.
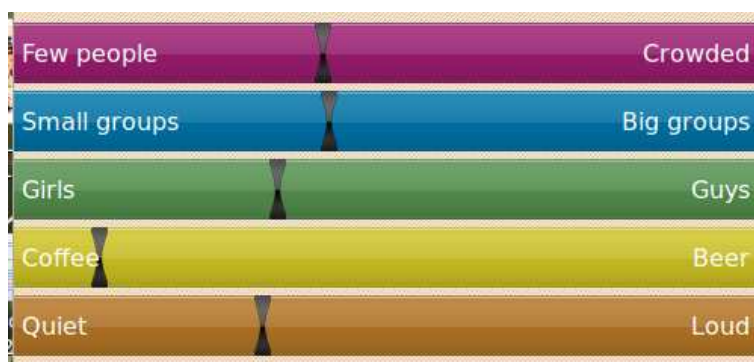

Figure 3.1: *The former mood parameters.*

Our framework is as an abstraction of this and we use colors instead of the sliding bars to represent mood. The colors change according to a coordinate in the three-dimensional coordinate system, which corresponds to an RGB-value, as shown in figure 3.2. Each of the three parameters represent a base colour. Crowdiness is red, Activity is green and Atmosphere is blue.
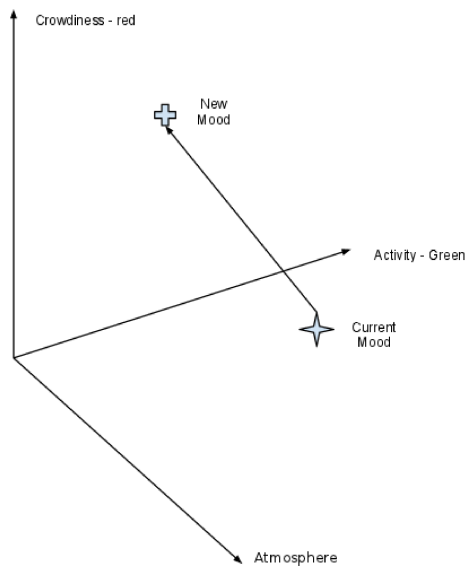
Figure 3.2: *The final version of our framework model.*

This model represents our understanding of "mood" and relies on the basic idea, that at any given time we can define the mood at Studenterhuset by pointing to a specific place in the coordinate system. The three parameters we use to specify this exact point are derived from the framework utilized in the master thesis. Whenever the mood changes from one point to another, a factor, time, defines how this transition is done.

3.3 Design ideas

3.3.1 Lighting version 1

The first idea of a situated system to represent the mood, was some sort of coloured lighting of the building. Already at the day of the project introduction, illuminating the facade of the building was presented as an idea. The idea of illumination was also the reason why one of the project groups changed name from "Display Group" to "Situated Group".

During the first design workshop, several ideas of representing ambience as a colour came to life. One of them was to illuminate the front of Studenterhuset with a projector. Later on, this idea was further supported by a guest lecture in the aHCI course, held by Jonas Fritsch. He showed us several ways of using a projector as a way of transforming a fixed structure into a dynamic and living thing.

He had been working on making "Holger Danske" (Holger the Dane), a historic statue situated in the catacombs of a castle, come to life. What really caught our attention,

was that he had actually faced many of the same challenges as we do. For instance, he made a system at Roskilde Festival, where the colour on a container changed according to peoples t-shirt colour. When told, people were absolutely thrilled by it, but they were unable to establish the connection between shirt colour and the container colour by themselves. This made us realize the importance of focusing on making users understand the connection between them and the system.

With this lecture in mind, the idea at the joint design meeting was to use a projector to make different shapes and colour on the facade. However, this formed a problem. To illuminate things outside, two factors come into play: Light intensity and distance between projector and the facade. We found that the amount of ansi-lumens, indicating how bright the projector is, have to be well above 4000. This means that the projector would be very expensive. This, combined with the fact that we do not have a clear product goal, means that we are not even certain that a illuminated front is the right solution. Therefore we choose to move the projector inside and focus on evolving the physical world into the virtual. To see how different light settings would influence the different areas, we made a small mockup of Studenterhuset, as shown in figure 3.3. The mockup was placed upon a computer monitor, to simulate indoor lighting.
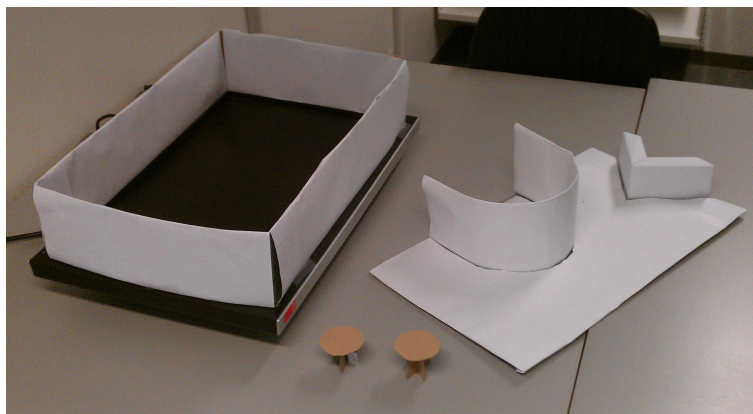

Figure 3.3: *Picture of a mockup papermodel, with an underlying monitor to simulate inside lighting in Studenterhuset.*

Seeing as the computer monitor can replicate most colours, we could replicate many different light themes. The real breakthrough came when we combined the idea of using a projector on the wall with different coloured light themes. The projector along with the mockup can be seen in figure 3.4.

In order to be a part of the overall system, the lighted colour could be included as part of the theme of both desktop and mobile systems. By using the same variable colouring in all parts of the system, it should be possible to make a uniform overall experience of the complete system.
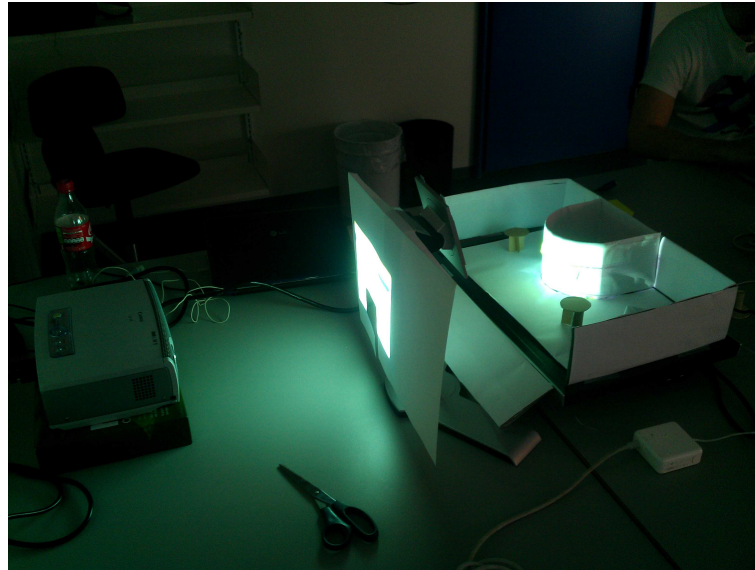
Figure 3.4: *Picture of the mockup model, with a projector showing an image on the center wall of Studenterhuset.*

3.3.2 Silhouettes

Based on the first concept of lighting, a more vivid representation of the mood, especially crowdiness, came to mind. It was suggested that a video stream of the bar should be processed to make silhouettes of the people present, and then integrate these silhouettes in some sort of visualization, based on the sound level, as seen in different media player software. Furthermore, virtual generated silhouettes could represent visitors to the web-page developed by another project group, along with active users on mobile devices, thereby combining the physical and the virtual room of the overall system.

In order to design a system showing silhouettes, the previous described mockup of Studenterhuset as a doll house, with a screen underneath, was modified to allow for a projection on the wall. Several different programs were used in an attempt to show real time processed silhouettes, as shown in figure 3.5, overlayed with visualization. However, none of them were able to fully produce the desired result. In order to test the concept in-situ, it would therefore be necessary to use recorded video clips of different crowdiness, to see how it would perform in context. Examples of such videos can be seen on the blog.

A mockup of the concept can be seen in figure 3.4, where visualization is projected onto the center wall of the model of Studenterhuset. Users are passively influencing the system, by just being present, without necessarily being aware of how they affect the system. The system does not determine any specific mood. Rather, it forwards certain factors with the intention of making people able to determine the mood themselves. However, since the target users of the system are already present at the bar, there is a good chance that
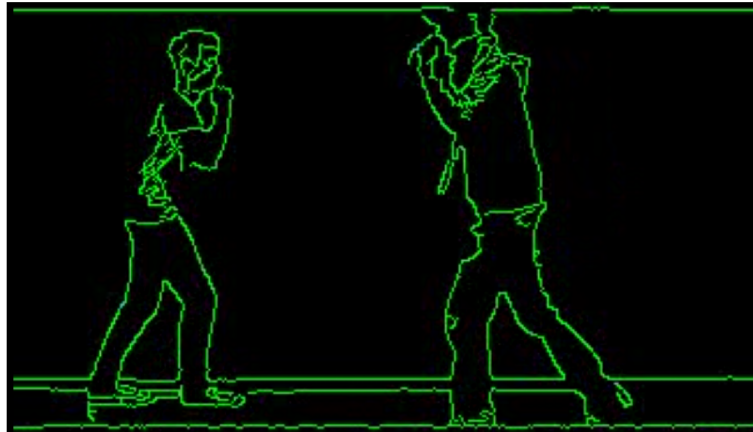
Figure 3.5: *Frame of a processed test video, showing the concept of showing people as silhouettes in real time.*

the representation is futile. By using virtual silhouettes based on visitors to the desktop or mobile system, the silhouettes concept can be part of the overall system. However, it will probably be hard to design it to be experienced as related to the other parts of the system.

3.3.3   Slap the Wall version 1

Given the problems encountered in trying to combine audio visualization and silhouettes, it was decided to go back to focusing on coloured lighting. This time a more active approach was taken regarding user involvement. By using a webcam combined with motion tracking software, and a webpage with a row of hands illustrated, it was possible to make a projection onto a wall, which could be high-fived, in order to change the background colour of the webpage. The interface can be seen in figure 3.6. The tiles are meant to show relevant information, such as messages from users, or notifications from the bar.

As with the lighting concept, the colour changing could easily be used as part of the theming on the desktop and mobile systems, by using the shared database.

At the first week of October, the high-five colour change system was put up at Studenterhuset, to see how it would look in context. This was done during a joint meeting with the other project groups. In the form it had at the time, it was more of a fancy lightswitch interface, than a representation of the mood. Users should actively interact with the system in order for it to work. At the meeting, the feedback received was less than stellar. There was no incentive to interact with the system. During the feedback session, a use case scenario was suggested. The system had to support the normal activities of the users, including leisure activities such as board games, foosball and pool. This became the focus of the next iteration.
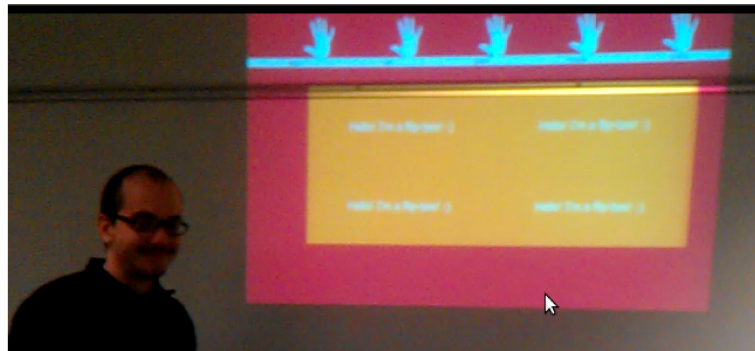
Figure 3.6: *The high-five interface projected onto the wall of the group room.*

3.3.4 Robot Unicorn Attack

Further development of the idea of an interactive wall lead to the Robot Unicorn Attack concept. By putting two keyboards into cardboard boxes, and applying hands made of foam, a simple singleplayer two button flash game (i.e. Robot Unicorn Attack [1]) was ported to an interactive wall, as a coorperative game, as one player cannot reach both buttons.
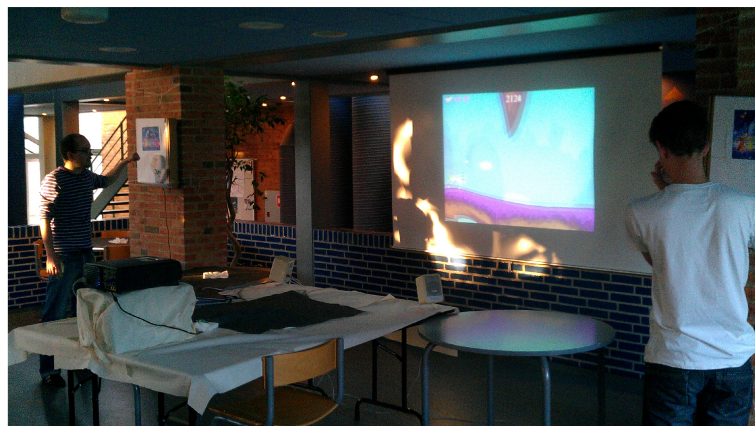

Figure 3.7: *The Robot Unicorn Attack being tested at the Department of Computer Science.*

The system was put up at the Department of Computer Science during a "Foobar", a friday bar, to see how people would respond to it. Even though this was not the real context, it was done for an easy proof of concept, given the consideration that some testing is better than none. People interacted without encouragement, not long after it was put in place. It was, however, more a game, than a representation of mood. If anything, it affected the mood rather than showing it. Figure 3.7 shows the testing setup.

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[1] http://games.adultswim.com/robot-unicorn-attack-twitchy-online-game.html

In regards to the other parts of the overall system, the Robot Unicorn Attack concept had very little in common. Of course, the game could be included in all parts of the system, but that would not help to reach the goal of representing the mood at Studenterhuset. Therefore, we did not work any further on this concept.

3.3.5   Slap the Wall version 2

Realizing that Robot Unicorn Attack was not a desirable solution, the Slap-the-Wall concept was reintroduced. This time it was combined with some of the categories from the old system. Instead of having the bartender change the different factors, users themselves should vote how they experienced the mood. Therefore, it was not a direct change of colour any more, as it was in the first version of slap-the-wall. It was more a user driven version of the old "TheMood.At" system. Furthermore, it should include some sort of messaging from users, as this is a key feature of the old system. A simple mockup of the interaction design can be seen in figure 3.8 and a screenshot of the system can be seen in figure 3.9.

Figure 3.8: *The interaction design of the Slap the Wall system, showing how the system should act.*
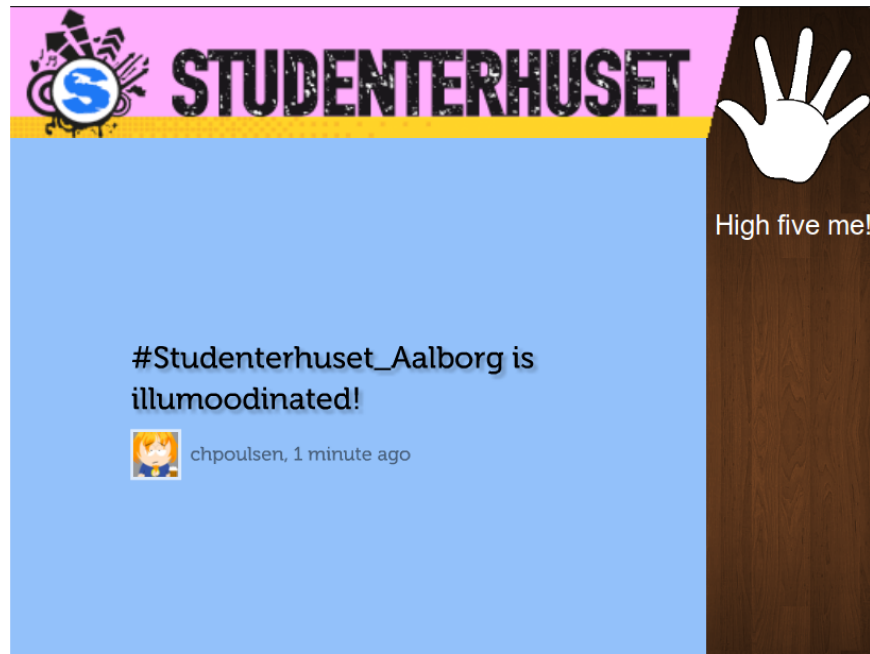
Figure 3.9: *Screenshot of the second version of the Slap the Wall system, showing tweets and a high-five request.*

This concept so far seemed to be closest to fulfilling the same task as the old system. The same factors could be measured, this time just by letting users themselves determine the conditions at Studenterhuset. A combination with coloured lighting was to be developed, but was disrupted by a separation of the group, caused by internal disagreements. It was determined that it was not realistic to get both the Slap the Wall and the mood based lighting designs completed within the time limit of the project. Hence, this project was confined to designing the lighting concept, whilst the separatists focused on further development of the interactive wall design.

3.3.6 Lighting version 2

At first, the lighting was meant as an addition to the first version of Slap-the-Wall, as demonstrated in one of the videos of the project [2]. Here, it is shown how high-fiving the wall can change the projected colour along with the colour of the LED strips in the mockup of Studenterhuset. However, as the system was not intended to be a fancy lightswitch, people should not just pick a colour to illuminate Studenterhuset. Hence, the second version of Slap-the-Wall was introduced. The problem at hand was then to interpret the input from users through Slap-the-Wall. A storyboard featuring sketches can be found in appendix A.2.

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[2]`http://www.youtube.com/watch?v=VOVINq5caQU`

The project was however influenced by complications in the group leading to the group being divided. As a consequence it was decided to just focus at the lighting, and leave the Slap-the-Wall interface to the separated part of the group. Instead, some of the factors from the old system was utilized - essentially crowdiness and how loud the ambient noise is. To show the concept at a sufficient large scale, 20 meters of RGB coloured LED strips were put up around the windows of the facade.

This was the first concept in which the framework presented in section 3.2 was used to determine the colour. In order to get input to set the parameters, different types of sensors were applied. A webcam was coupled with a Python script utilizing the OpenCV library, to identify how crowded a room is. This results in a red colour value. The microphone of the computer in-situ measured the audio level, resulting in a blue colour value, and the video feed from the heat cam, designed by one of the other groups, was translated into an activity measurement, corresponding to a green colour value. In order to control the colour and brightness, along with the possibility to make the light pulse, an Arduino microcontroller [3] was programmed to control a small circuit of chips, that adjusted the voltage to the colours in the LED strips. This is shown in figure 3.10. The initial idea was to use an ethernet extension to make the controller read the desired colour from the shared database of the four project groups, but this proved to take up to much time to get working. Hence, a laptop was used to send commands to the Arduino via the USB interface. A picture of the system in place at Studenterhuset can be seen in figure 3.11.
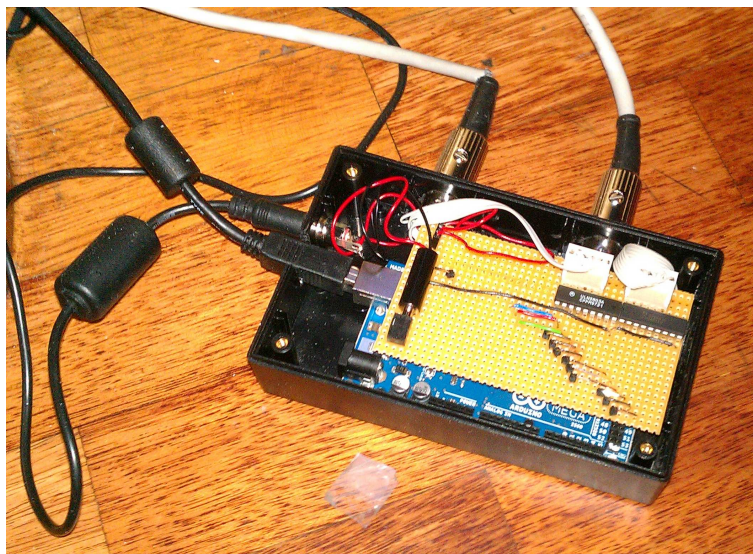

Figure 3.10: *The Arduino microcontroller and the associated electronics.*

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[3]`http://www.arduino.cc`

Figure 3.11: *The second version of mood lighting in-situ at Studenterhuset.*

This concept has been tested at Studenterhuset for a duration of two weeks. The bartenders did not like the sharp colours that were produced when only one of the RGB colours were on. Therefore, a minimum value for each colour was introduced, in order to keep colours smooth.

People seemed to think the lighting was part of christmas decorations. Besides the obvious time of year, this is presumably due to the windows being decorated with fake snow and christmas greetings. People did not notice they had any effect on the colour of the lights. This was the general outcome of the interviews conducted, and should be one of the key foci of further development.

Another observed factor, which could thwart the experience of the system, was the "competing" coloured lights at the edge of the desk of the bar. In order to make the system more clear to users, all coloured lights at Studenterhuset should act in the same manner. In regards to being part of the overall system, the colour is available for the other project groups. The lighting also includes an activity value based on the video feed from the other project groups. However, if the user is to experience a correlation across the systems, the colour of the lighting should probably be included in the other parts of the system.

3.3.7   Lighting version 3

This development iteration has not been conducted, but is included in order to state how further development of this part of the system should be done.
The next focus of development should be on increasing the feedback of the system, in order to make it clear to the users, that they have an influence on the lighting. One way to do this could be to install a proximity sensor at the entrance, that could make the entrance light change rapidly when people approach it. Also, the colouring of the second version of the *Lighting* concept tend to stay in the same range of shades, i.e. a mix of red and blue. A more advanced calculation of colour could be developed, instead of just having three different inputs eche determine the value of one of the base colours of the lighting, in order to make a more varied colour representation. To accomplish this, the three-dimensional framework descriped in section 3.2 should be utilized more.

4.1 Discussions

In this chapter we explain the work process throughout the project and discuss how we could have done things differently. Furthermore, we discuss our findings and the final system we ended up with

Our work process

As explained in section 3 of this report, we wanted to structure our work around three criteria: *Get something down there fast - Study it in context - Redesign accordingly.* As made apparent by our multiple design suggestions and plethora of seemingly good ideas, this proved to be easier said than done. One of the main problems has to be our ever changing definition of what this project was really about, and what we needed to accomplish with it. At the start of this project, we were presented with the task of redesigning an already existing system, which was part of a master thesis. Furthermore, we were told to collaborate with the other project groups to form a digital ecology. We found the project proposal rather vague and it did not do much to narrow down exactly what problem needed to be solved. Thus, our comprehension of the entire problem area was shrouded in uncertainty. Normally, this does not have to be a bad thing as uncertainty can force creative and out of the box thinking. However, in this project, it led to disagreements within the group and arbitrary ideas that never made it past the developmental stage.

As the project proposal was tied to the master thesis system [Christensen and Møller, 2011], we found it only natural to start off by trying to understand what they were trying to achieve with their system. We set out to try to understand their definition of "mood", as it is a term that covers a rather complex phenomenon. Initially, we wanted to base

our project on the results of the master thesis and tap into their understanding of the problem area, in order to explore a different route for the design of their system. This was all done to make sure that our redesign of their system would be based on the same parameters. However, later on, it seemed that the focus for the project changed from a redesign of the current system to the creation of an entirely new system, which did not need to be based on any of the old parameters. Our understanding of what needed to be done changed accordingly, and as the ties to the original system were severed, we sunk into a hit and run approach, where we would come up with new concepts and ideas on a daily basis. The myriad of ideas and concepts were not based on anything other than our interest in exploring them, and they were discarded as soon as we lost interest in them. We lost focus on what we set out to do in the first place and the criteria we originally wanted to structure our work around. That is, instead of just getting somethings down to Studenterhuset fast and then let the users judge whether or not they worked out, we claimed the role of judge, jury and executioner of our own ideas. It is not that we were totally ignorant about our work criteria, we were just stuck in an infinite developmental loop, and our ideas and concepts never made it to Studenterhuset. To further complicate matters, we had a hard time defining when something was complete enough to be tested in context. If the things we set up were underdeveloped, we feared that the users would have a hard time figuring them out, which could potentially render any feedback invalid. However, if we never set anything up, we would not get any feedback at all. Thus, the project ended in somewhat of a stand still, where we desperately tried to develop a complete system that could be quickly deployed at Studenterhuset, a task that proved to be impossible and we never got anywhere. This was further fueled by the before mentioned uncertainty of the problem that needed to be solved. Ultimately, the problems, related to the development, caused a split up of our initial group.

Following this split up, we went back to square one and tried to constrain ourself. Instead of making something perfect the first time around, a task that we found impossible, we began looking at what was really important. Throughout the project, we had tried to explore a lot of different ideas and concept only for the sake of exploring them. This time around, we wanted to structure our work by creating a framework that would serve as the basis of our understanding of the problem area. Instead of coming up with ideas and then create a framework to understand them, we wanted to start out with the framework and then incorporated it into our ideas. It was only when we came to that realization, that we were able to get out of the stand still and actually get something down there. This realization, however, came way too late, and the project ended at a stage we should have been at months earlier.

Collaboration with the other groups

A big part of this project has to be the collaboration between the project groups. We were tasked with making a digital ecology and the relevant question must then be: Did we succeed? Unfortunately, the short answer is no. During the course of the project, we attended workshops with the other project groups, where we developed design ideas for the different systems and sought a common understanding of problem area. To achieve an even deeper understanding of the work being conducted in the other groups and to help organize our work, we made subgroups. They consisted of representatives from the different groups, and their primary function was to deal with tasks that stretched across the groups, such as Facebook and Grooveshark plugins. The subgroups worked excellent and were disbanded as soon as their tasks were completed. However, the subgroups were only made in the start of semester and new ones were never created, which meant it got much harder to coordinate tasks between the other groups throughout the project. This resulted in groups doing design work on their own with no regards on how it would affect the other groups. This is was big problem for us especially, as our system is only present at Studenterhuset and depends on a widespread representation throughout the ecology to make the users aware of the colors and their meaning. Our colors ended up not being represented by the other groups, and the users was completely unaware of the correlation between our system and the other systems. So, instead of creating a digital ecology where every subpart seamlessly fit together, we ended up with a bunch of systems that just share some, if any, common elements.

To avoid this free-for-all state of mind, we should have made a dedicated design group consisting of representatives from each of the groups. This design groups should take care of the design and force some uniformity across the systems in order to plant the seed for a digital ecology. Furthermore, it would have been favorable to evaluate and gather user feedback on the systems together as a whole, and not just as individual systems, as we did. This would further emphasize that the systems were supposed to work together and provide incentives for the groups to work together even at the later stages of the process. At an early point in the process, we became aware of the monumental task it was to coordinate tasks between groups, which each had their own unique take on how things were supposed to be done. To combat these difficulties, we held cross group meetings and created the blog, where every group could post their findings and work progress. In spite of these efforts, communications still broke down. This was partly due to some of the other groups who insisted on using closed Facebook groups to share information, leaving the rest of us without of clue on what they were doing. To make matters worse, some groups seemed to have a general aversion to make post when progress had been made or a new direction was taken, which made it borderline impossible to have any control or insight into what every groups was doing. It would have been better with a different approach regarding the sharing of information across the groups. A planned meeting every week where each group could present what they had been doing since the last meet and what they intended to do, would make a lot more sense. Furthermore, at meeting in person i a lot harder to ignore than a blog somewhere in cyberspace.

The final concept

According to the problem statement, found in section 1.3, we sought an understanding of the term; mood. Over the course of the project we have had an implicit understanding of what it is. This mutual understanding of mood is manifested in the framework, which acts as the foundation of the system we have build. However, our understanding of mood in the first place, is of course up to discussion. We used the framework as a technique to understand mood and translate it into colored light. The creation of the framework came late in the process, and we simply did not have time to thoroughly investigate if the framework and its color representations are compatible with the users and their perception of mood. Ideally, we would like to experience a scenario where users start to use the colors to express how the mood is at Studenterhuset. Before such behaviors can be observed, we believe the implemented system is required to operate a longer period of time, in order to make users aware of its presents and its function.

The system we ended up with is passive in the sense that it measures and represents how the current mood is. Over the course of the project, we have switched between systems that actively or passively involves users. Several times, we have had the discussion whether to let the users actively change the mood though the interaction with the system, or just let the system interpret a variety of parameters and then represent the mood accordingly. The idea of having a system where users are in control of the representation of the mood, opens up for a wide variety of possible interaction designs. However, an active system could potentially make it harder for the users to interpret our color representations, as an active systems would make it possible for the users to interfere with the measurements, which could potentially render the data invalid. In a passive system, we have much greater control of the data and color representations. This control comes at the price; it narrows down the possibilities of potential interaction designs and the passive nature of the system runs the risk of being ignored by the users. A potential solution could be a systems, which balances between the two extremes and incorporates some active user involvement to help make the users aware of its existence, while still relying on passive measurements to preserve data integrity and represent colors that are not just a product of random user inputs.

4.2   Conclusion

In contrast to our former projects, we were faced with a rather different ghost this time around. Our previous projects have had emphasis on technology and development, utilizing object oriented programming or database driven web services. Common for these projects, were the solidified understanding of what needed to be done. However, in this project we were faced with a design process where we struggled with even grasping what we were supposed to do. When faced with these obstacles, we created and implemented a framework as a fixed reference point, to which we have anchored our development and understanding.

We set out to answer the following questions:

What is "mood"?

Throughout this project, we have tried to achieve an understanding of what mood is. We found that the term covers a complex phenomenon with no clear cut definition. In order to understand mood and be able to work with it, we have constructed a framework. This framework is an abstraction on the framework utilized in the master thesis, as it uses colors instead of sliders, to allow users to get an idea of how the current mood at Studenterhuset is. The framework consists of a three-dimensional coordinate system with three parameters, each with their own unique color representation: Crowdiness(red), Activity(green) and Atmosphere(blue). The values for each of the parameters, allows us to point to a specific area in the framework, which corresponds to a color. Thus, turning our definition of mood, into colored light.

How will users interact with the system?

Our system autonomously measures on three parameters, that are tied to the users' behavior at Studenterhuset. Rather than a more traditional user interface such as a GUI, our system let the users affect our system with their presence and use patterns. As a further interaction element of our system, we have tried to facilitate the incorporation of the mood colors into the users vocabulary. We wanted to hear users describe a specific mood at Studenterhuset with a color. However, in the short time we had to test the system, we were unable to observe such a behavior.

How will the system converge with the systems of the other groups?

This semester is about working with new technologies, which is why we have tried to facilitate the formation of a digital ecology in combination with the three other project groups. Due to the fact that the communication and collaboration with the other groups fell apart halfway through the project, we ended up with four individual systems that only share some, if any, common data. The lack of communication between the groups resulted in no parts of our system being visible throughout any of the other systems.

This brings us to the final question:

"How can an IT system utilizing new technologies be designed and developed for the location of Studenterhuset, in order to show the current mood at the bar?"

In this project, we have made a framework, which we use to understand mood and represent it as a color. From this framework, we have made an IT system, that measures on the three parameters, presented by the framework, in order to illuminate Studenterhuset in the color according to our understanding of the current mood. We have been working together with three other project groups to facilitate the formation of a digital ecology. In our understanding, such an ecology depends on users interacting with multiple parts of the overall system. Unfortunately, due to poor communication between the groups, we were unable to implement part of our system across all platforms, which in turn meant that the user experience we try to form, severely lacks uniformity. Because of this, and the general lack of users paying attention to our system, the digital ecology we wanted to form, leaves much to be desired.

We, however, remain optimistic, that the framework constructed in this project could form a way to facilitate the understanding of mood in future projects.

4.3   Perspectives

This chapter is dedicated to evaluating the system in a greater context. To evaluate if the developed concept idea makes sense according to our newfound understanding of the mood at Studenterhuset.

When looking at the former framework [Christensen and Møller, 2011] and its parameters, it is interesting to see how their framework is based on the cognitive response. We argue that any person, provided with these parameters, could make a mental picture of a bar, thereby getting an idea of the mood at the bar. With this information, a person would be able to decide whether to go to a bar or not. We see our framework as somewhat of an abstraction of the former.

From an abstract view, all the systems combined, form a unity, or at least try to. This unity was envisioned to replace the former system in terms of representing the mood at Studenterhuset. The other groups have made abstract parameters as well; a "kind of" thermal image, replacing the old activity bar (coffee or beer), and the mobile group developed a way to listen to the music playing at Studenterhuset from mobile devices. The latter we see as an abstraction of the quiet vs. loud parameter. To further improve our framework, we would like to incorporate this understanding of a unity.

It is interesting to see how all groups have adapted an abstract view of the former framework, more or less knowingly. We strongly believe that the first introduction of the project proposal, redesign the system, influenced this. With this in mind, we argue that a comparison of the two frameworks is needed. At the end of the project we spend two entire weeks from early morning to late night, getting feedback on the systems, whilst writing this report. One group actually made an interesting argument. They actually thought that the old system was updated automatically. This was one of our main new ideas, we saw that the bar crew did not update the system very often and that information often was misleading, therefor an automated system would be preferred. However, that groups argument seems to rather disprove this concern, therefor making a lot of technology focus unneeded.

We would still argue that an automated system is preferred, hereby making our systems idea valid. The design, however, still needs a lot of work and unity should be a keyword. As for framework, we still have not evaluated whether these abstracted parameters work. Clearly, much more information is needed to make the cognitive connection between the mood and colours for instance. We, however, maintain the claim that the framework is valid and much more open to be defined. Showing people the parameters from the old system, they have a cognitive response, that is corrupted by mixing bar experiences together. The colour however is only defined at Studenterhuset. This means that defining a mood automatically and setting colour hereby is worth further research.

BIBLIOGRAPHY

AAU. 2011. "Studieordning." `http://www.sict.aau.dk/digitalAssets/34/34888_informatik-bachelor.pdf`.

Christensen, Anders and Søren Hugger Møller. 2011. "Context Is All - Exploring Digital Representation of Ambience." `http://projekter.aau.dk/projekter/files/52798434/Context_is_all.pdf`.

Ehn, P. and M. Kyng. 1991. "Cardboard Computers: Mocking-it-up or Hands-on the Future." Design at Work, pp. 169 - 196. Hillsdale, New Jersey: Laurence Erlbaum Associates.

Olofsson, Erik and Klara Sjölén. 2011. "Design Sketching.".

Oulasvirta, A., E. Kurvinen and T. Kankainen. 2003. "Understanding contexts by being there: case studies in bodystorming." Personal Ubiquitous Comput., 7(2), 125-134.

Paay, J. and J. Kjeldskov. 2008. "Understanding Situated Social Interactions: A Case Study of Public Places in the City." Computer-Supported Cooperative Work, 17(2-3): 275-290.

Vetere, F., M. Gibbs, J. Kjeldskov, S. Howard, S. Pedell, K. Mecoles and F. Mueller. 2005. "Mediating Intimacy: Designing Technologies to Support Strong-Tie Relationships." Proceedings of CHI 2005, Portland, Oregon, USA, ACM, pp. 471-480.

This appendix shows the relevant sketches and designs from different workshops.

A.1 Workshop, September 16

This section shows the workshop sketches that initially launched the design process.
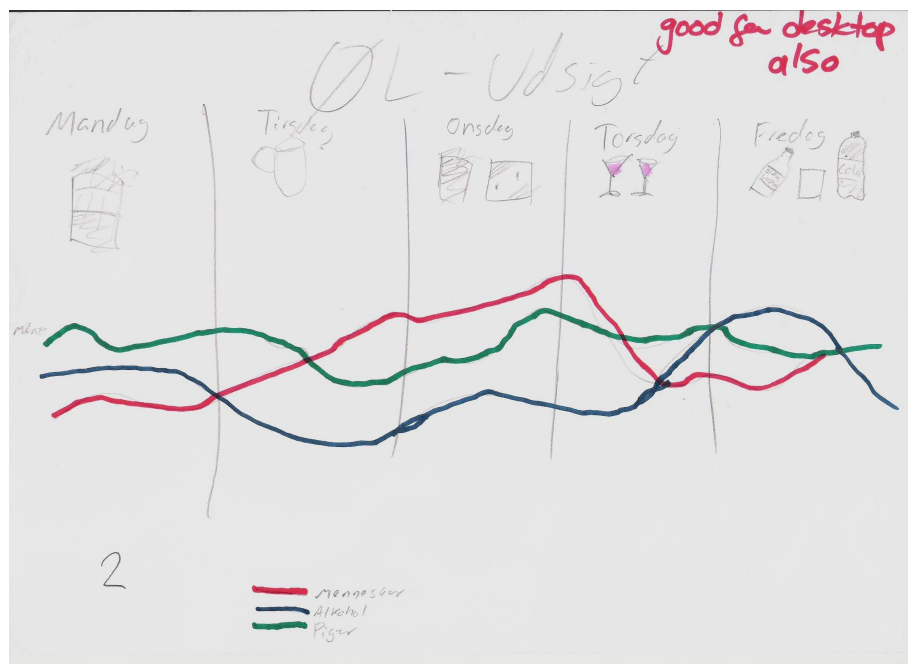
Figure A.1: *The main sketch from the first workshop.*
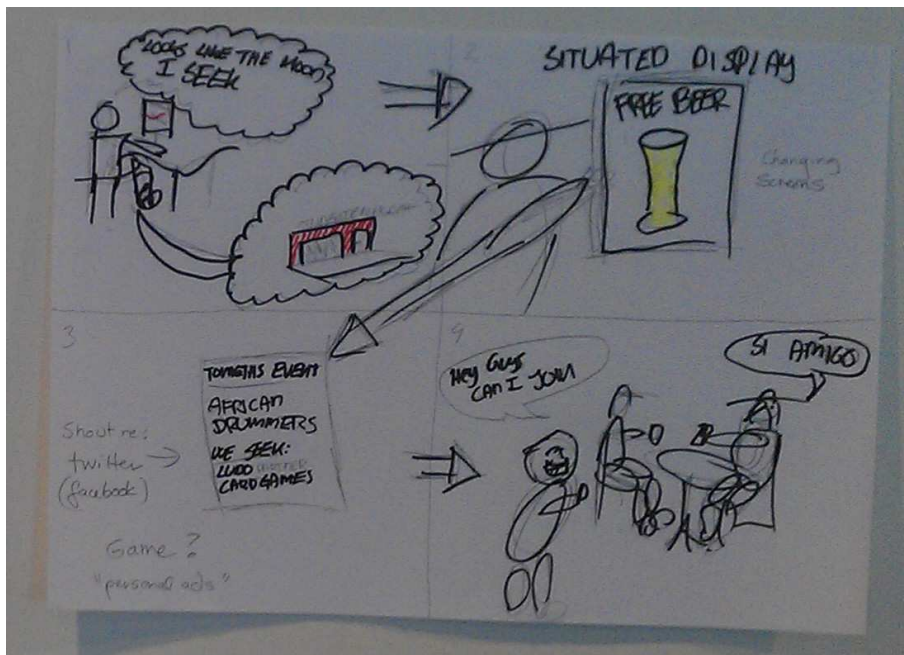
Figure A.2: *The main sketch from the first workshop, showing how the situated system could be used.*
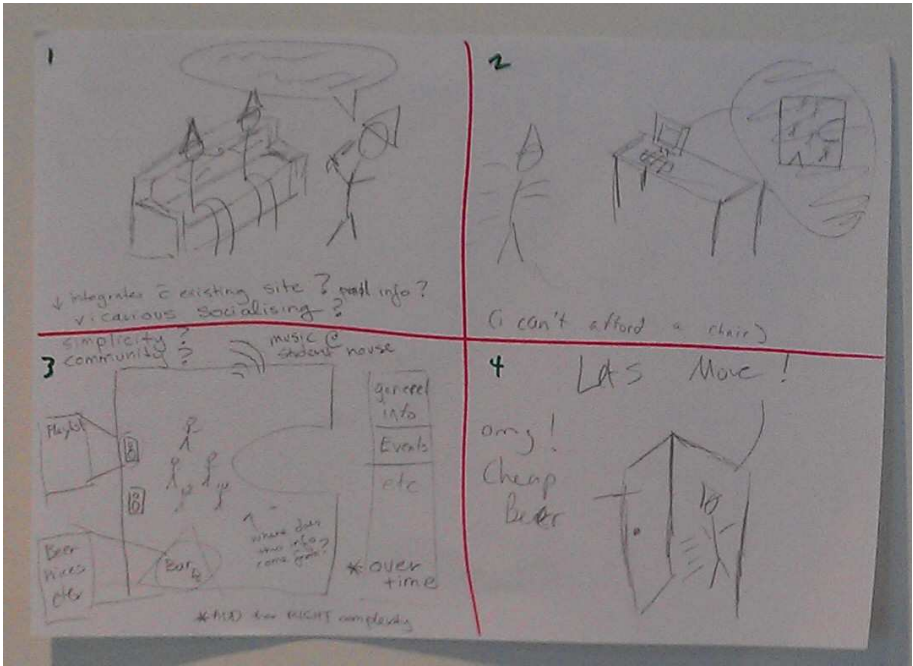
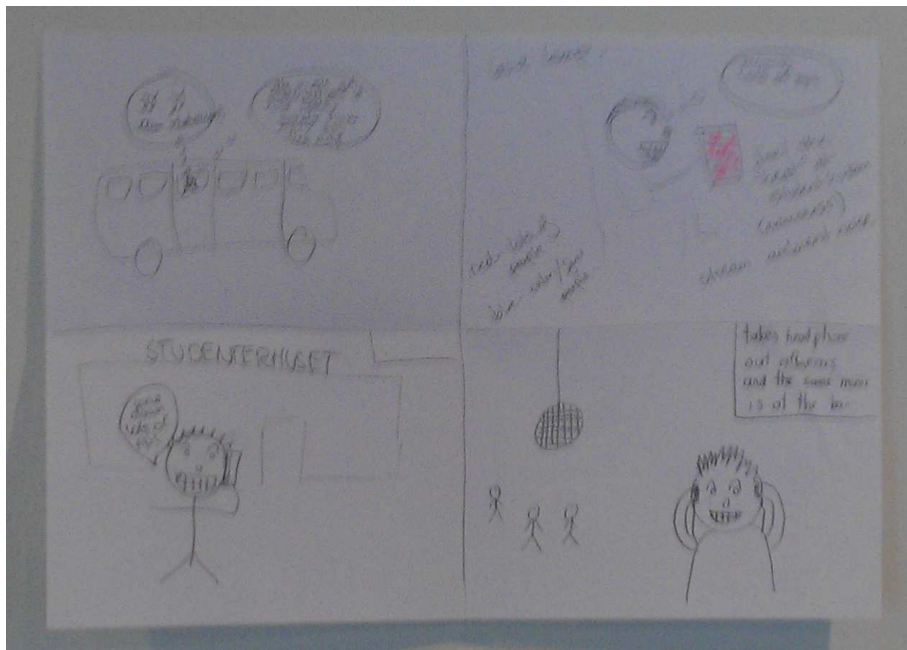Figure A.3: *The main sketch from the first workshop, showing how the desktop system could be used.*

Figure A.4: *The main sketch from the first workshop, showing how the mobile system could be used.*

A.2   Workshop, Oktober 24

Here, a list of sketches showing interaction with the lighting and slap-the-wall system as a storyboard is presented.
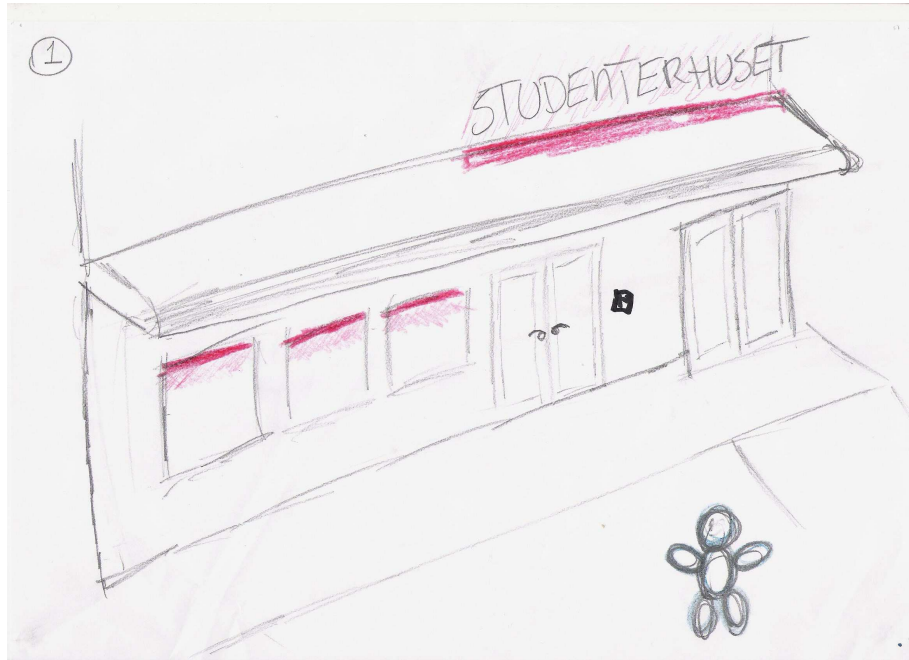
Figure A.5: *A user is passing by Studenterhuset, and notice the colour of the facade, thereby realising the present mood in there.*
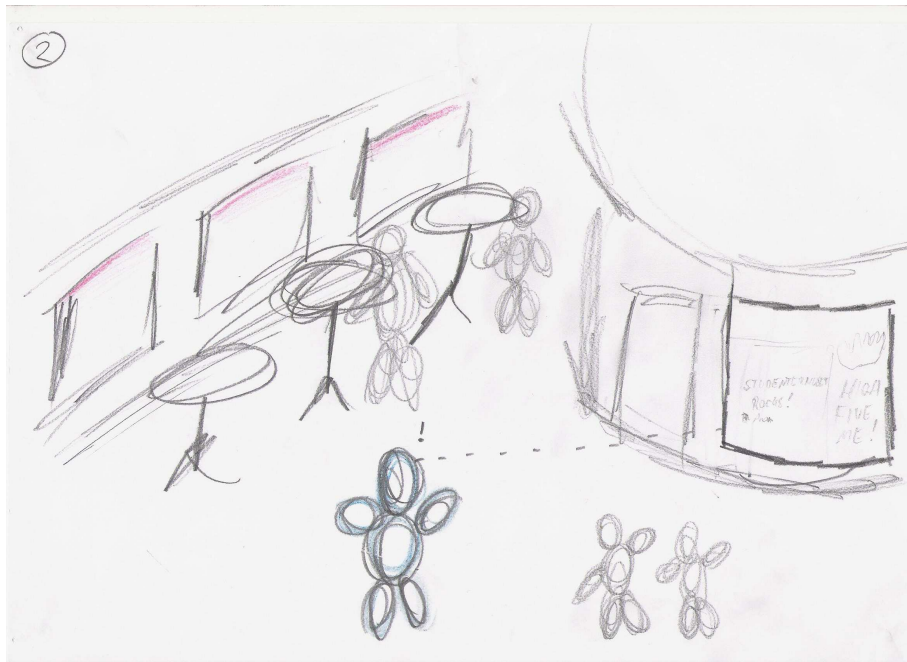
Figure A.6: *The user notices the projection on the wall, with messages and an encouragement to high-five the system.*
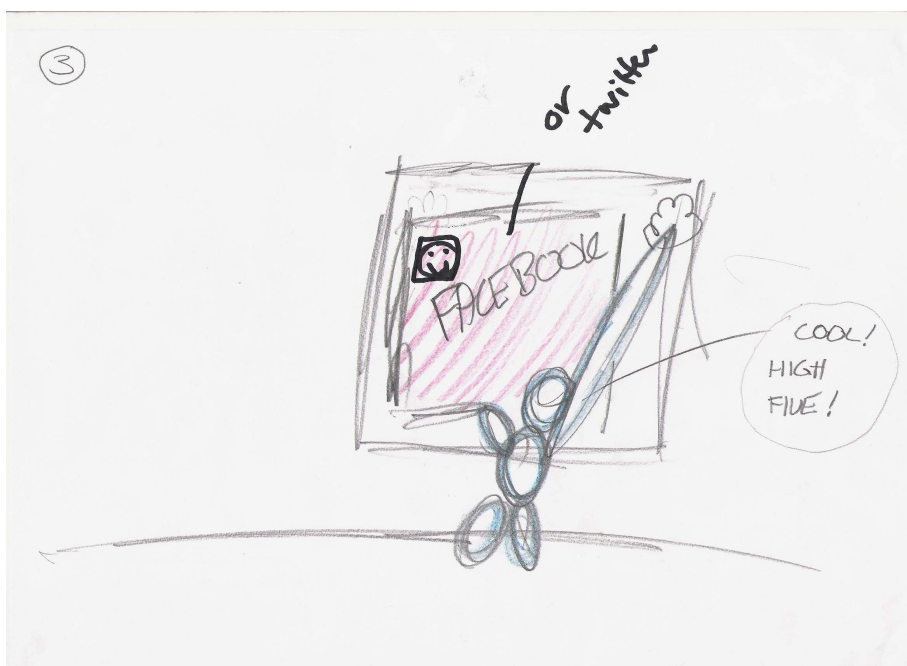
Figure A.7: *The user high-fives the wall as requested.*
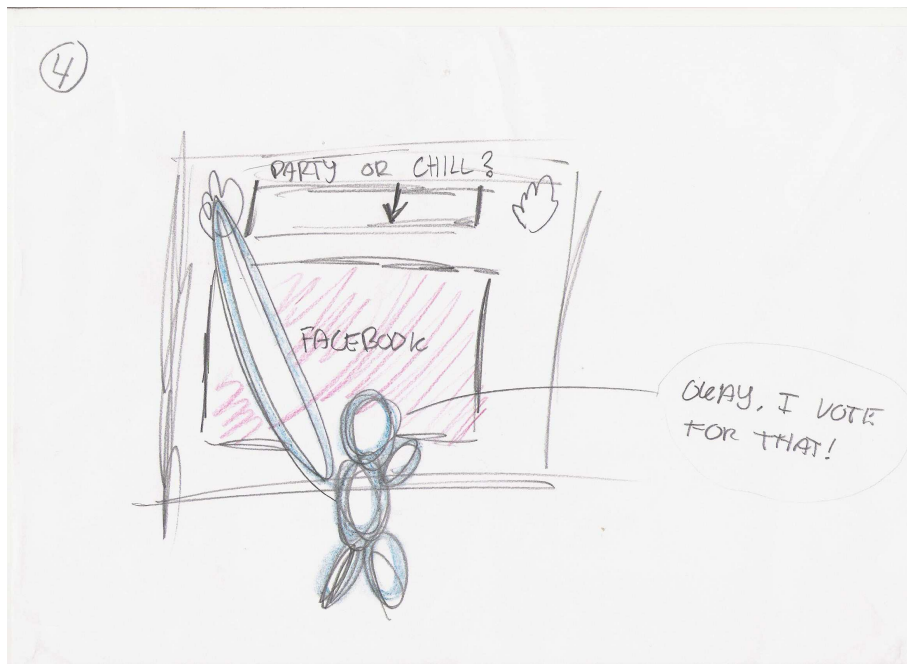
Figure A.8: *The system then asks the user if he wants to party or chill.*
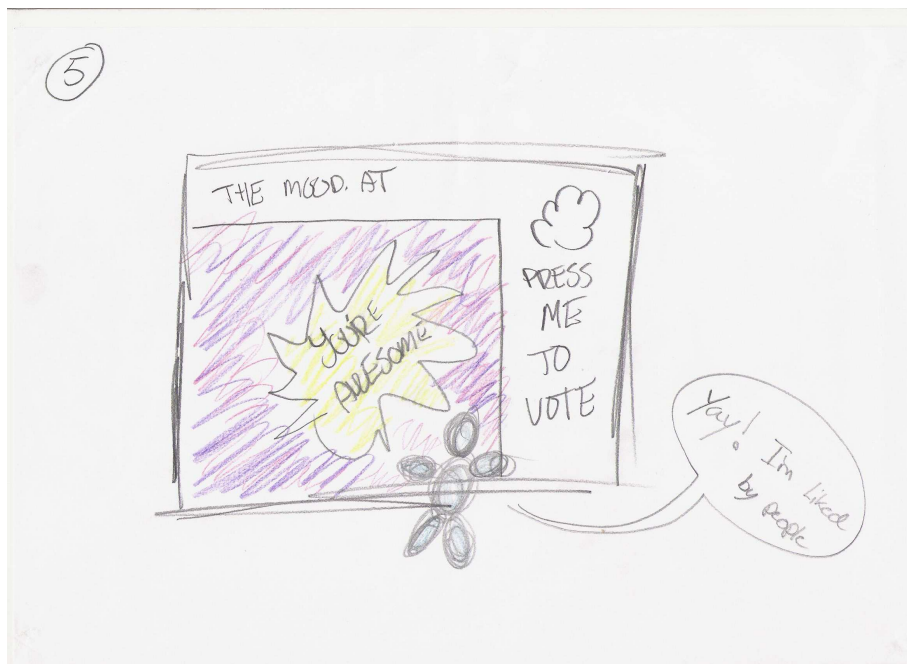
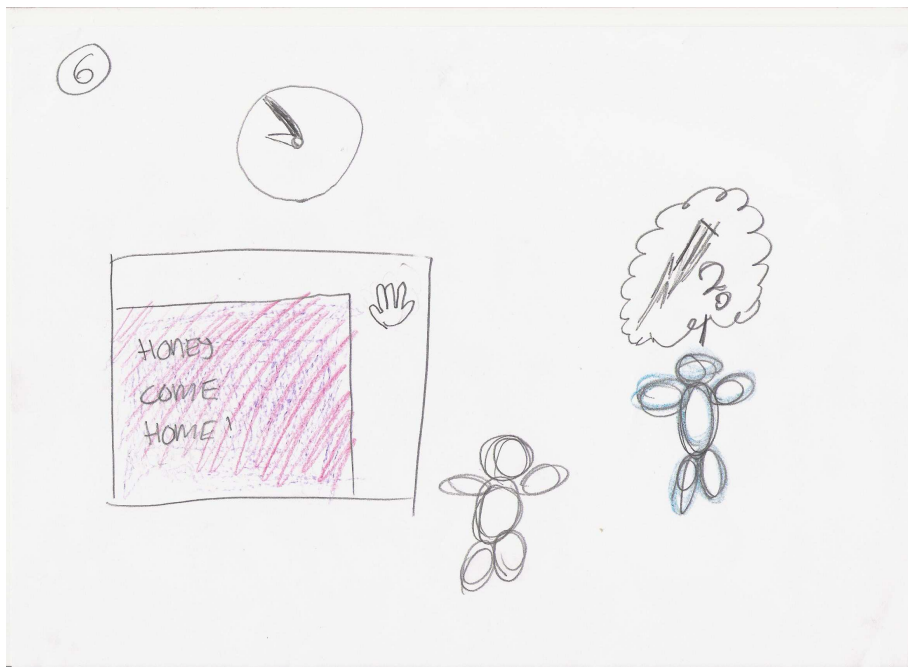Figure A.9: *The system gives positive feedback, and resets to encourage users to high-five the wall.*

Figure A.10: *The system shows a message from someone wanting the user to go home.*

A.3   Ecology

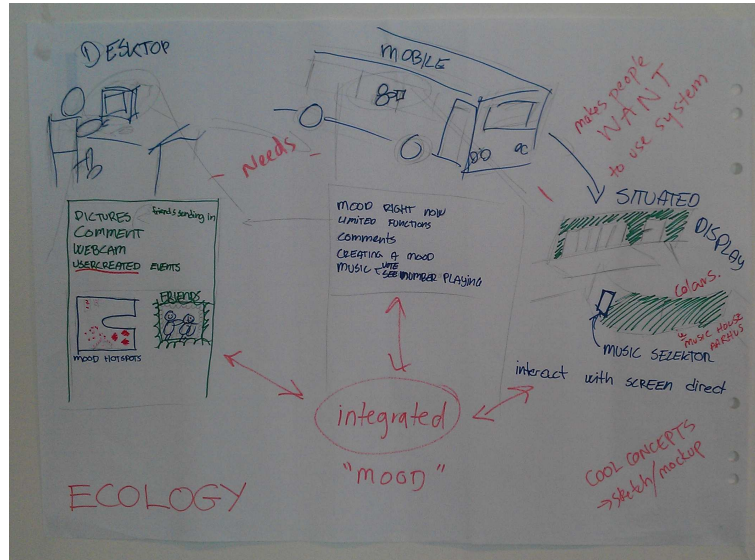These are the three ecology concepts created at the workshop of September 15.
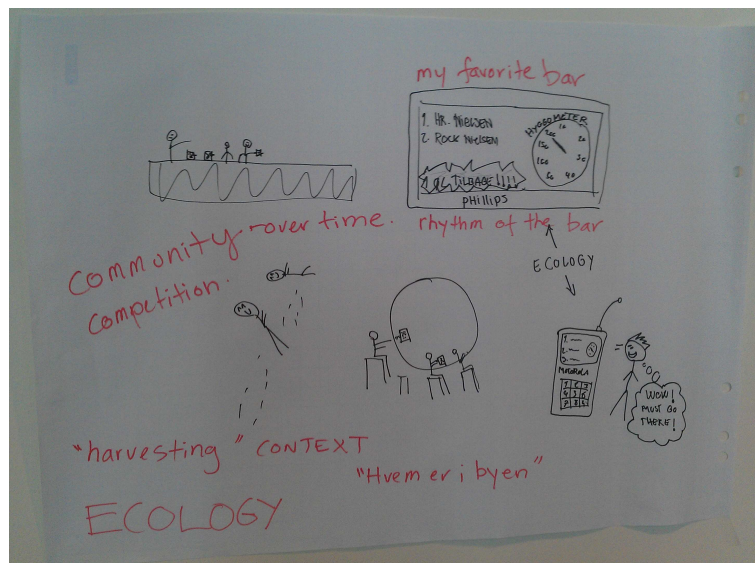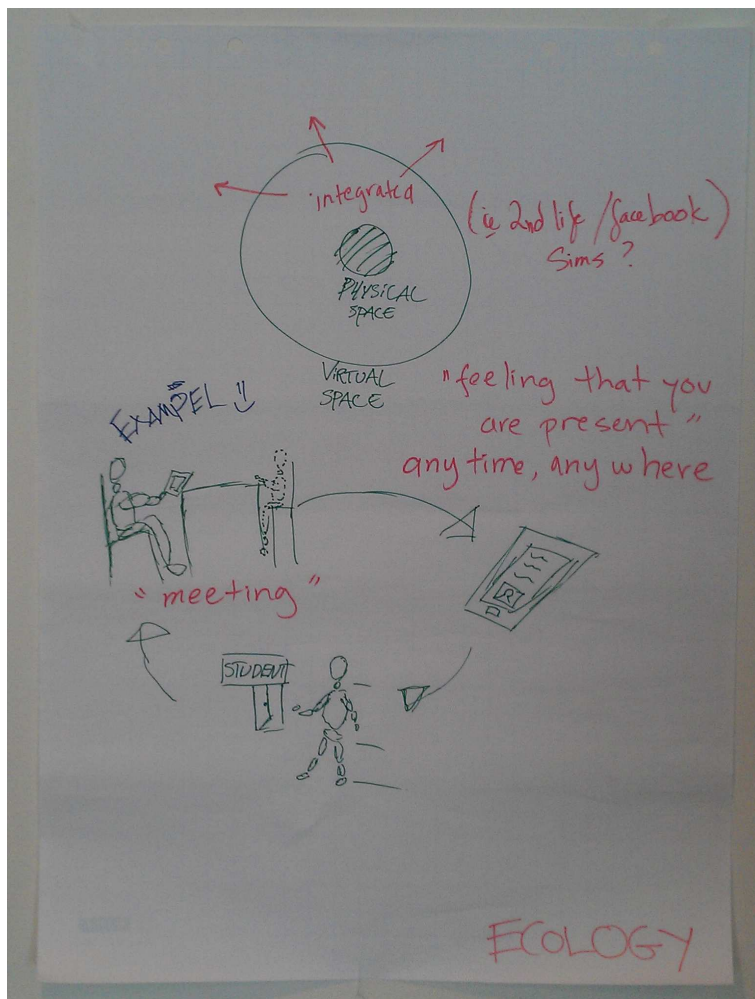

Figure A.11: *Ecology.*

Figure A.12: *Ecology.*

Figure A.13: *Ecology.*

This is the wall used to discuss how a situated system could be designed, if a funhouse was to be the inspiration.

Figure B.1: *Moodwall.*