

GRADUATION PLAN: ARCHITECTURE

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‘Adaptive City’ Graduation Studio, The Why Factory

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Argumentation for studio choice

The choice for The Why Factory ‘adaptive city’ graduation studio stems from the studio’s strong research methodology. The Why Factories ‘process driven’ research involves the quantification of design parameters (based on a thematic angle) and the building of new relationships between these parameters. The notion of ‘adaptive’ is invariably implied in this parametric methodology, and so the graduation studio presents the exciting challenge of addressing the very contemporary topic of adaptation in our cities, using a very relevant research methodology.

Theme

The Why Factory graduation studio entitled ‘Adaptive city’ imagines potential future scenarios of adaptivity within the urban environment at different scales. The implication of each scenario is tested, with the ambition of exposing the current limitations of the city, as well as future benefits of an all-adaptive city.

The Evolving Room.

The ‘*evolving room*’ project tries to imagine a living environment which learns over time from human behavior and eventually learns how to predict it. It suggests a new way of envisioning architecture; no longer static, but as a constantly evolving system.

Problem Statement

The research project ‘*the evolving room*’ investigates the limitation of our ‘*static*’ living environment to adapt efficiently to our special needs; the result of which is space inefficiency and lack of customization. The current state of our living environments, predefined in its organization, does not reflect space usage and user needs. Adaptability is restricted to free standing (*furniture*) and hinged elements (*windows, doors*) and the building fabric is static.

This research project, therefore, questions how we can envision a living environment which adapts to changing spatial needs through the 24 hour cycle. The assignment extends further in incorporating customization, in such a way, that the system adapts differently to each user. As this suggests a passively adapting space, the idea of actively overriding the system will also be explored.

Goal

The goal of this project is to investigate how far we can define a living environment that adapts in real-time to user needs, and to test the implications of this in the urban context. The 'room' is treated as a learning system which collects parameters from our environment (*behavioral patterns, temperature and noise levels*) and learns to adapt structurally (*i.e. when the user wants to sit; the space will transform*). The ambition of this project is that the 'room' evolves as human behavior changes, to the extent that it learns to predict user behavior (*i.e. specific temperature and noise readings, in combination with time of day, might imply a specific user action before he asks for it*). The goal of this project extends to the investigation of the relationship between passive and active relation to our environment; *i.e. at what point does the user intervene on this fully passive system?*

Method Description

The research methodology carried out in the studio brings together two parallel strands. The first, the collective investigation, defines adaptivity thorough the dissection of 5 principle 'lenses'; *Why, What, Who, When and How*. The second, the individual investigation, envisions a future scenario of adaptation in the city and explores its implication.

Collective Investigation

As we define the 'adaptive city' to be everywhere, the research begins with a firsthand semantic exploration of the limitations and frustrations within our cities, based on the location of where we first met as a studio in Rotterdam. 5 important questions are exposed through this **Chronicle** and these form the basis of the 5 lenses with which we define adaptation. Each lens is then explored in isolation at first, and later brought together.

The **Why** lens investigates the drivers for adaptation. It aims to expose the notion that different drivers produce different adaptations (*by showing the same scene with different adaptation according to driver*) and further tries to highlight the temporality of adaptation in our cities (*by blurring and overlaying these different images*).

The **What** lens breaks down the city into its elements. This highlights 'what' in the city can adapt, and starts to suggest how prone these elements are to adapt currently. This lens, further tries to form relations between the elements, in an attempt to highlight the complex relations that are at play when an element needs to adapt.

The **Who** lens relates the elements of the city investigated in the 'what' lens to the parties involved in the process of that element adapting. It describes users, regulators and owners as the three main parties involved, information which will be used in individual the projects.

The **When** lens is an analytical tool which aims at exploring city usage at different 'metric' scales as well as 'chronological' scales. By doing so, this exposes parts of the city which are unused at different scales and are thus potential 'areas' for adaptation.

The **How** lens presents a diagram with the logic of the adaptive city process. This diagram is then modified to explain each individual project.

The collective study concludes with the **Adaptive City Map** which brings together the 5 lenses in a 'map', within which each individual project is be positioned and described.

Individual Investigation

The 'Evolving Room' project is split into 4 distinct chapters of research.

The **First** chapter, which forms the point of departure of the project and on which the problem statement is based, investigates the space usage of a typical 4-person family, in an existing apartment model. It does this by animating, the maximum space used at any minute of the day. This study indirectly suggests new spatial configuration which reflect space usage.

The **Second** chapter breaks down typical user activities (*sitting, sleeping, cooking etc...*) to three important components; the *ergonomics* of the activity (*what space is used*); the *temperature values* under which the activity operates; and the *noise levels* required for proper functioning of the activity. These three strands form the **data input** for the ‘*evolving room*’ system. In this way, when a user want to sit, the evolving room, having learned over time from the users sitting patterns, will transform accordingly.

The **Third** chapter introduces the logic of the ‘*evolving room*’ - the data inputs from chapter 2 are here translated to transformation rules. This chapter will introduce the 3 important functionalities of the system. The first is the **default rule set**; i.e. *how* the system will generate a default set of transformations to respond to user trigger (*i.e. user wants to sit*). The second is the **prediction functionality** of the system which will explore how the system will learn to predict user action before it is triggered (*i.e. the system knows you want to sit*). The third is the ability of the **user to actively override** the system (*active vs passive*).

The **Fourth** chapter will explore the conflict between ‘*evolving room*’ systems when multiple users are introduced.

Literature and References

Research projects used as references for the ‘evolving room’:

Deb Roy (MIT media lab): investigates generating algorithms which cross-reference different types of data (*TED talk ‘the birth of a word’*). This is used as a reference for chapter 2 and 3, where the system transformation rules are generated from cross-referencing data sets.

Philippe Rahm’s ‘interior meteorologies’: the project “*decomposes reality and identifies elements that compose it*” (*P.Rahm lecture: Parsons; 2011*). This is used as reference for chapter 2 which tries to break down and identify the elements that connect human to his environment.

Further Reading:

1. S. Johnson, *Emergence: The Connected Lives of Ants, Brains, Cities, and Software*. (New York: Scribner, 2002).
2. H. Nakamura, *Microscopic Designing Methodology*. (Japan: INAX, 2011)
3. Gilles Clement; Philippe Rahm, *environ(ne)ment*. (UK: Skira, 2007)
4. Seth and Ariane Harrison, *A performance of Bodies and Architecture*. Found in: Volume Journal ‘*Everything Under Control*’, no.1 (2013)

Relevance

The ‘evolving room’ presents an extreme scenario of an all adaptive space. In doing so, it exposes two intentions. The first, the **social relevance** of the project, is an investigation into space usage and how we can start introducing adaptivity into the current state. The idea of complete adaptivity, aims to diminish current limitations in our imagination of ‘what’ can be adaptive, and in doing so, introduces new ideas on changing our static surroundings. The second, the **scientific relevance** of the project, is an investigation in the potential of technology to begin to connect us with our built environment; no longer just in the design phase, but also during the life of a project. Can we envision an architecture where every user plays an active role in the performance of his living environment?

Time Planning

(Based on 2012-2013 and 2013-2014 academic calendar)

February (week 7-9)

Week 7: First studio meeting brainstorm

Week 8: Group definition of adaptivity/ presentations of previous Why factory studio work

Week 9: Theoretical references and formulation of individual position within adaptive framework

March (week 10-13)

Week 10: Group work – Matrix of adaptivity and final product presentation options

Week 11: Presentation of Group Work: scenarios of adaptivity around the Wester Pavilion; ‘what if’

Week 12: Group work – Introduction chapter highlighting city frustrations. Introduction of lenses

Week 13: Individual presentations – present chapters of project. Define scale and user

April (week 14-17)

Week 14: Individual project chapter development
Collective work – safari and definition of lenses

Week 15: P1 presentation

Week 16: Future View Theoretical research.
Presentation of plan up to P2

Week 17: Defined Sensors to be used in individual project. Future view Interview development

May (week 18-22)

Week 18: Interview invitations to be sent

Week 19: Collective work: addition of 2 lenses

Week 20: Collective presentation–new lenses
Individual - kinect experiments animations

Week 21: Chapters of post P2 plan and study

Week 22: Individual presentations – data visualization; new Individual chapters (for after P2)

June (week 23-26)

Week 23: Presentation with Winy; collective + individual work – first attempts to connect the two

Week 24: Group presentation – update of lenses and discussion for creation of ‘Adaptive City Map’

Week 25: Individual presentation work

Week 26: P2 Presentation

July (week 27-30)

Week 27: Organize interview with Philippe Rahm;

Week 28: Meeting with Winy - ‘adaptive city map’

Week 29: Set up sensor experiment in apartment and collect actual data for the project (3 weeks)

Week 30: Continue sensor experiments

August (week 31-35)

Week 31: Represent sensor data

Week 32: Present first attempts of transformation logic based on real data collection

Week 33: Summer break

Week 34: Summer break

Week 35: Present ideas on the materiality of the ‘evolving room’; from virtual to material

September (week 36-39)

Week 36: Studio presentations - individual advancements in data collection and system logic

Week 37: Formulate future models assignment, as well as future views interview series

Week 38: Further development of system logic
Introduce the idea of evolving system in the script.

Week 39: System logic – introduction of user overriding the system

October (week 40-44)

Week 40: Scenarios of the system functioning for one user – develop a 24 hr scenario to test the system

Week 41: Future models report

Week 42: **P3 Presentation** – animation of the 24 hour cycle for 1 user, showing system transforming (make freezes to explain logic – show how user overrides

Week 43: Present concept drawings of how the model materializes (1:20) – structural principle

Week 44: Introduce the idea of multiple users

November (week 45-48)

Week 45: Develop parametric logic for multiple users

Week 46: Develop building technology concept

Week 47: Present Technical drawings (1:20, 1:5)

Week 48: Finalize Collective work – lenses + Map

December (week 49-52)

Week 49: Develop animation for multiple users (freezes in animation to explain logic of the system as well as structural principle)

Week 50: Present material for pre P4 studio review

Week 51: **P4 presentation** – animation series explaining the process. Situation (1:500), series of drawing showing transforming of ‘room’ (1:50)
Technical details (1:5)

Week 52: Christmas break

Week 53: Christmas break

January (week 1-5)

Week 1: Finalize drawings and details

Week 2: Scenario and development of final rendered animation. Collective installation development

Week 3: Finalize collective and individual – book dummy and installation

Week 4: **P5 presentation** - Final rendered animation with technical details and system logic shown in freezes through the animation. Collective installation