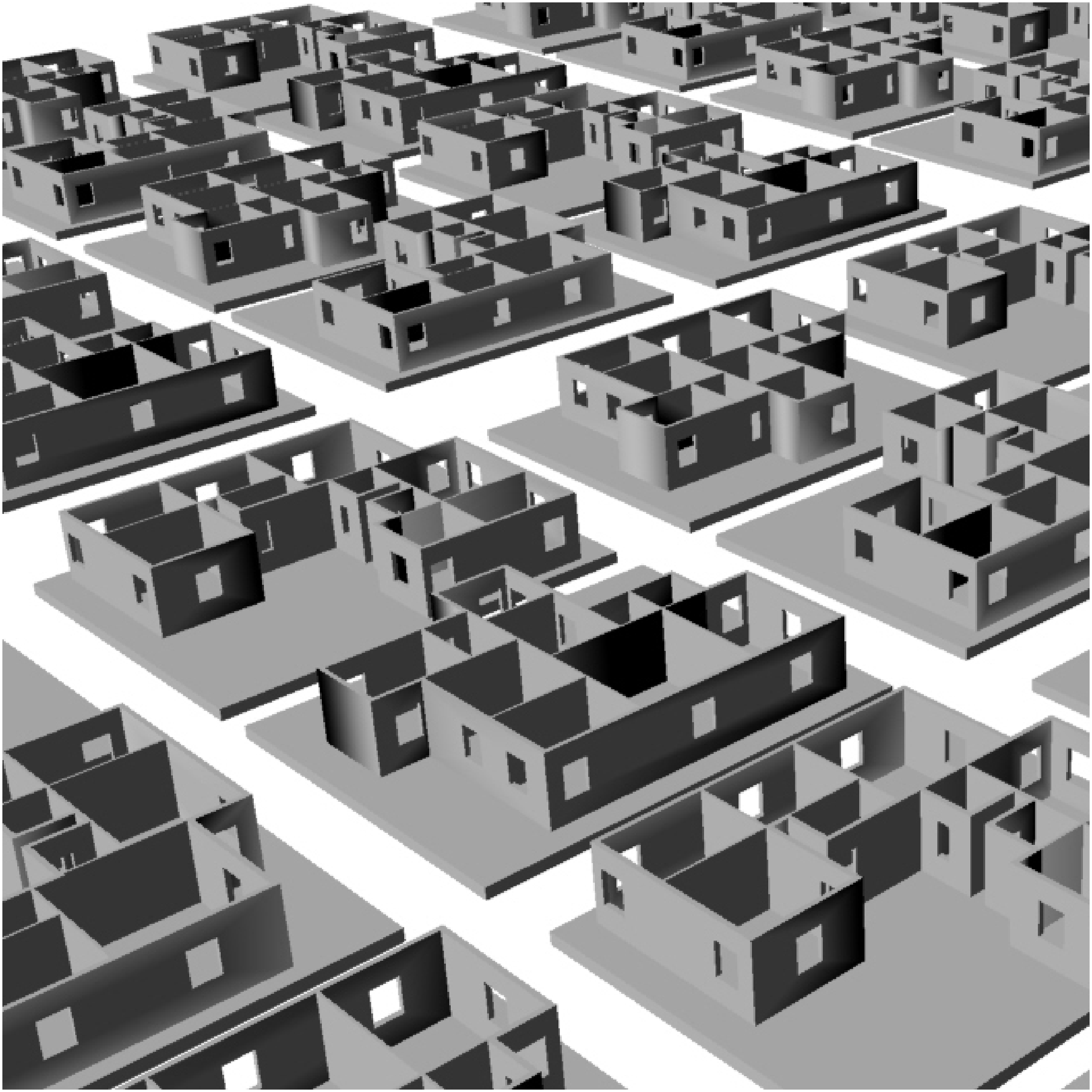


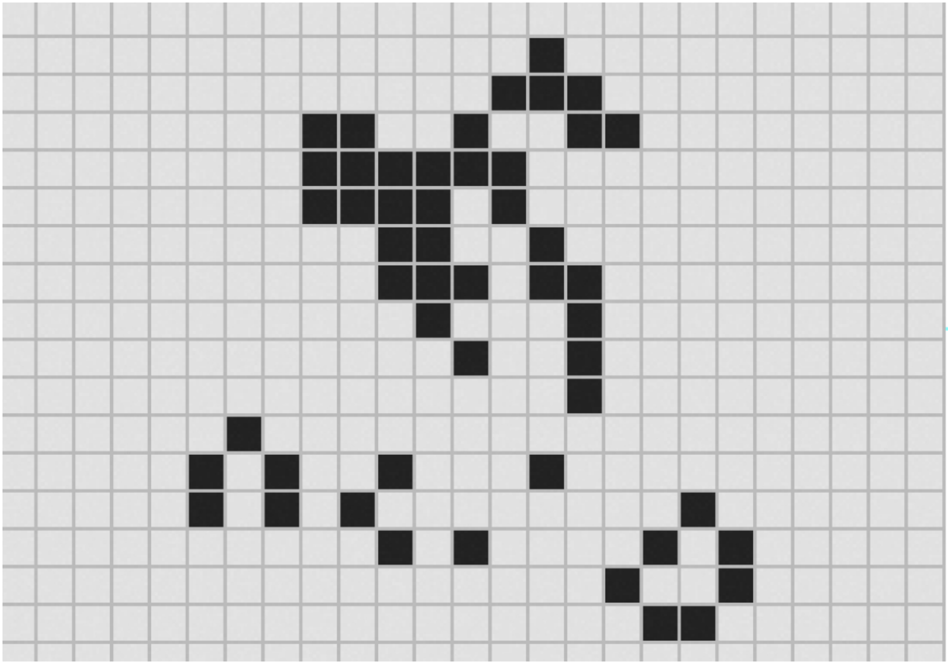
THE CLIMATE HOUSE
THESIS BY KATERINA BOUZIANA

House is basic need for human beings. From nomads to the richest people, everybody tries to build a house to stay, to protect him and gain some privacy.
Evidence is gathering that human activities are changing the climate. This 'climate change' could have a huge impact on our lives. As contemporary architects we have the obligation to propose solutions in order to create safe and viable houses.
By combining these two facts, the title of the project arouses: "The Climate-House". It is a first try to approach and create a program that filters contemporary dwelling through the vital problem of climate denaturation and changing of our planet. It's an attempt to predict and design the best possible floor plan of a house and how it changes over the time. It's also an attempt to create a flow of information from nature to residence and vice versa, in real time.
It is a project that started with pretensions and can constitute an important tool for contemporary architect, when refined.

HOW IT WORKS

An application in Java-based programming language Processing Beta 0135 that produces possible floor plans for houses, depending on the climate of the area that it is going to be built in. The result every time is evaluated from factors such as average temperature, noise, light and the house is optimized until it finds the best position for the rooms. The program is based on cellular automaton theory.

Cellular automaton:
A cellular automaton evolves in discrete time steps, with the value of a variable at one site (t+1) being affected by the values of variables at sites in its "neighbourhood" on the previous time step (t).
The theory has four distinct characteristics:
1. cells
2. state of the cell
3. neighbourhood of a cell
4. transition rules



Cellular automaton

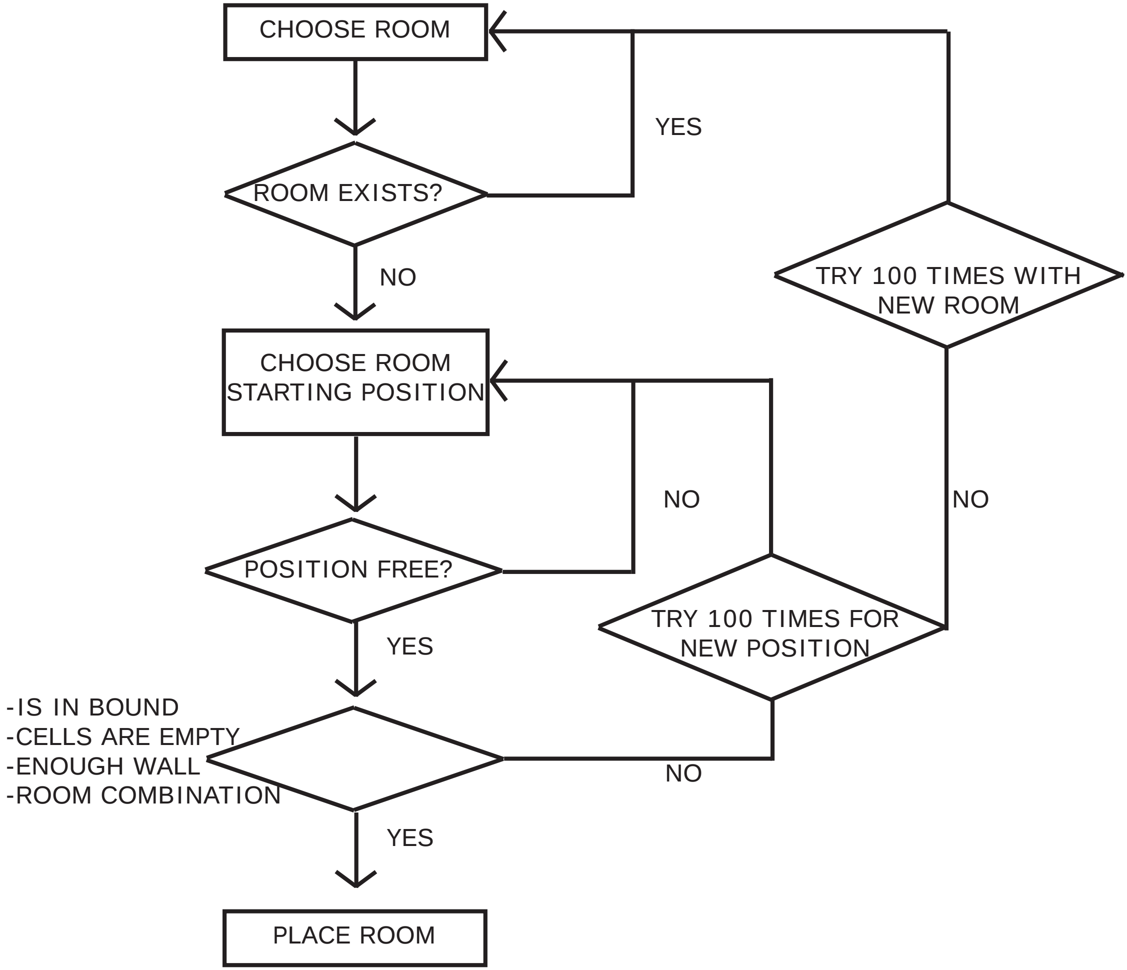
The process is non linear but logical. On one hand, the monad, the perfect, the non-subdivided object that is reproduced, multiplied, and on the other hand, the continuous matter that is subdivided, seeks for and creates relations among its points, its parts, with the aim of creatively distorting them.
Although the above criteria have been described in terms of optimizing functions, the aim is not to produce global optimum solutions but rather to direct the evolutionary process to produce populations of good solutions either as components for higher levels or at the final level itself. So that, even though the global optimum solution for the shape of a house using the above criteria, may be known, this may not be the optimum solution at the zone and city levels. By selecting other non-optimal but good solutions, according to the given criteria, good unexpected results may be achieved for the overall design.

adjoining room combinations

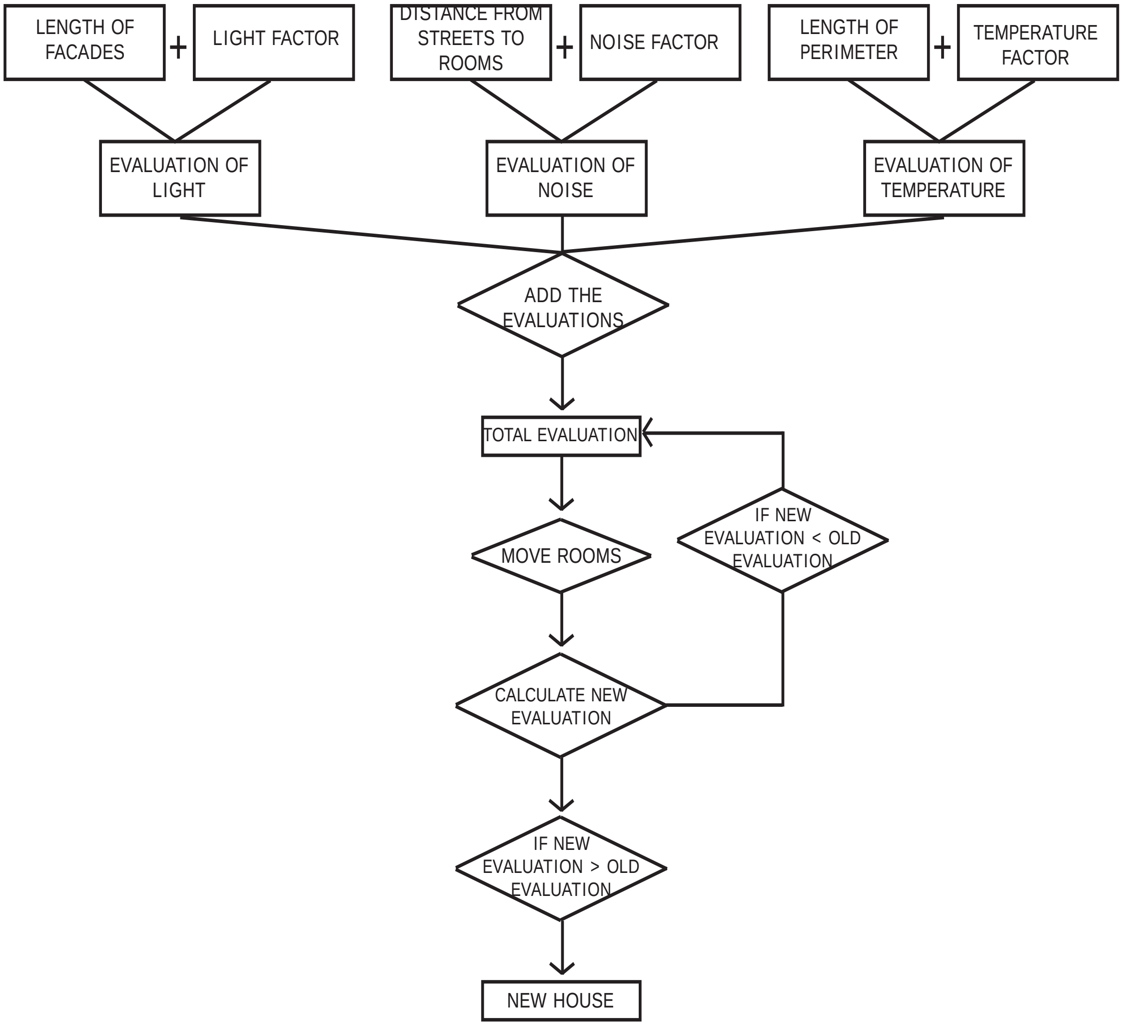
		entrance	living room	kitchen	bedroom	bedroom	bedroom	bathroom	wc	guestroom	office
	room id	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
entrance	**1**	2	1	1	0	0	0	0	1	0	1
living room	**2**	1	2	1	1	1	1	0	1	0	1
kitchen	**3**	1	1	2	0	0	0	0	1	0	1
bedroom	**4**	0	1	0	2	1	1	1	0	1	1
bedroom	**5**	0	1	0	1	2	1	1	0	1	1
bedroom	**6**	0	1	0	1	1	2	1	0	1	1
bathroom	**7**	0	0	0	1	1	1	2	0	0	1
wc	**8**	1	1	1	0	0	0	0	2	1	1
guestroom	**9**	0	0	0	1	1	1	0	1	2	0
office	**10**	1	1	1	1	1	1	1	1	0	2

0 = room combination can not be next to each other
1 = room combination can be next to each other

Allowed room combinations



Rules for creating the house



Evaluation of the house

1 Room: Number 1 = entrance
2 Room: Number 3 = kitchen
3 Room: Number 8 = wc
4 Room: Number 2 = livingRoom
5 Room: Number 10 = office
6 Room: Number 6 = bedRoom 3
7 Room: Number 5 = bedRoom 2
8 Room: Number 7 = bathRoom
9 Room: Number 4 = bedRoom 1
10 Room: Number 9 = guestRoom

Perimeter: 844
North Facade: 224
South Facade: 224
East Facade: 198
West Facade: 198

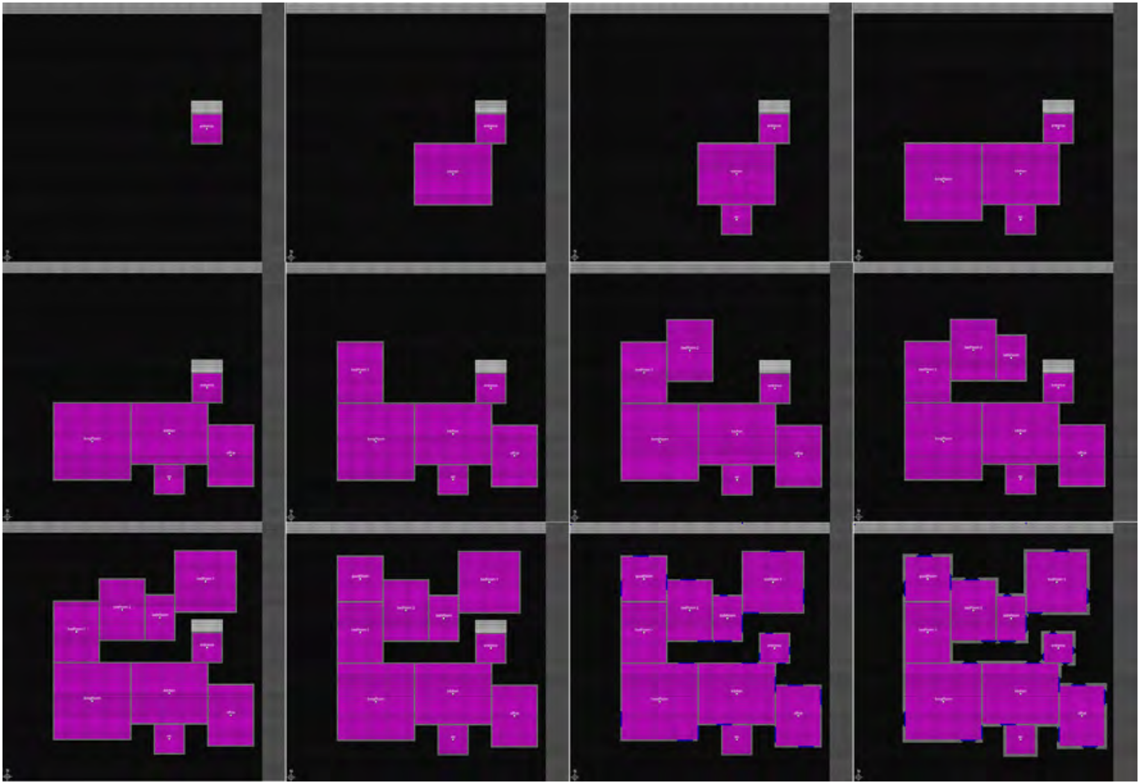
Temperature: 35 C
Evaluation of Temperature: 240

	DistL	DistD	Noise	Light	Up	Down	Left	Right
entrance:	74,000	35,000	288	31	0	0	0	0
kitchen:	103,000	59,000	293	36	0	0	0	0
wc:	132,000	59,000	293	28	0	0	1	1
livingRoom:	108,000	108,000	292	75	0	0	1	0
office:	117,000	20,000	249	60	1	1	0	0
bedRoom 3:	64,000	118,000	282	45	0	0	1	0
bedRoom 2:	50,000	89,000	273	69	1	1	0	0
bathRoom:	55,000	65,000	291	25	1	1	0	0
bedRoom 1:	32,000	36,000	249	111	1	1	0	0
guestRoom:	30,000	118,000	276	78	0	0	0	0
total:			2786	558	4	4	3	1

Total Evaluation Of House: 3584.0

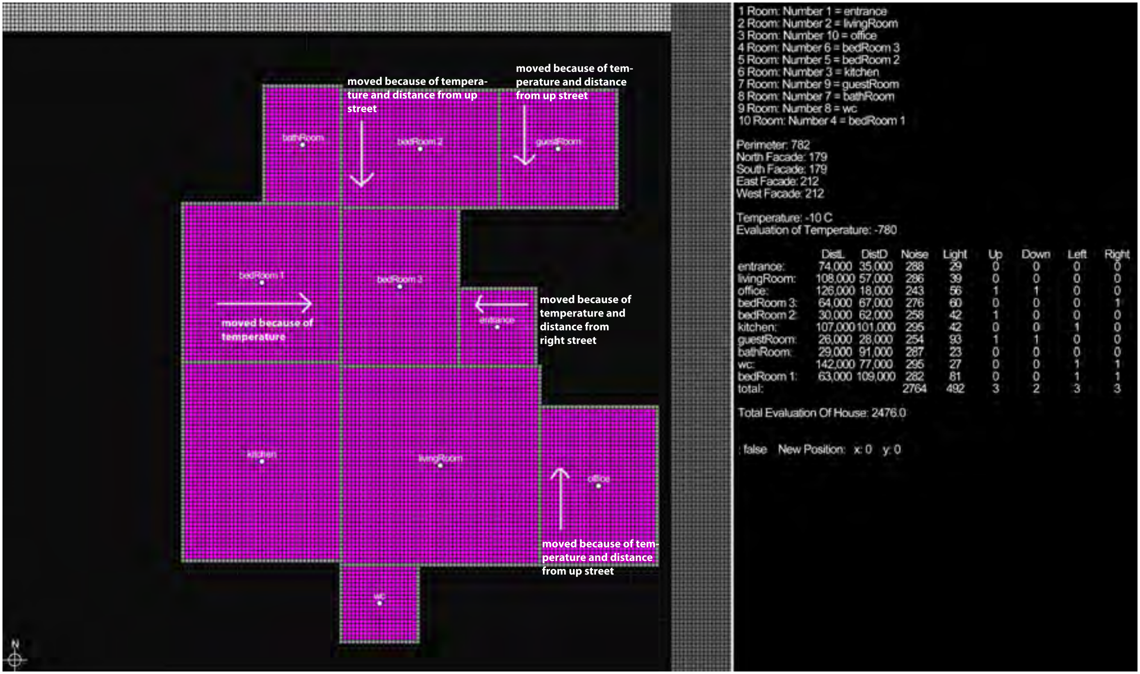
THE HOUSE

The project results of a clear scripting procedure but it maintains the concept of the human's needs and the viability of the house.
The repetition, the multiplication, the genesis, the reproduction of the elements, they all relate to movement, the size, the history, the memory, the evolution.
Architecture finally becomes truly time-based and climate- based. It is no longer a simulation, not only in the isolated sectors of the design process but in the experience of the space itself.
Space in my project communicates actively with the users of the space in real time: they know each other, they flock together, space, nature- climate and people are becoming linked through a complex series of net-works.

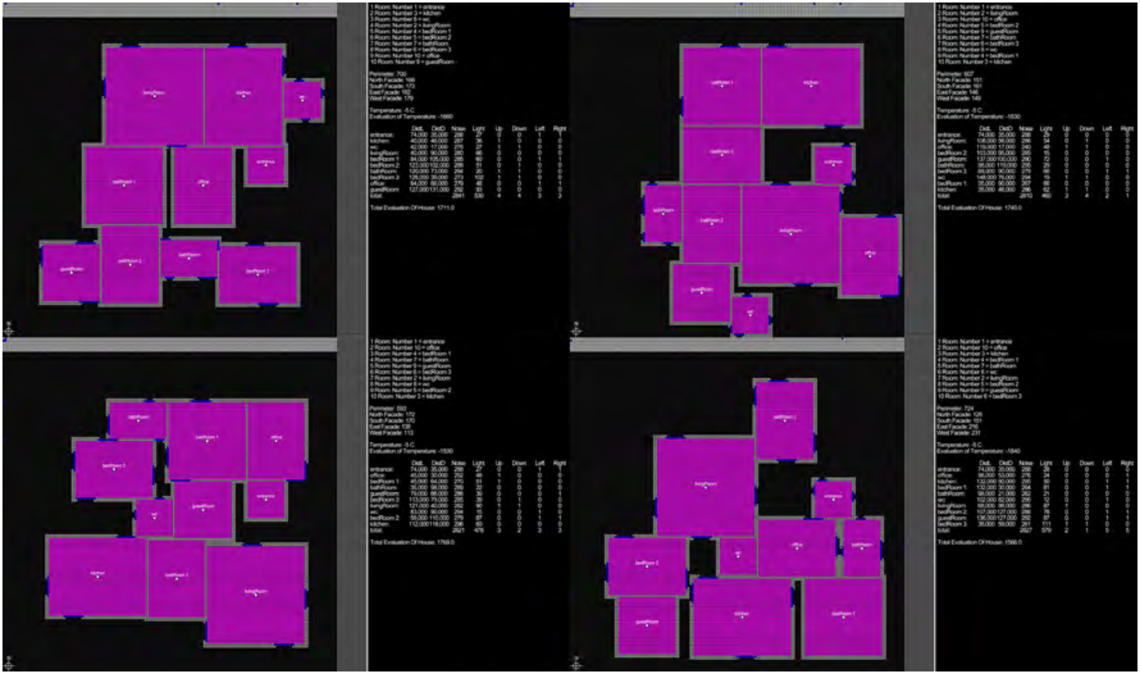


Procedure

Floor plan before optimization

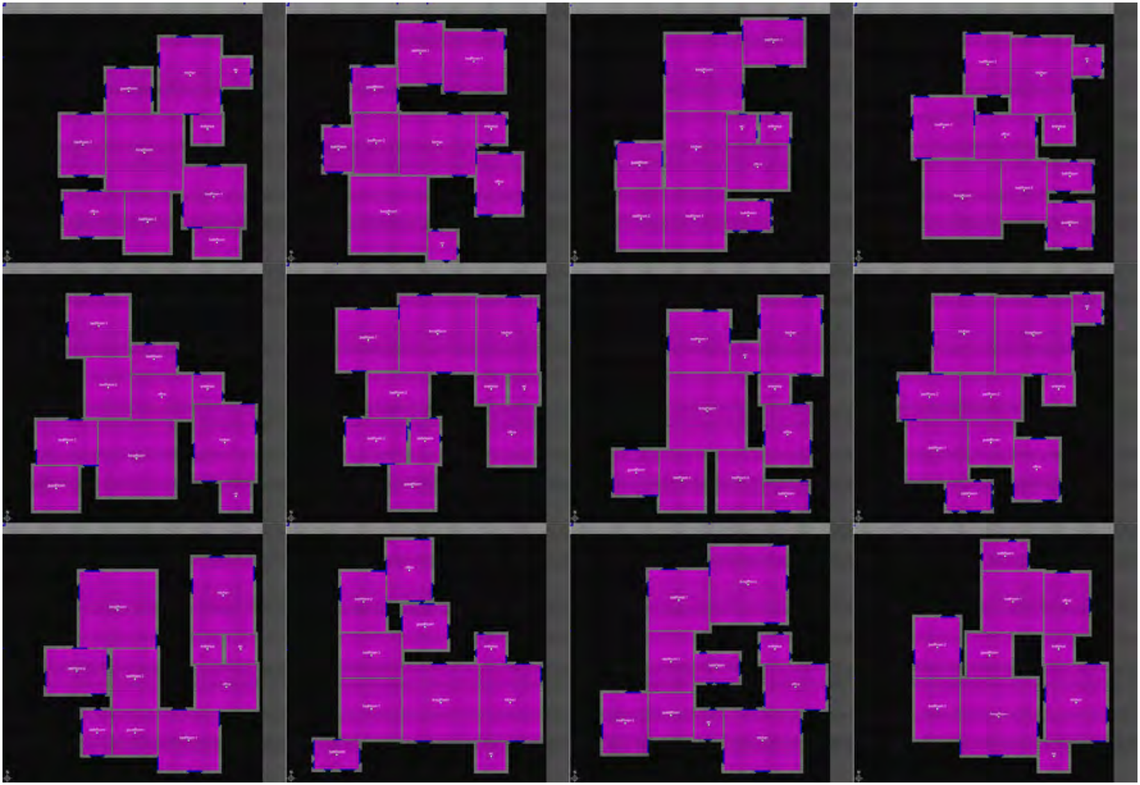


Floor plan after optimization

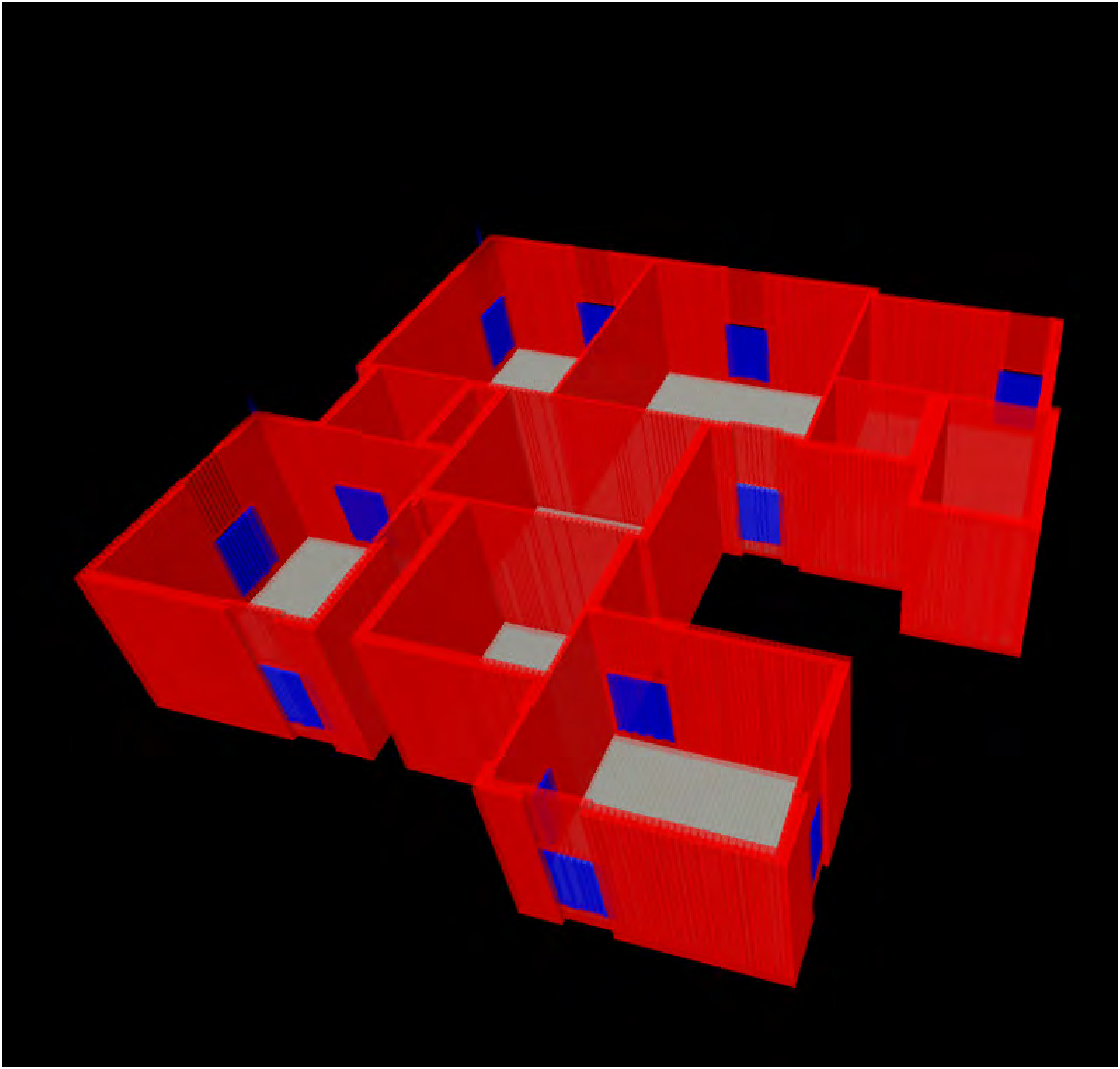


examples in temperature of -5 C

examples in temperature of +40 C

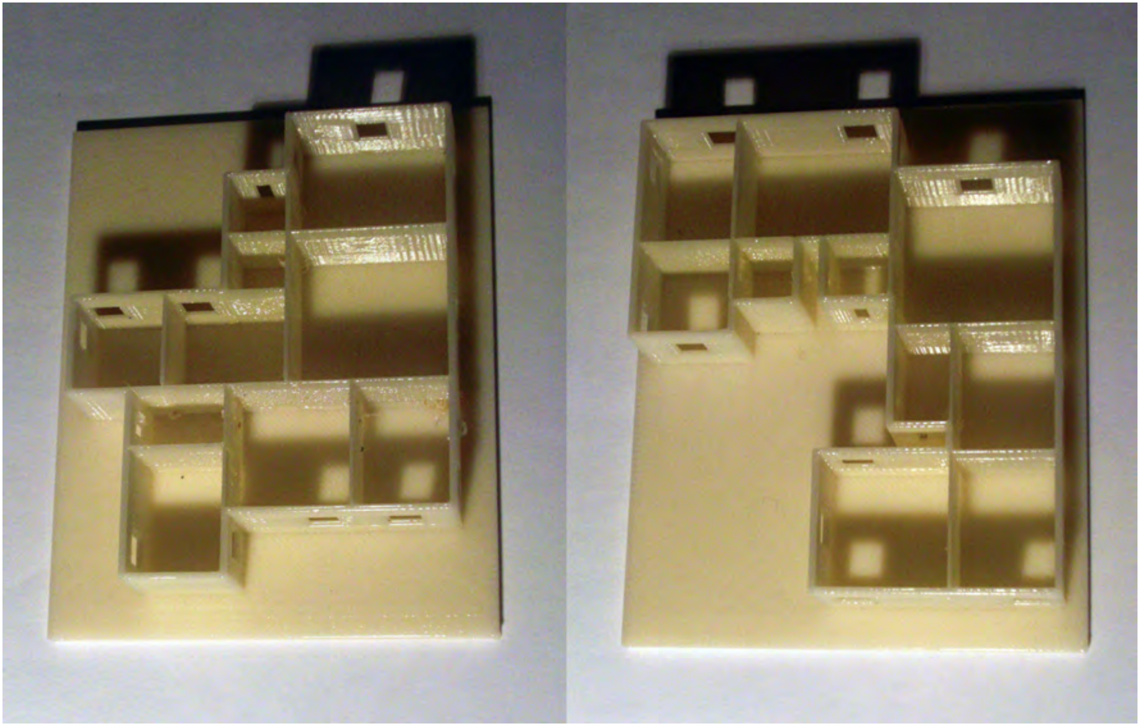


12 floor plans



3D in Processing

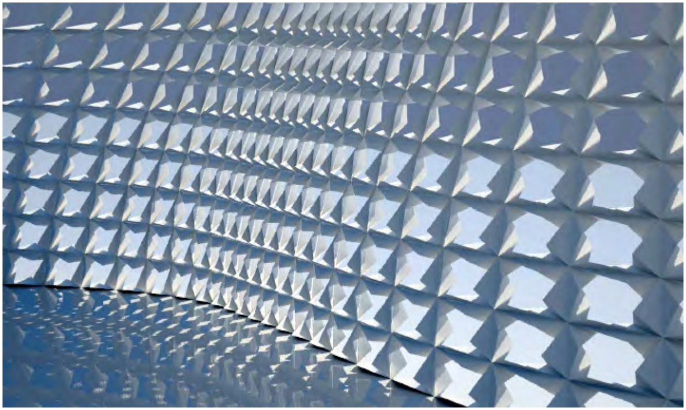
Renderings of the final house

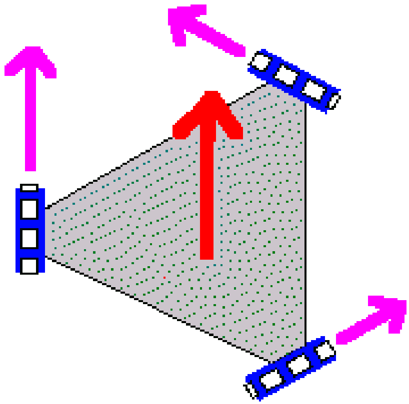


Models printed in the 3D printer

NEXT STEPS: THE VISION

This project serves as a way of visualizing the potential for a house that respects the nature and the inhabitants and has the ability to change during the time. In order to finalize the dwelling it is suggested to apply solar power panels for electric independency. Another important step would be the design of a parametric and movable façade that could control the introversion and the extroversion of the house. Lastly, the application of special systems for moving the rooms in real time would end in a smart and flexible house.





solar panels, parametric façade and moving systems

CONCLUSION: THE BUILDING BECOMES THE INSTALLATION

My project tries to give a solution to the ultimate task of architecture, which is to inform its new born structures in real time. The design task of the information architect is how to keep the process alive and apply meaning to the behaviour in real time. How can the designers tunnel a continuous stream of data to and from the built structure and give meaning to the shape and content of the structures changing in real time? These dynamic buildings I regard as running processes, which are continuously informed and which continuously inform other running processes. They are active nodes in a complex adaptive operational network.

The building becomes an active installation where numerous actuators are constantly communicating with other actuators, their users and their environments. We know from practice that in each building there is already a large portion of the budget dedicated to the electro-technical and mechanical installations up to 30% of the total budget. In the bright future of dynamic buildings the whole structure will be interpreted as an installation. Project the actual trends into the near future it makes sense to regard all constituting components of the built structure as active members of the installation. The building becomes a live organism, it becomes the installation.