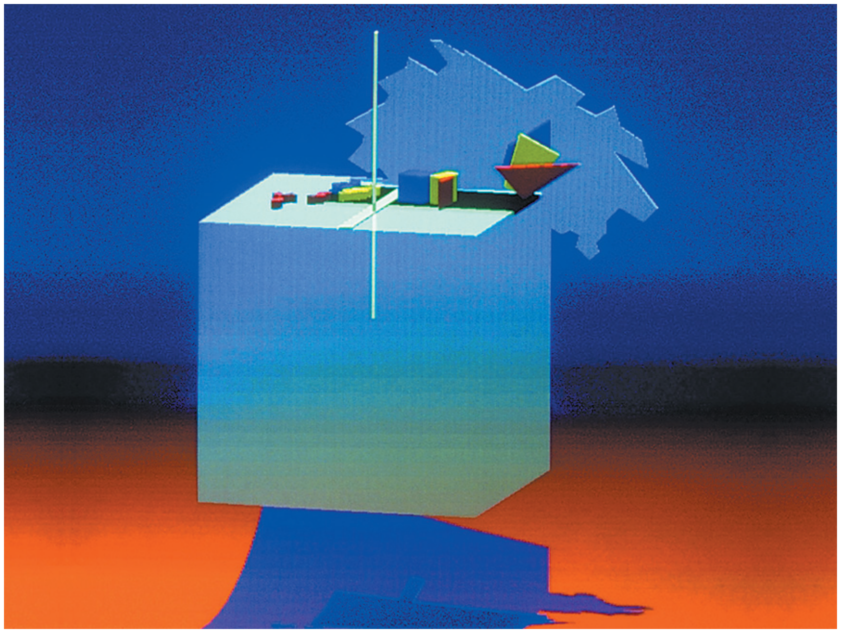
Game, Set, and Match

Kas Oosterhuis

L'architecture est un jeu magnifique

"Architecture is the masterly, correct and magnificent play of masses brought together in light"[1] as Le Corbusier put it in his manifesto *Towards A New Architecture.* Everything has changed since, and we are ready for the new paradigm: "Architecture is the programmable hyperbody played skillfully by its masters with the speed of light." Le Corbusier gave shape and meaning to architecture in the era of the Industrial Revolution. Let's now process hyperreality for the Digital Revolution. Let me be clear from the very first paragraph: virtual reality is in all respects more real than so-called reality. Virtual reality, including all software ever written for any platform, is hyper-real. Simply because we know the stuff which it is made of. We know every bit and byte. In the Digital Revolution reality has been re-written from ground zero. And if we look closely at commonplace reality, our so-called natural world, we really do not know much. Looking up into the sky, we keep inventing questions about the nature of the universe. And when we focus our scientific investigation inward into the microcosmic universes we keep adding more questions about the very nature of the smallest building blocks. It is my guess, and not only mine, that there is no such thing as a building block after all. I expect to learn more about waves, pulses and force fields than about solid masses. All matter, including all material where architecture is made of, is being redefined as information flow.



Legovilla XYZ, Kas Oosterhuis, 1985

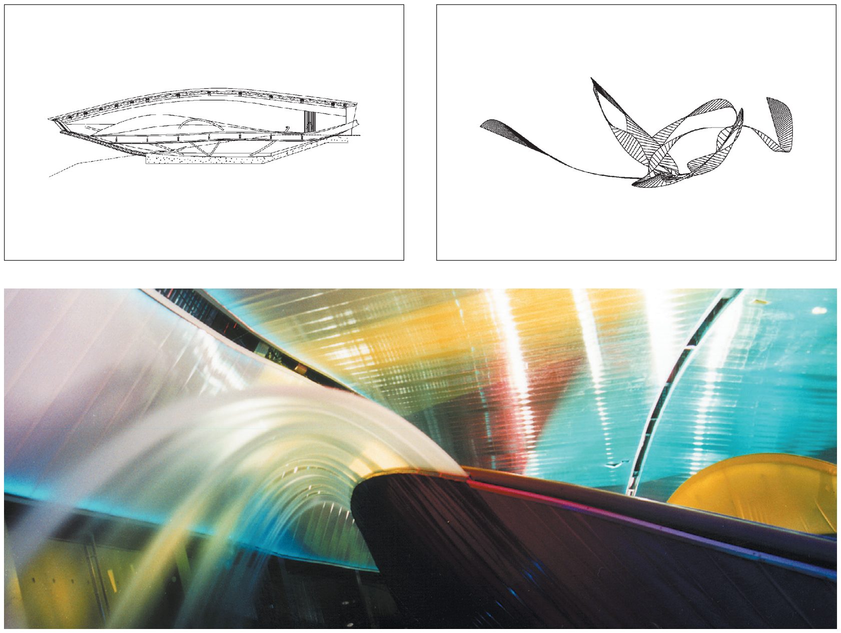
Ray Tracing in 3-D Computer Programs

I started to work with the computer in the early eighties. First I explored the possibilities of the computer for representation. The architectural concept was made until the very last detail in my head, and I explored methods of communicating the concept. Using the Mechanical Engineering software shell running on Intergraph Unix workstations my team built the digital 3-D model of the Legovilla XYZ for an exhibition in the Centre Pompidou in Paris. For the first time the ray-tracing technique was available to build light and shadows. We did in virtual hyperreality what Le Corbusier dreamt of in his retro-reality. At the same time we built the digital 3-D model, a Lego-team built the physical 3-D model which consisted of over 50,000 pieces. Here the smallest building blocks were known indeed, and in a peculiar way the building process in Lego preceded my later work within the new field of programmable architecture. In the description of the concept I spoke about the genetic code of the villa, and created a database of all pieces and the exact number of pieces used, flagged for the colors chosen. It was from the very beginning clear to me that we should not try to make a scale model 1:20 (which was the brief) but a 1:1 model representing the concept only.

Virtual Reality Markup Language

Nearly ten years later I had found ways to embed working with the computer deep in the design process. The very making of architecture could no longer be conceived in the head of the designer. I stepped into a process, starting with the intuitive sketch (done by Ilona

Cloud 012 from Sculpture City, Kas Oosterhuis with Ilona Lénárd and Menno Rubbens, 1994



Saltwaterpavilion Sensorium, Kas Oosterhuis, 1997

Lénárd), working my way through boolean operations, which led to 3-D models and 3-D details which were of unpredictable nature for the limited human mind. Sculpture City was an exploration into the new mental horizons set free by the calculation speed of the computer. Designing became, from then on, going with the flow. I had to relate in a completely different way to the tools I was working with. The computers were operating in many aspects faster than the human brain; I had to redefine my superiority towards this tool. I was no longer in command; the design process went slightly out of control. I rather worked with the computer, instead of having the computer working for me. Computers became partners; we gave them names. In the Sculpture City project I found the then very new VRML technique essential for the rethinking of architecture. VRML taught me that objects can have behavior—that they can behave in time—that they can change in time. Time was added to space. For me architecture became, from then on, a time-based discipline. Time became inclusive. I started to realize that static architecture had to be redefined as an instance taken from a continuous flow. And, already then, we projected motion on the programmable façades of the building/sculptures named the Clouds, preceding the later fully programmable structures.

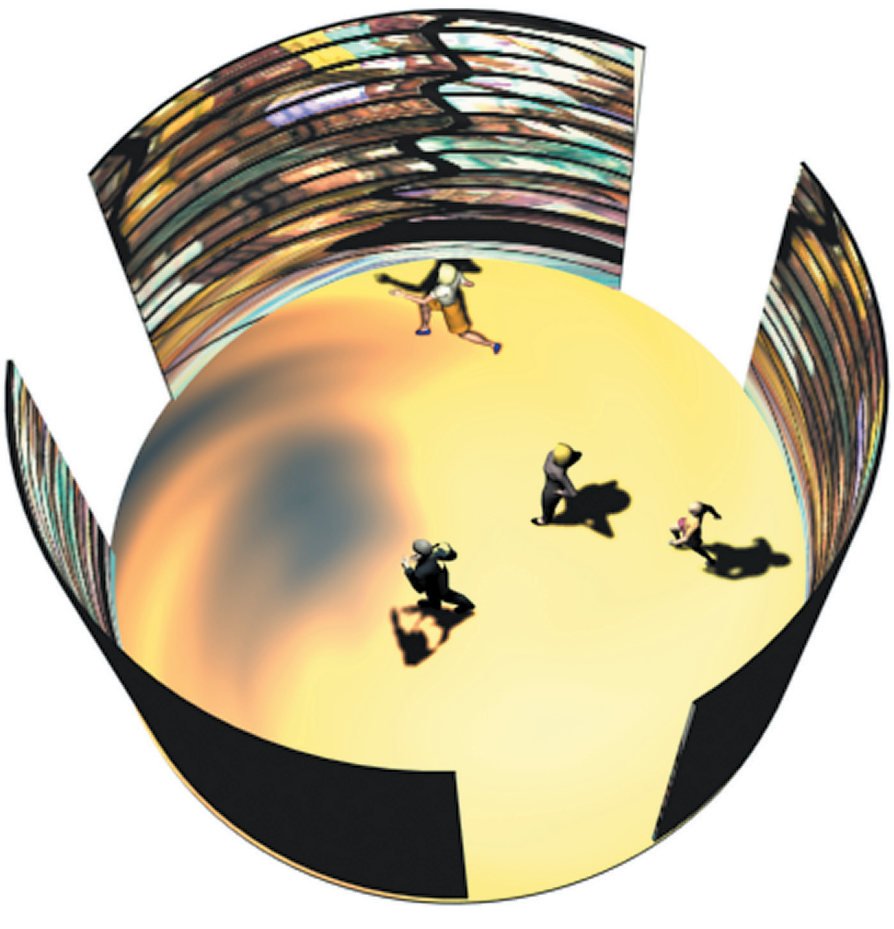
Real-Time Behavior

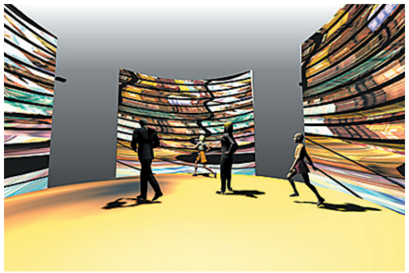
The conclusion was inevitable: if we want to give behavior to architectural objects in VRML, we want to give behavior to built architectural objects as well. It is a temptation I could not resist. And in the end, it is the most natural way to go. It was immediately obvious to me that resisting these new technologies wouldn't lead anywhere. The architect would become the retroactive defender of its cultural heritage (not unlike Rem Koolhaas in his retroactive manifesto for Manhattan). I have seen too many attempts to resist and to look back. The alternative is so much more appealing: the architect becoming the animator of constructed environments, working with the now available technologies. This attitude positions the architect right in the middle of the actuality of nowadays society, where multimedia are quickly becoming a dominant economic factor. Working on the commission for the *Saltwaterpavilion*

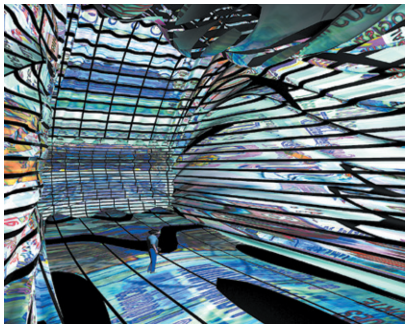
I decided that a real-time connection to a continuous dataflow was essential. I proposed and realized the real-time dataflow for the profession of architecture in a completely new, but affordable manner. This is how it works: first we capture radio signals from a buoy on the sea, and use these signals as raw data input. Then these signals are read in real-time by a computer program (Max) and transcribed into MIDI signals. Still in real-time the MIDI signals are sent to two separate mixing tables, one dedicated to the programming of the lights and one for the sound control. The dimmable RGB lights are continuously changing according to the instructions they are receiving in real-time. And the sound environments add continuously new sound samples to the basically cyclic sound design. Since the choices for the colors, for the light intensity and for the choice of the sound samples are a direct and continuous interpretation of the radio signals coming from the buoy on the North Sea, the whole process can accurately be described as real-time behavior.

Interactivity Design

In the *Saltwaterpavilion* and for other projects like *ParaScape* and *ParaSite*[2] I established a real-time dataflow resulting in always changing and hence unpredictable environmental conditions. Being inside these architectural bodies feels like experiencing changes in the weather. It is all over you. You find yourself immersed in a dynamic environment, and it is not you who controls it. These environments are basically out of control, they have a will of their own. Now, imagine you might want to interfere with these out of control environments. That is a logical next step. I took this idea as the consistent follow-up approach, working with computers in the design process, and working with computers to design the real-time behavior of my realized (and to be realized) information-digesting vehicles (called architecture). I wanted the users to communicate with my building bodies. I wanted them to interact. In the *Saltwaterpavilion* we already experimented with built-in sensor boards, where the visitors could interfere with the light and sound design by adding new data to the real-time dataflow. The environmental colors and sounds would react immediately on their input, the visitor could actually play with the building. Playing is a nice way to think about communication between the building and the user. From that point on I realized



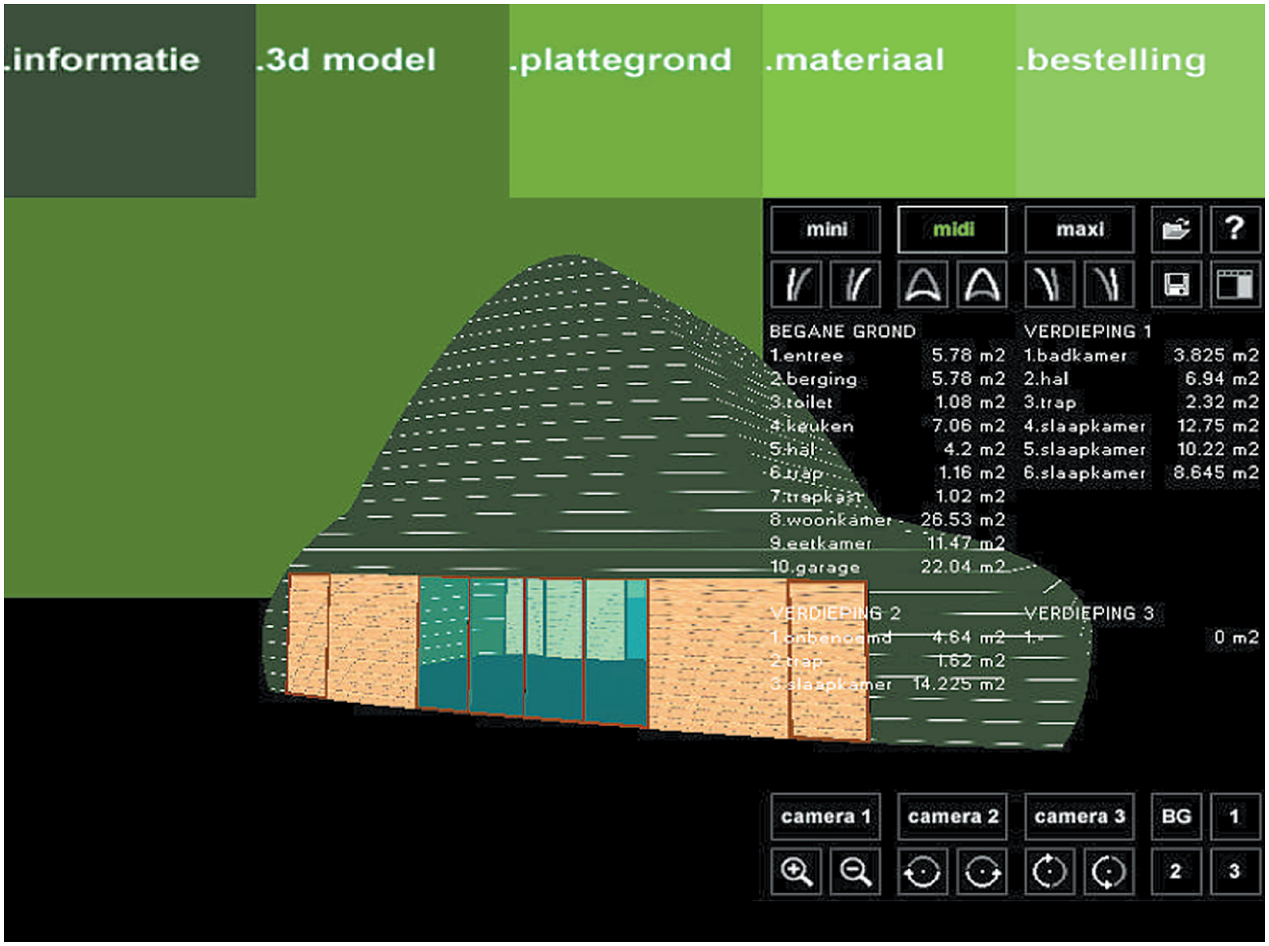




Installation Trans-ports for the Architecture Biennale in Venice, Kas Oosterhuis, 2000 that we needed to build my bodies of architecture as interactive games. The first major attempt in this direction is my installation *Trans-ports* for the Architecture Biennale in Venice in 2000. The installation is a group achievement of architects, artists, programmers and users alike.[3] *Trans-ports* can be adequately described as an interactive cave. By walking around the visitors trigger sensors and hence send signals to a game which is running on three computers connected to three projectors. Each projector is a camera viewpoint registering 120 degrees of the virtual (hyperreal, remember) world. The signals coming from the sensors are similar input as the keyboard strokes when playing a computer game. Each signal means a certain action in the game. And since in the *Trans-ports* installation 16 signals act simultaneously, it works like a multi-user game environment. Some of the actions change the geometry of the environment, others insert particles (rain, bees, ghost images), some add sound samples, and others create fog effects in the worlds. The visitors are in real-time creating the environment where they feel themselves part of. The sensors function as a collective mouse. We designed three completely different worlds, each with a run-time of 10 minutes: *Handdrawspace* (by Ilona Lénárd), *Floriad*e, and the self-explaining *Trans-ports* world.

On-Line Design

Having the users interact with the very geometry of the body of architecture now seems to be one of the major issues of my office.[4] Positioning my buildings in a network of continuous dataflow is another major theme. These two issues are combined in the *Variomatic* catalogue housing project. Visitors of the *Variomatic* website <http://www.variomatic.nl> can build their preferred shape on-line. They actually create the geometry on-line, producing the data the architect needs to administrate the coordinates. The generated coordinates are directly used by the factory, which assembles the prefabricated building elements. In this way there is a unique hotline established between client and producer. On top of this the visitor can choose the cladding materials on-line, and the colors, not unlike is seen on some automotive websites selling cars (assemble your own car). The inventive Smart company launched the first site to encourage its buyers to go on-line two years ago.[5] With the *Variomatic* website we are introducing a similar commercial tool for the housing market. The big difference though



BEGANE GROND

1.entree	5.78 m2
2.berging	5.78 m2
3.toilet	1.08 m2
4.keuken	7.06 m2
5.hal	4.2 m2
6.trap	1.16 m2
7.trapkast	1.02 m2
8.woonkamer	26.53 m2
9.eetkamer	11.47 m2
10.garage	22.04 m2

VERDIEPING 1

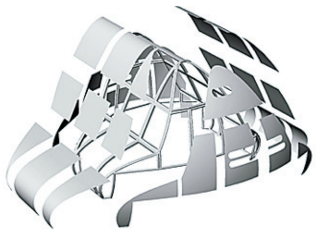
1.badkamer	3.825 m2
2.hal	6.94 m2
3.trap	2.32 m2
4.slaapkamer	12.75 m2
5.slaapkamer	10.22 m2
6.slaapkamer	8.645 m2

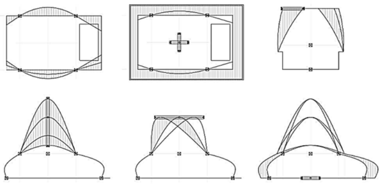
VERDIEPING 2

1.onbenoemd	4.64 m2
2.trap	1.62 m2
3.slaapkamer	14.225 m2

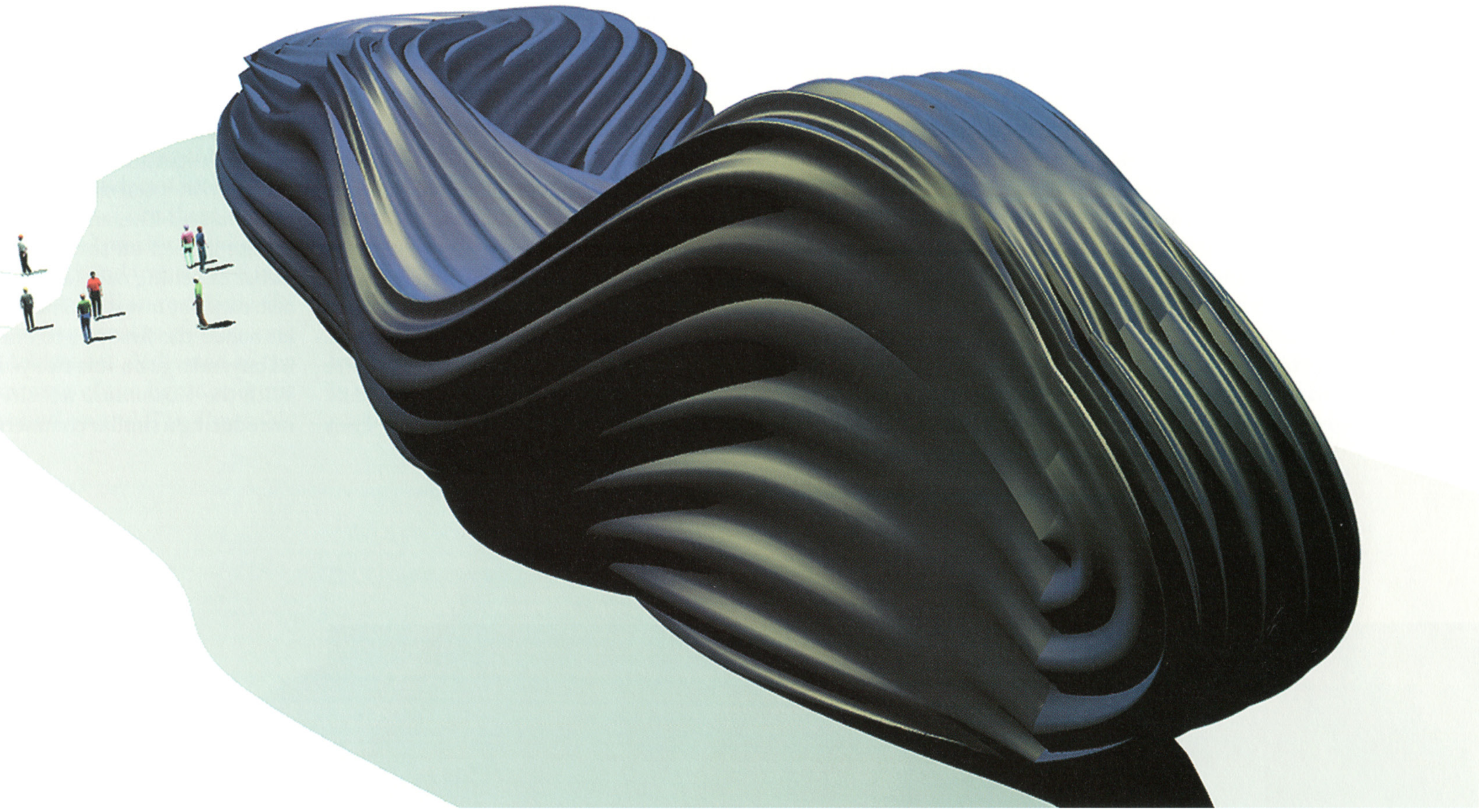
VERDIEPING 3

1.	0 m2





Webplayer version Variomatic catalogue housing project, Kas Oosterhuis, 2001

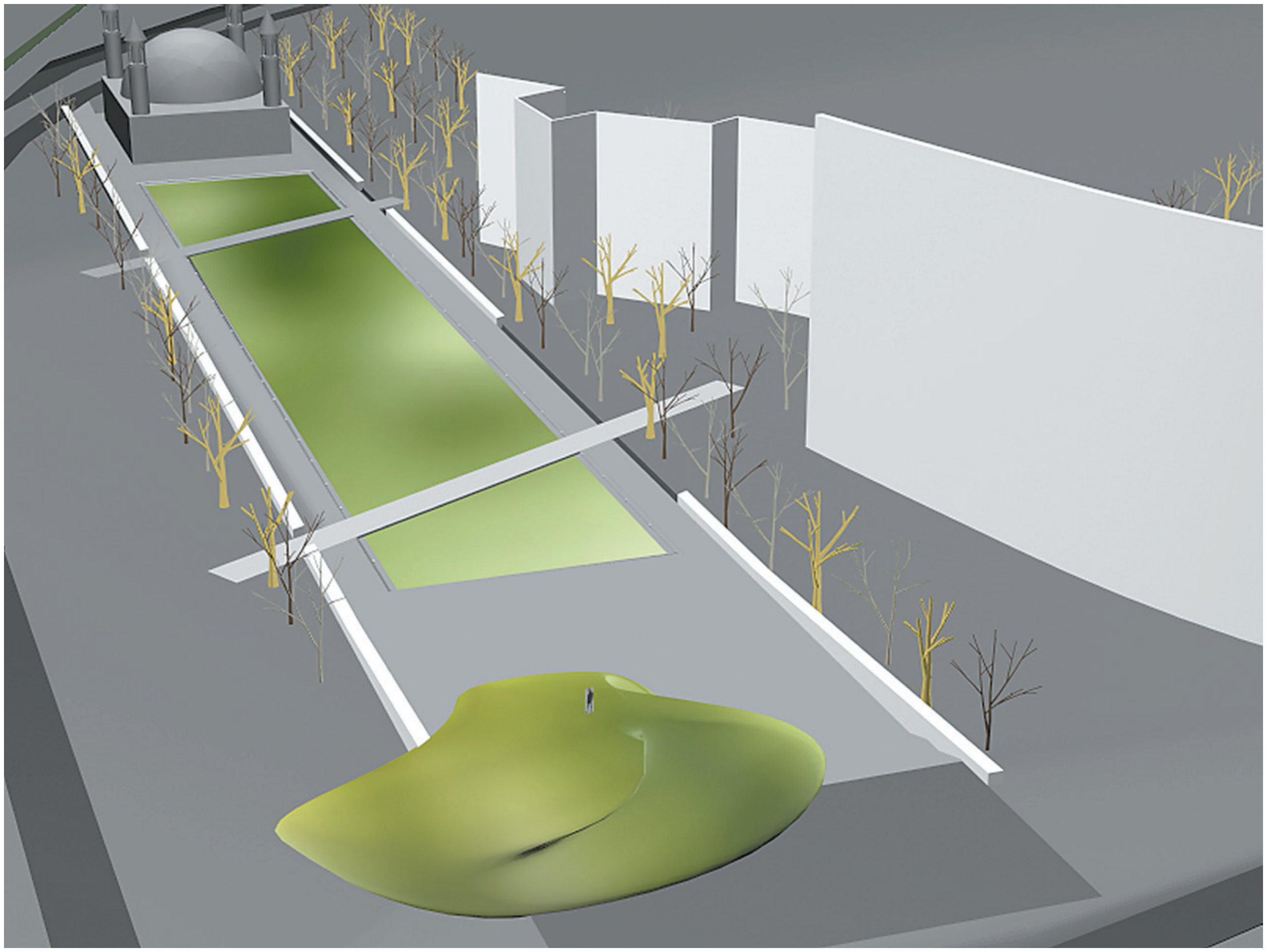


Installation Trans-ports

is that in the *Variomatic* website the clients interact with the 3-D model. While the interaction on the Smart website is limited to the refreshing of 2-D images, the *Variomatic* interaction engine connects the 3-D model to a database in real-time. The dream of the facility manager comes true.

"If you are not in real time, you're dead"

"If you are not in real time, you're dead" is the perfect one-liner by Kevin Kelly.[6] If that is the case (and who can even try to argue against this?), all traditional buildings must be declared dead. They are not here with us in real-time; they merely function as a dead body in the background of human activities. But now I have found the tools to activate the building. Not only can I activate the lighting conditions and the sound environments, or generally speaking the content, but I can also activate the very structure of the building. The concept of programming an active structure forms the basis for the *Trans-ports* pavilion.[7] *Trans-ports* is an active structure which can change shape and content in real-time. There are many ways to achieve this. One particular solution I have chosen for the *Trans-ports* project. The constructive mesh of the pavilion is to a large extent made of hydraulic cylinders, all programmable. Meaning that pulses are sent to the cylinders to become either shorter or longer. When a pulse is sent to only one of them, nothing happens. The pulses must be sent to all cylinders, which are connected to that particular cylinder which has to move. All connected cylinders have to work together to be able to reconfigure. One must realize that this method of changing shape is much more complex than for example moving an automatic sliding door, or other mobile parts of the traditional building. In the *Trans-ports* project the structure behaves like a muscle. All fibers cooperate to perform the new configuration. Now, suppose I want to move a bigger area of the building. Then the whole dynamic space frame construction must reposition its joints by lengthening or shortening the hydraulic members. The whole construction becomes active, like a muscular bundle. Sending the pulses and address them to the specific cylinders means programming the structure. *Trans-ports* is the first example of a fully programmable building. I can program *Trans-ports* to take any shape within its predefined bandwidth. And at the same time I can program the electronic skin, interior and/or exterior skin. Programming the skin means immersing the users in any environment. The skin consists of numerous programmable RGB LEDs fastened in a flexible fabric. The

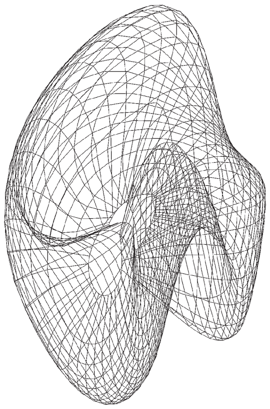


ParaScape, Kas Oosterhuis

interior and the exterior skins must be able to follow the movements of the main structure. They must be flexible; they must be able to stretch 1.5 times their original size. These techniques are readily available on the market. What is needed to realize a concept like *Trans-ports* is a mental switch.

Game, set, and match

Architecture becomes a game being played by its users. And not only architecture will be subject to the forces of real-time calculation. Also planning, construction, interior design and landscape design are ready to be developed as real-time games. During the design process the game is designed by the architect and played by all parties involved. During the life cycle of the building and the built environment the game is played by the users, by the visitors of the show. Visitors become participants in our experience economy.[8] By playing the game, the participants set the parameters. Each action triggers sensors which write the new data to a database, from where the building picks up the new data and starts reconfiguring itself, in shape, in content, or both in shape and content. Then the new configuration must match to the desired conditions. It is fair to say that the building will find itself in a state of continuous operation. The building, consisting of numerous cooperating programmable elements, will behave exactly like a swarm. The building elements will show flocking behavior, always keeping an eye on the neighboring element, always ready to act and react. Hence I propose this new slogan for the profession of architecture: "Game, set, and match." Over and over again.



Notes

[1] *Le Corbusier, Towards a New Architecture,* 1927, p. 31.

[2] *ParaScape* is an interactive sculpture in the urban environment by visual artist Ilona Lénárd and Kas Oosterhuis, together with composer Richard Tolenaar. *Parasite* is an inflatable sculpture in the urban environment by visual artist Ilona Lénárd and Kas Oosterhuis with Menno Rubbens and a variety of guest-artists and composers.

[3] *Trans-ports* team: Kas Oosterhuis, Ilona Lénárd, Andre Houdart, Richard Porcher, Nathan Lavertue, Philippe Müller, Bert Bongers (sensors), Ole Bouman (video fragments from Freeze).

[4] The name of the office is Oosterhuis.nl, see http://www.oosterhuis.nl, or contact oosterhuis@oosterhuis.nl

[5] See http://www.smart.com

[6] *Out of Control,* Kevin Kelly, 1994.

[7] *Trans-ports Pavilion,* v1, v2, and v3, Kas Oosterhuis, content in collaboration with Ole Bouman, 1999/2000.

[8] *The Experience Economy,* Joseph Pine II and James H Gilmore, 1999.