

DE-MATERIALISED

An architecture of virtual materiality.

Text: Ekta Idnany
Photographs: Courtesy LAB[au]

1

Architecture is becoming increasingly involved in digital information technologies, yet its manifestations continue to remain in material realms. It is our attempt here to showcase an architecture typology/vocabulary comprising of alternate materials (virtual), through pioneering practices and projects that operate in installation, architecture, urbanism and other spatial spheres.

Dune 4.0

Dune 4.0 is an installation by Studio Roosegaarde, an independent artistic laboratory in Rotterdam,

the Netherlands, that mainly envisions and creates interactive art. The creative director of the firm, Daan Roosegaarde, is a young artist whose work explores the dynamic relation between architecture, people and e-culture. His sculptures create a situation of 'tactile high-tec' where visitor and public space become one. Roosegaarde says, 'My artworks explore the dynamic relation between architecture, people and new media. In this research the sculptures are a materialised collision of technology and human body. Through the use of new media the sculptures trigger human senses to make a sensual engagement with their environment.'



Dune 4.0 is an interactive landscape which reacts to the behavior of people. This hybrid of nature and technology consists of large amounts of fibres which is brightened with respect to the sounds and motion of visitors. The installation is created using fibre optics, microphones and sensors controlled by specially formulated software. It acts as a sensual layer of interaction over the existing architecture. Dune investigates nature in its futuristic

relation with urban space by means of looking, walking and interacting.

The interactive landscape created in Dune 4.0 challenges the mundane behavior of people, reacting to their sound and motion as they pass through. Here the visitor transforms into a participant; a direct influence on the identity of the interactive work. Fused into an intelligent and sensible environment, the artwork becomes an extension of our collective, social skin. Walking through Dune has been described by the visitors as being an 'Alice in Technoland'.

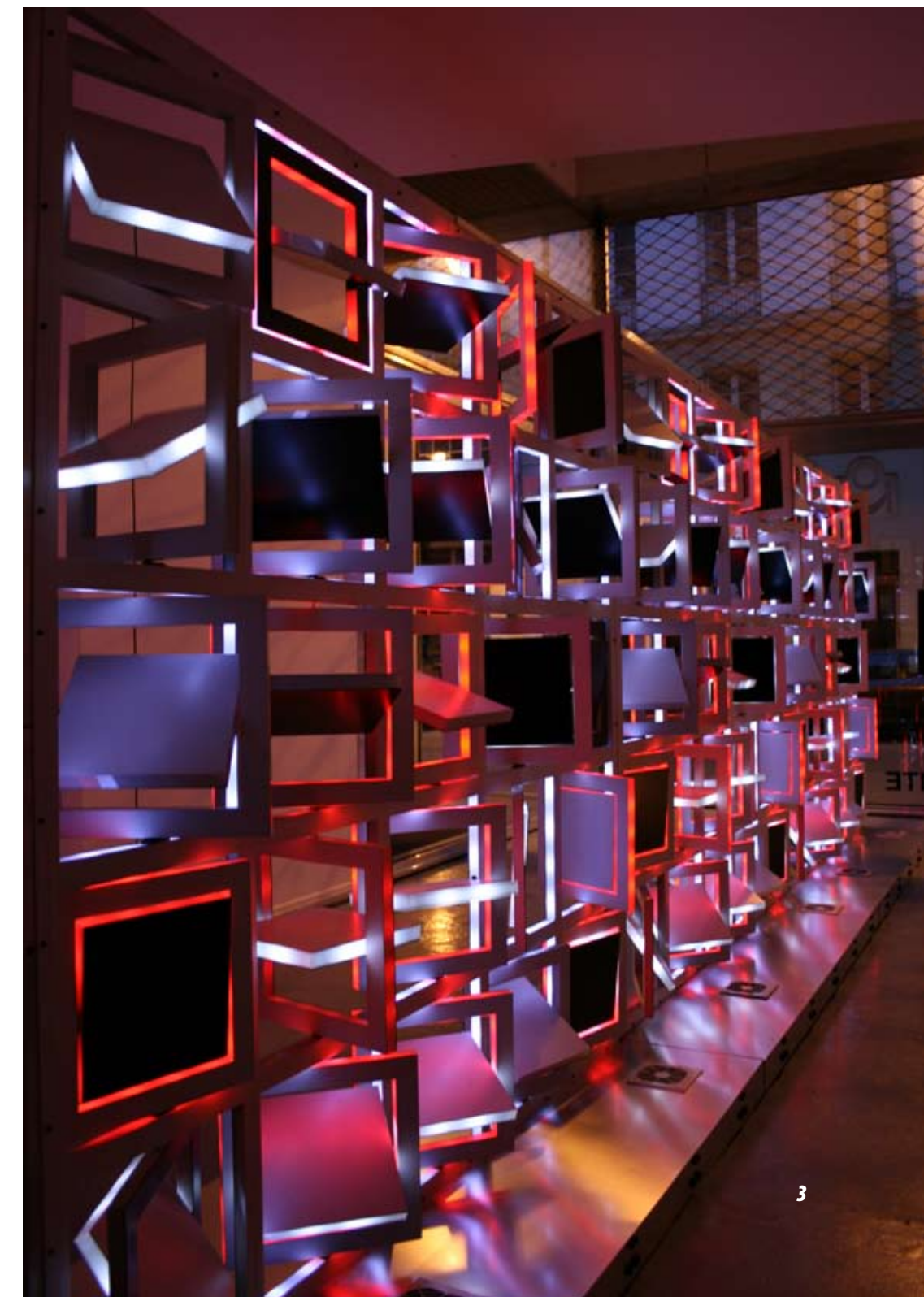
f5³, framework 5x5x5

The f5x5x5 sculpture is a kinetic and luminous framework conceived and realised by LAB[au] or laboratory for Architecture and Urbanism, founded in 1997 and based in Brussels. The firm mainly creates interactive artworks, audio-visual performances and scenographies, for which they develop their own software and interfaces. Its four members are Manuel Abendroth, Jerome Decock, Alexandre Plennevaux and Els Vermang. Their methodology of MetaDesign underlines

special focus

that 'The technological developments of the last decades are at the base of the shift from industrial to post-industrial information society. Notions of body, matter, space and time are increasingly being defined by the unit of information, introducing new parameters of space and time - presence, such as immersion and interaction,

1. Fibre optic landscape acts as a sensual layer of interaction over the architecture. ©Studio Roosegaarde
2. An interactive landscape that reacts to the behaviour of people. ©Studio Roosegaarde
3. Frameworks installed in Bernard Tschumi's pavilion at Groningen, the Netherlands, at night. ©LAB[au]





4. Frameworks constituting a random binary state (0 = black; white = 1). ©LAB[au]
 5. White and red light specific binary state. ©LAB[au]
 6. The touch installation on the Dexia Tower in Brussels. ©LAB[au]
 7. The folded interactive station. ©LAB[au]

as well as new parameters of materiality or biological ones in its definition.'

The f5x5x5 installation is part of the '16n' project cycle confronting architectural concepts such as congestion and flow with spatial sensing technologies and its constructs through the means of programmed 'lumino-kinetic' devices. The grouped projects range from architecture, urbanism to landscape and sculpture. The term 'framework' refers to the installation's constituting elements, a raster of 125 fixed and 250 kinetic aluminium frames, and to the multiple operating modes of the installation, from a low-resolution display to a generative and interactive sculpture. The 375 aluminium frames constitute the framework, a space built up by five modules of 2x2m each, divided in 5x5 regular elements, establishing a matrix of $5 \times 5 \times 5 = 125$ main frames. Each of the 125 main frames contains a middle frame, rotating around its central vertical axis, which itself contains a central filled frame, a square, turning around its central horizontal axis; as such, it is an encapsulating principle of a frame in a frame in a frame. These fixed and kinetic frames form 10m long and 2m high installation, which by scale forms an architectural element or a 20sqm kinetic sculpture.

On one side the frames are lacquered white, diffusing the light, while on the other side it is lacquered black, thus absorbing light, constituting as such a binary state (0 = black;



white = 1). Following these kinetic and colour principles, a black side of a mobile frame can be turned on the white side of a fixed frame, as well as the reverse allowing one to exploit the black and white contrast by creating visual patterns and geometric signs. The 375 frames of the installation are enlightened by light-emitting diodes on their edges. The main frame with white light, the middle with red and the innermost one with white light again, each of the 375 modules, presenting up to four edges, can be enlightened and controlled individually adding further states to the framework. These light-specific binary states, on/off and white/red, enhance the device for night and darker environment use.

At the base of the installation 50 infra-red sensors, 25 on each side with a maximum range of 6m, help to produce a horizontal sensing matrix at the ground level similar to the vertical grid of the installation. Due to this infra-red grid, the presence and position of people in the vicinity of the installation can be tracked and the direction of their movement deduced.

The correspondence between the spatial division and the tracking grid of the installation allows the correlation between a person's position and its change, movement, to a corresponding module of the installation with a kinetic or luminous behaviour.

Touch

'Touch' is another project by the Belgian firm, LAB[au]. It takes Brussels' 145m-high Dexia Tower as a starting point, from which 4200 windows can be individually colour-enlightened, by RGB-LED bars, to turn the façade into an immense display.

Instead of considering this infrastructure as a flat screen surface displaying pre-rendered video loops, the project works on the architectural characteristics of the tower and its urban context. The characteristics of the building such as orientation, volume, scale are used as parameters to set up a spatial, temporal and luminous concept, which allows people to interact with the tower directly.

On Place Rogier, an interactive station is mounted at the bottom of the tower where people can interact either individually or collectively with the display through a multi-touch screen. The static input of touch as well the dynamic input of gesture is recognised, taking into account certain parameters such as width, direction, duration and speed to generate an elementary graphical language of points, lines and planes, in a monochromatic background colour palette combined with black and white graphical elements. Once a composition is created, it can be sent as an electronic postcard with a snapshot of the tower, taken from a distance.

The design of the interactive station is based on the idea of folding and unfolding space. Embodied in three parts, the station is placed on Brussels' North-South axis in front of the Dexia Tower. The first fold allows people to interact with a multi-touch screen; the second fold directly displays the user interaction or finger drawing on a projection screen. In this manner, the station not only establishes a direct relation with the visual and luminous display of the tower but also shows the passers-by the ongoing process of interaction.

This real-time and collective interaction on an urban scale transforms the Dexia Tower into a new Brussels landmark which presents art to the city by allowing temporary urban graffiti.





8



9

8. Digital Water Wall programmed with discreet images. ©Milla Digital Project
9. people interacting with the Digital Water Pavilion designed by Carlo Ratti. ©Milla Digital Project

Milla Digital is a new public place to work, live, and embed citizens into creative arts and digital life. The Milla Digital (Digital Mile, or simply DM) project started as a perfect opportunity to regenerate 107Ha in the city centre of Zaragoza, formerly used for railways. The project aims to strengthen the advantages of the traditional, consolidated city, reintegrating new sources of employment into its heart, increasing the mix of uses and providing a new generation of public facilities able to create an ecosystem of innovation and creativity.

The Master Plan for this project was presented in 2004 – prepared by McKinsey in collaboration with Telefonica, Endesa, Siemens, Indra and Samsung. It used the findings from the study conducted by the Engineering Research Institute of Aragon (13A) of the University of Zaragoza on the cutting-edge

telecommunications network of the area and the domestic needs of the residential and tertiary uses; as well as the study conducted by the MIT entitled “designing a new century public realm”, which defines singular and original urban design elements. With its study, the MIT shows that the new technologies and ideas of urban design provide opportunities to improve the economic competitiveness of Zaragoza, its social character and its unique cultural identity.

The project is currently converting a mile-long district into an area of technology-driven parks, public facilities and development. This combination of urban design, cultural facilities and new media technologies contributes to create an innovative ecosystem. The aim is to design digitally mediated places and create an environment which would interact and respond to the users and become part of their own identity. The software of the digital city refers to the content, the social participation and the need for a social open source approach, while the physical environment constitutes the hardware.

Trying to consider hardware and software at the same level in the digital city leads to ideas of developing a new generation of digital media for public spaces and new instruments, allowing people to participate and interact with the city and the citizens. This new urban media appears as a physical expression of the digital life, the mix of the existing and the virtual cities. These technologies make these spaces agile, responsive, and particularly innovative, since they also contribute to urban liveability. A number of different proposals are in different degrees of execution at this time such as the Paseo del Agua area and the Portillo area, two of the most visible parts of the DM. Some of the media, like the Digital Water Wall, are already present at the Paseo del Agua and the Digital Water Pavilion. Other examples of this Urban Media, several interactive prototypes like Memory paving, Urban pixels and the Digital Bus stop that react to the presence of the citizens are due to be installed in the medium term.

Paseo del Agua (Water Walk)

The Paseo del Agua is part of a new green area,

located in the neighborhood of the Delicias train station. It consists of a public space with different elements, including an impressive collection of programmable, responsive, interactive water fountains, already in use. At dawn, people make the most of the nightlights, the water features and the spectacular optical effects derived from the show. The Paseo includes a Water theatre, featuring a Digital Water Wall.

Digital Water Wall

Water as a new digital media keeps its traditional role of decoration in the cities, but is at the same time a screen, a digital graffiti, a new way of creating spaces, interactive facades and programmable architecture. The digital water wall is a creative concept from MIT research. Water falling in a curtain can simply be programmed with discrete images, and be reactive to the presence of pedestrians crossing.

Digital Water Pavilion (DWP)

The DWP, the first building of the DM, was opened in June 2008 and is located at the entrance of the Expo area, close to the Pavilion Bridge. It is the first building ever whose external facades are completely made of digital water curtains. Designed by the architect Carlo Ratti, it was voted as Best Invention of the year in 2007 by TIME magazine and it features some of the most direct applications of Digital Media, such as the Digital Water Wall.

Water curtains are digitally controlled and they feature embedded sensors. Openings are dynamically created in the water curtains, so that people can move freely in and out of it. Water curtain partitions inside the building can dynamically change based on necessity and use. The building has just one main solid element, the roof: it is a high-tech, 400mm thick moveable structure. The roof rests on moveable piston and can change its height: it is normally at 4m, it can lower down to 2.5m in the case of strong winds and it can also be flattened onto the ground. At that point the whole building disappears. The building contains 3000 digitally controlled solenoid valves, several dozen pumps, 12 hydraulic stainless steel pistons and a digital control system based on open source software. ■