

Photonic modulation of light and space

TU/e, Ambianti & Van Abbemuseum, Glow Eindhoven 2016

Location: TU/e campus, Eindhoven (Glow Science nr. 18)



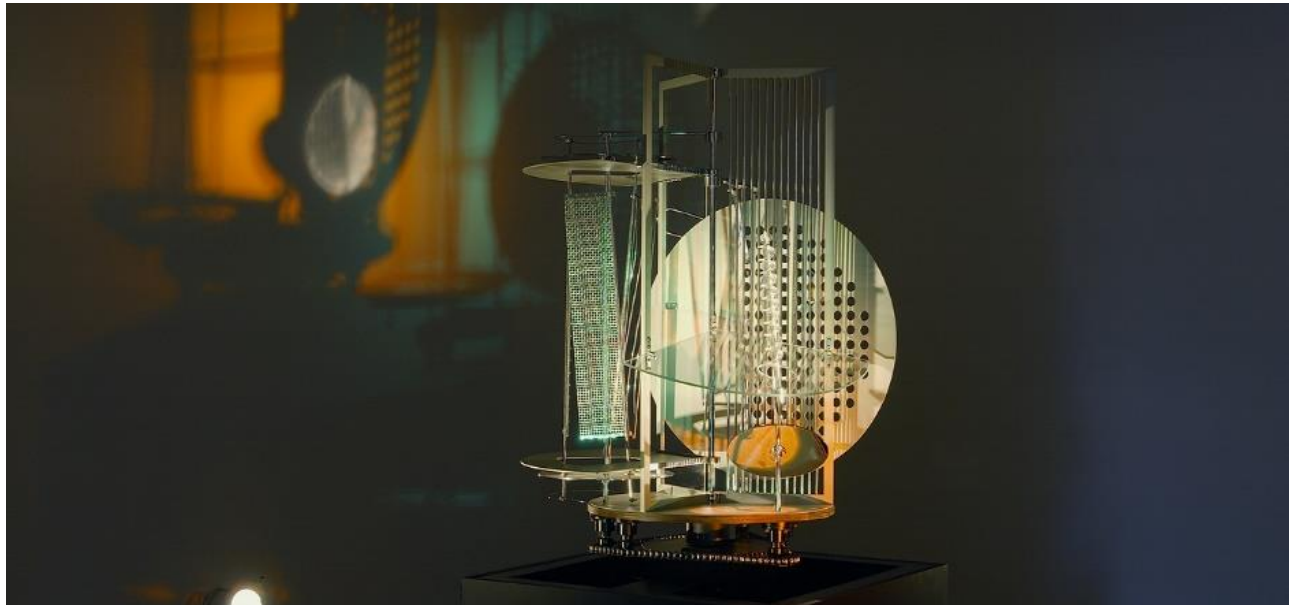
“Photonic modulation of light and space”, part of the Glow festival 2016. The Glow festival is a prominent yearly outdoor lighting event, featuring works of 40+ artists and designers. Its 2015 edition attracted over 700 000 visitors in one week

The project started as an idea of Eindhoven University of Technology (TU/e) and the Van Abbemuseum (Eindhoven, the Netherlands), both celebrating their anniversary in 2016. For the yearly lighting festival Glow Eindhoven, the two organizations decided to join the forces and use intelligent lighting technology of Ambianti for merging the powers of science and art.

László Moholy-Nagy

The theme of combining art and technology comes back prominently in the works of one of the most influent avant-garde artist of the XX century, Laszlo Moholy-Nagy (1895 – 1946). Born in Austria-Hungary, Moholy-Nagy was one of the first artists that started to experiment with technology. His ideas got expressed in “Licht-Raum Modulator”, a kinetic sculpture with geometric forms of metal and glass attached to a turning platform. The forms of the sculpture reflect the colored light shining on them. As a result, this abstract work modulates (changes) the room in which it is exposed, creating spectacular

colored shadows and reflections on the walls and ceiling. The artist plays with light and motion to modulate space and time.



Licht-Raum Modulator (1922-1930) replica 1970, image courtesy Van Abbemuseum

New technologies

For the Glow 2016 festival, the TU/e and Van Abbemuseum wanted to reconstruct the effect that the sculpture creates in a closed space of a museum room in an outdoor location. But how can you simulate the complex interactions between the original work of Moholy-Nagy and the lights without having the room surface where the shadows and reflections can be casted upon? This is where new technologies, such as photonics, 3D printing and intelligent lighting from Ambianti, come in place. The classical artwork has been complemented with a digital “wrap-up” at the Eindhoven University of Technology campus.

The original sculpture of “Licht-Raum Modulator” was accurately scanned in three-dimensional (3D) high definition data using photonics based on both visual light and non-visible light-modulation radiation patterns. The TU/e VCA research group at the faculty Electrical Engineering used the newest 3D reconstruction algorithms to make an accurate 3D model of the Moholy-Nagy’s work, and reproduced individual parts of the machine, amongst other by 3D-printing.

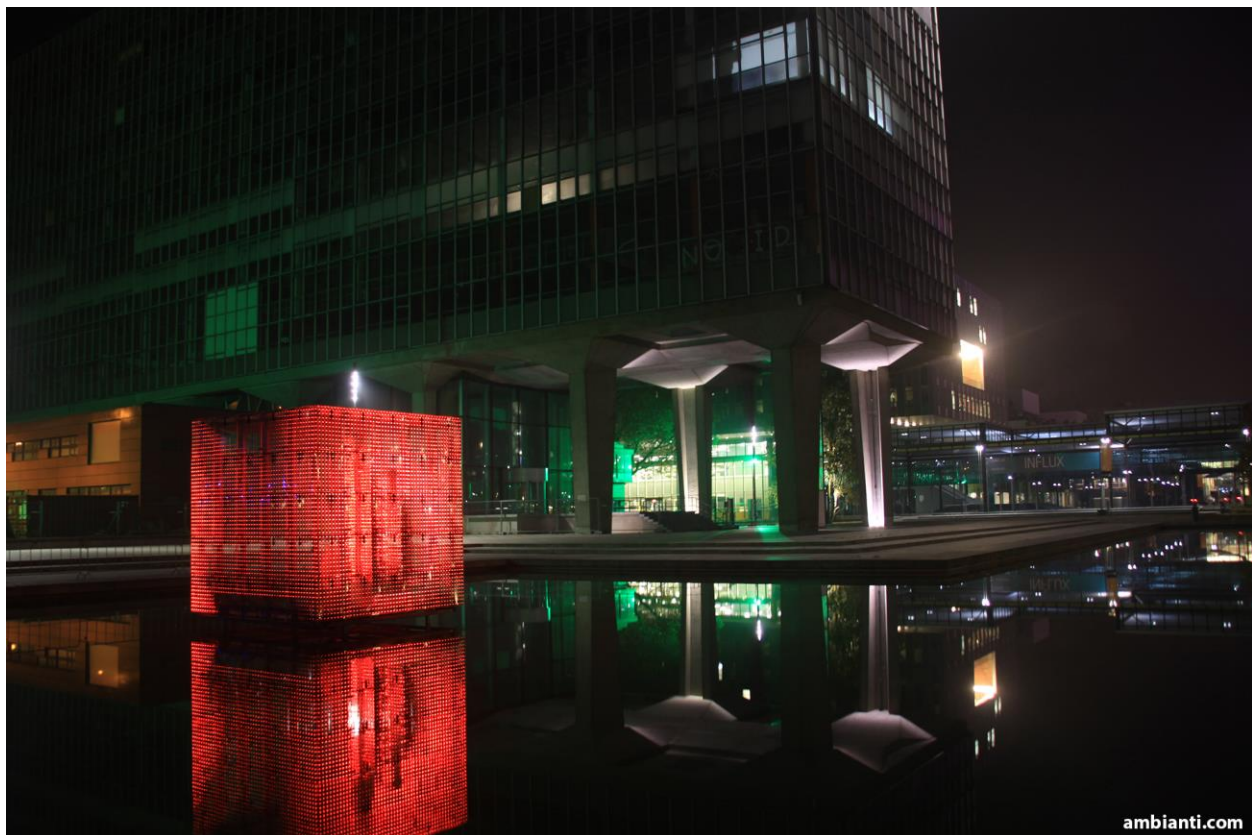
Intelligent lighting

At the same time, Ambianti was working hard to create a custom version of the intelligent Ambianti Tiles, T2 Glow. One hundred of these Tiles form a transparent intelligent lighting Cube, with a built in grid computer. In total 20 000 LED lamps, together with the electronics, were encapsulated in crystal-clear polymer compound. The encapsulation ensured the Tiles to be fully waterproof, a feature highly necessary due to rainy November weather in the Netherlands. Each tile contains a mini-computer that enables it to connect and communicate with other tiles.

Using this unique technology, the Tiles form a “grid”, a distributed computer, which can solve even very complicated tasks. Using its own distributed real-time ray-tracing algorithm, the Cube is analyzing the digital 3D model of “Licht-Raum Modulator” to re-create the movements of the original artwork. The Tiles independently recognize each other’s position and shape, communicating and adjusting their status to extrapolate the movements and the lighting patterns of the original sculpture and transfer them onto the cube’s walls.

On top of the water

To support the Cube, an 800-kg steel frame has been mounted in a pond next to the main building on the University campus the days before the festival. The placement on top of the water allows the effect of the Cube to be enhanced by reflections. “It was particularly wet and cold the last days. We needed to work hard to place the Cube in the middle of the pond. But when you see the result, you know it was worth having cold feet for a while”, - a representative of Ambianti reports.



Especially for the project, a custom, translucent RGB version of the Ambianti tiles is developed. In addition to other modifications, the tiles are designed fully waterproof (IP67-compliant), adhering to the wet weather conditions typical for the late fall in the Netherlands.

The visual appearance of the tiles as well as the cube’s supportive steel frame and rotating podium have also been specially designed by Ambianti to respect the Bauhaus’ school traditions and amplify the airy, austere and sharp impressions of the original work.

Unique cooperation

The installation delivers a fascinating experience to the observer, building upon the original Moholy-Nagy's focus on combination between technology and art using the advancements of the XXI century, such as solid-state lighting and distributed computing. This impressive result could not have been achieved without very productive cooperation among involved parties: the Video Coding and Architectures (VCA) group of the Electrical Engineering department (and especially professor Peter de With and assistant professor Egor Bondarev), the project leader of the GLOW Science professor Gerrit Kroesen of the TU/e and the committed Ambianti team. The department of Applied Physics and the Institute for Fotonic Integration also helped to think along about the project.

About Ambianti

Ambianti is founded in 2012 in Eindhoven, the Netherlands, by an international team of engineers, scientists and experts who share the same passion: to make ambient technologies part of everyday life. The company designs and develops high-tech building materials, combining cutting-edge digital intelligence, inventive minimalism and the flexibility of conventional building construction. Ambianti Tiles are intelligent LED tiles based on patented technology, which comprise a powerful distributed computing system when connected to each other.

Contact

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More about the project:

- <http://ambianti.com/glow>
- <http://www.gloweindhoven.nl/nl/glow-projecten/glow-next/photonic-modulation-of-light-and-space>

#theCube facts

- A giant transparent grid computer with 20 000 full-color LEDs
- Uses its own distributed ray-tracing algorithm to analyse a digital 3D model of "Licht-Raum Modulator"
- Uses little energy (1500 Watt) due to the energy saving properties of LEDs

The Cube is made of:

- 20 000 full-color LEDs
- 8.6 km of total wiring
- 240 liters polymer compound
- ~37600 solder points
- 800 kg steel frame

- 500 screws
- 1200 bolts
- 3.2 km network wiring
- 4.8 km wiring for the LED controls
- 600 m power supply
- 3000 capacitors
- 2000 resistors
- 100 motherboards