IN BETWEEN

a new solar dynamic aesthetic
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Project Information (EN)

How to open up urban space for solar energy harvesting?

The urban space is characterized by a high energy consumption as well as limited available space. If all the energy demand could be harvested directly at the place of consumption, transmission infrastructure and losses could be reduced. But how to integrate a space consuming system like photovoltaic in a living environment with little space? The approach of the solar concept IN BETWEEN is based on two intents to make it as adaptable as possible for the complexity of metropolitan areas, with the aim of enriching public spaces instead of occupying them. On the one hand, the photovoltaic structure should be modular and, as an in-between level, be able to cover any urban space or surface. On the other hand, the structure should be responsive to the intensity of solar radiation, linking the need for acute shading with the efficient harvesting of solar energy. This way it becomes possible to add another level of use to existing urban structures and though to open up urban space for solar energy harvesting, through a new solar dynamic aesthetic.

The sensitive structure

IN BETWEEN is a surface structure of individual, sensitive solar modules. When sunlight hits one of the elements, it independently straightens up, provides shade for the space behind and converts the sun energy into electricity. The converted energy cannot heat up the space behind, resulting in a reduction of the energy required for temperature regulation. Nevertheless, even when shading, the semitransparent PV-foils still lets in enough light that no external illumination is needed. Shaded modules return to a relaxed resting state, allowing the view and light to pass through. The smart, spontaneous realignment not only increases the energy output but also enriches the space behind with a balanced microclimate and a dynamic interplay between light and shadow. The solar surface can be installed as a second layer on a simple crossed wire construction in front of facades, over parks, sidewalks, etc. It can be mounted vertically, horizontally or in any intermediate position to offer high adaptability to be complemented to existing infrastructure. To attach the modules on the wires, holders made of simple metal pipes, were designed that stabilize the modules and the whole structure.

The materials

Solar cells have a unique advantage compared to other energy systems: they have no mechanically stressed sources of error. To avoid adding potential defects with the adaptive motion, the complexity of the mechanical solution should be minimal. The key to this challenge is the combination of a solar cell with a metal that shares a particular characteristic with it: both autonomously respond to solar energy. A shape memory alloy can take any pre-programmed shape once it reaches a set temperature. By combining the thermal animated deformation with the generation of sun energy, a solar system can merge the simplicity of a static panel installation with the energy efficiency of solar tracking in a responsive, error-resistant and simple system. To convert the bending force into a movement causing a surface to increase and decrease, a new solar cell technology is applied. A solar film based on organic photovoltaics enables practically any surface to be energetically active. It allows semi-transparent, flexible solar foils in various shades to be created eco-friendly, that can withstand high levels of torsion, deformation and vibration, while absorbing wind animated movements.

Image List

Filename	Caption	Credit

0-inbetween_1662122740.jpg	the solar structure fully animated by sunlight	
1-inbetween_1661684384.jpg	oriented vertically with sunlight on the right	
3-inbetween_1661684688.jpg	the sun animated deformation of the SMA	
6-inbetween_1661684741.jpg	oriented vertically, pointing to the left	
8-inbetween_1661684747.jpg	oriented horizontally with sunlight in front	

The images above are included in the ZIP under `/images`.