Artee- Modular Approach

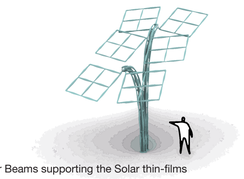
A novel solar-powered lightweight and adaptive kinetic tower has been proposed to optimise its tilt and direction for optimal efficiency and power output. By reorienting its petals toward the sun throughout the day and the seasons, the sun-tracking solar thin-film tower increases the amount of energy absorbed and, thereby, the solar production by 40% compared to conventional solar panels. The modularised 6m-tall hybrid tower comprises a combination of air beams made out of ETFE fabric and recycled aluminum recalling the musculoskeletal system of human body (muscles and bones /tension and compression). Air beams hold the solar thin-films and are connected to the tower by a bidirectional soft actuator. The compliant body of soft robots can be rapidly fabricated, achieving different locomotion. When inflated or deflated, the soft pneu-net actuators (Hao et al., 2017) may bend or rotate inward or outward, reorienting the petals to face the sun. In addition to solar energy systems, kinetic structures are implemented to maximise energy gains and social interaction. Therefore, modularised piezoelectric installations have been proposed as a combination of sun-tracking solar thin-film towers.

The rules for the aggregation of the elements (sun-tracking solar thin-film towers) considered using all the available space and giving people chances to spread over all the park sites. It is also considered to respect the habitat of diverse species living in the park. Therefore, the aggregation of the elements throughout the park is always dense in specific areas that include planting in between. In contrast to that, the main attraction should be set in the centre of the park as an outstanding symbol of the inherent beauty of green energy production.

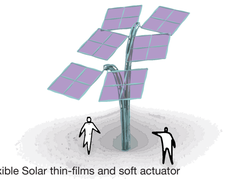
Hao, Y., Wang, T., Ren, Z., Gong, Z., Wang, H., Yang, X., Guan X., and Wen, L. (2017) “Modeling and experiments of a soft robotic gripper in amphibious environments.” International Journal of Advanced Robotic Systems, pp. 1-12

ASSAMBLE & DISASSEMBLE PROCESS

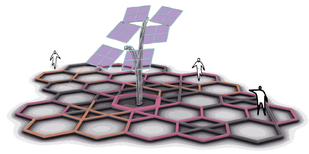
Hybrid tower:
Recycled Aluminum Column with Air Beams



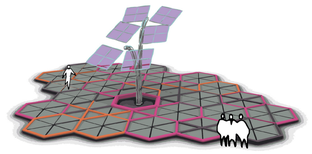
Air Beams supporting the Solar thin-films



Flexible Solar thin-films and soft actuator



Pneumatic Structure for the Piezoelectric Installations

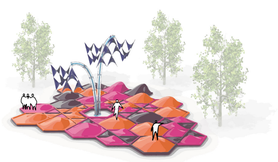


Piezoelectric Modular System

Piezoelectric Recycled ETFE

PIEZOELECTRIC TECHNOLOGY

Scenario 01 - Typical Sunny Day



Scenario 02 - Typical Cloudy Day

Scenario 03 - Expanded Module

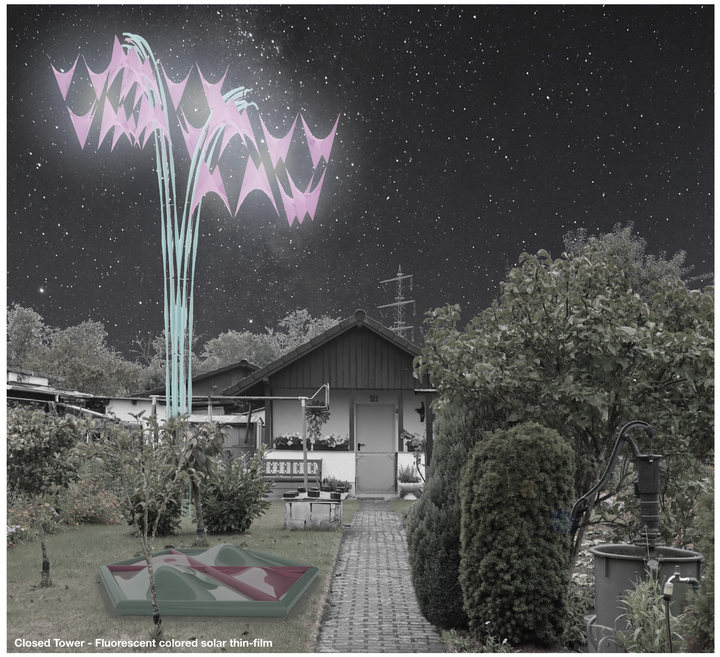
FLEXIBLE PHOTOVOLTAIC PANELS

Scenario 04 - Art Experience

Scenario 05 - Fluorescent colored solar thin-film Event

Scenario 06 - Bio Engineering Modified Solar thin-films

Schrebergarten - German Gartens



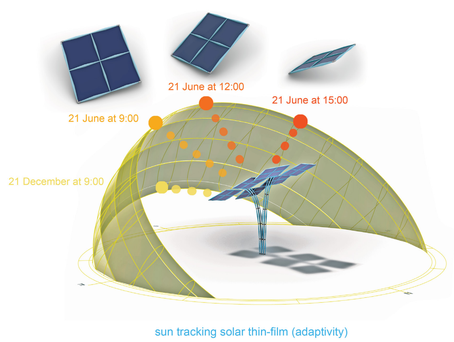
Closed Tower - Fluorescent colored solar thin-film

MODULE APPLICATION & ENERGY PRODUCE

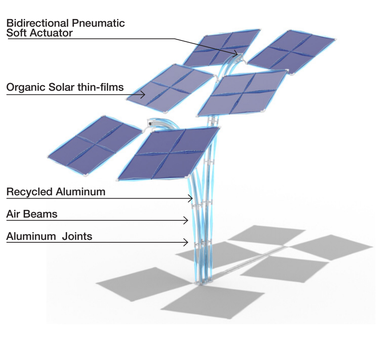
The sun-tracking solar thin-film towers cover 14,496m², and the total annual PV energy production is 1.66GWh. A significant impact on energy efficiency is reached by implementing kinetic structures that can track the sun’s position and adjust its orientation or shape to maximise the energy output. The soft actuator optimises the position of the petals at different points of time during the day and the seasons.

According to statics and research assessments, the dual axis of the solar thin-films provides high-energy performance systems. In our design project, we explore the potential of optimising the position of the petal not only at 12:00 but also at 9:00 and 16:30 (highest temperature) in summer with resilient and ultra-light systems. In addition, the implemented piezoelectric floors generate energy approximately 1W to 7W per bump. Added up, this works as a supplementary kinetic energy for LED street lighting.

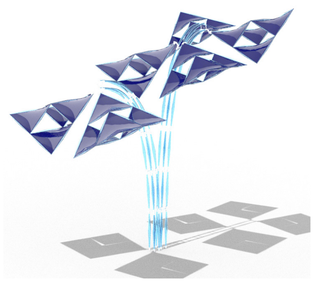
A performed comparison between the proposed systems’ static and kinetic states results in an efficiency increase of 20%.



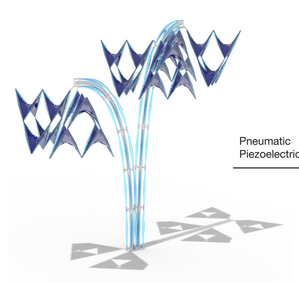
PHOTOVOLTAIC PANEL ADAPTABILITY



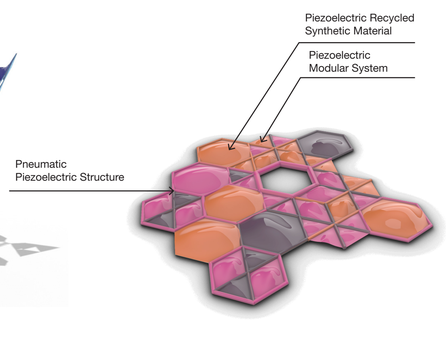
Adaptive Kinetic Tower Open Position



Adaptive Kinetic Tower In-transition



Adaptive Kinetic Tower Closed Position



Single piezoelectric structure