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SELECTED WORKS 2015-2019

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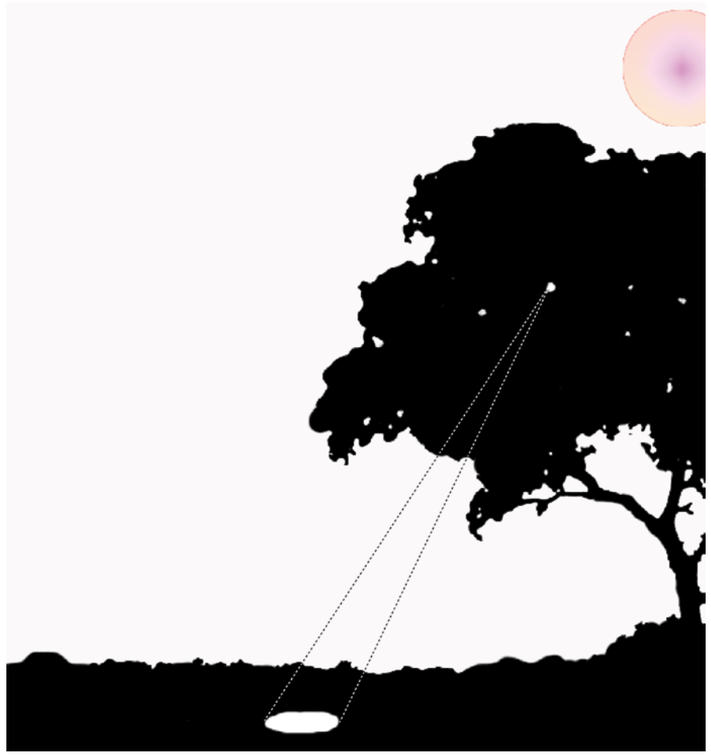
KOMOREBI 木漏れ日

EMBEDDING DAPPLED SUNLIGHT IN THE BUILT ENVIRONMENT

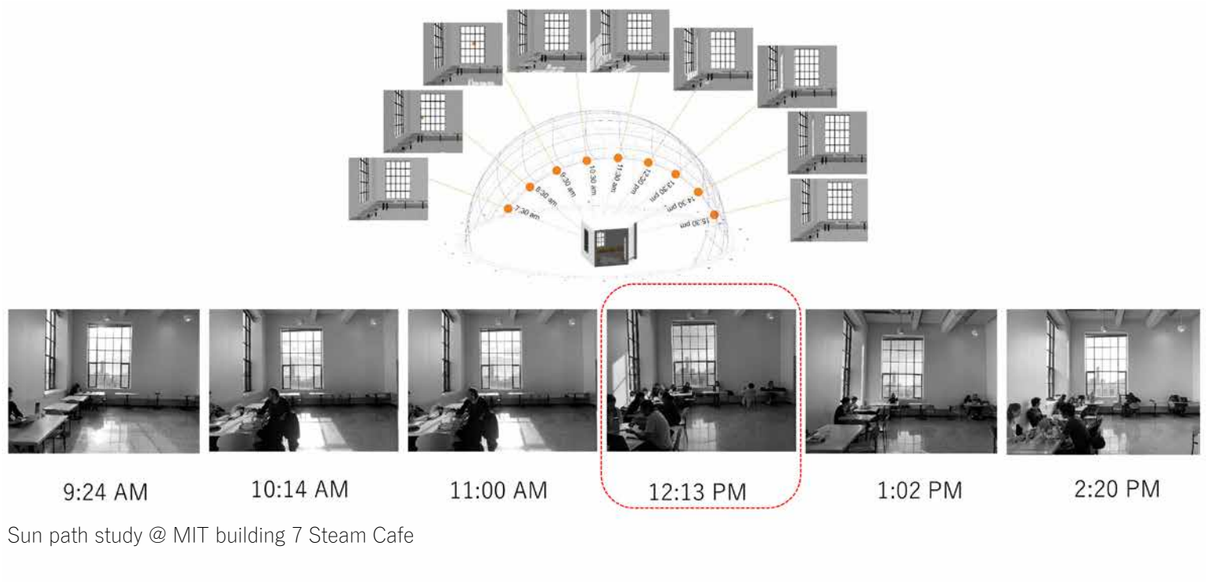
Committee: Christoph Reinhart , Terry Knight, Takehiko Nagakura
MArch Thesis, Fall 2019 @MIT

Nowadays, humans are increasingly disconnected from nature. Urbanization, resource exploitation, and changes in ways of living have diminished people's access to nature. In fact, exposure to nature is beneficial to human beings in many aspects. Research in environmental psychology and public health have shown the positive impacts of nature connections for people's happiness, concentration, and restoration. Various research has explored connecting the living environment with nature, such as the study of urban green space in the living environment, the application of virtual nature in psychiatric and medical care, the implementation of natural scenery in augmented reality, and ongoing research at Stanford exploring the integration of physical and digital spaces that connect with nature. However, the idea of connecting nature to the built environment via building systems has not been explored yet. This thesis aims to provide people with the perception of connectedness to nature in the built environment by embedding the sensory experiences Komorebi in building systems. Komorebi is a Japanese term that describes the dappled sunlight filtered through tree foliage. A daylight-filtering system was developed to bring the dynamic improvisational visual effect, Komorebi, into the built environment. The system integrates a double-glazing system with solar air collectors. As wind triggers the movement of leaves, the airflow, caused by the expansion of air from temperature rise in the solar air chamber, would be able to trigger the dynamic movement of the shading elements in the system. The size, blurriness, and roundness of the dappled lights are affected by the sizes of the holes that are composed of the shading elements and their distance to the projection surface. Depending on the conditions of the application, such as distance from the system to the projection surface, user cases, and exposure to the sun, parameters of the shading system could be adjusted. In all, the dynamic shading system working together with the natural factors of wind and sun would produce temporal and improvisational dappled light for the built environment.

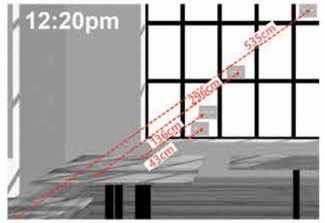
The vision for this study is not only to create a port for people who have limited access to nature due to work demand or mobility limitation, but also to renew and encourage more exposure to nature. Based on the existing infrastructure, this work integrates the improvisational natural factor as part of the building system and creates natural sensory experiences in the built environment. In application, it would have great potential at places such as high-rise offices, hospitals, and elderly care, where the natural connection is limited and where relinking occupants to nature would be highly beneficial.



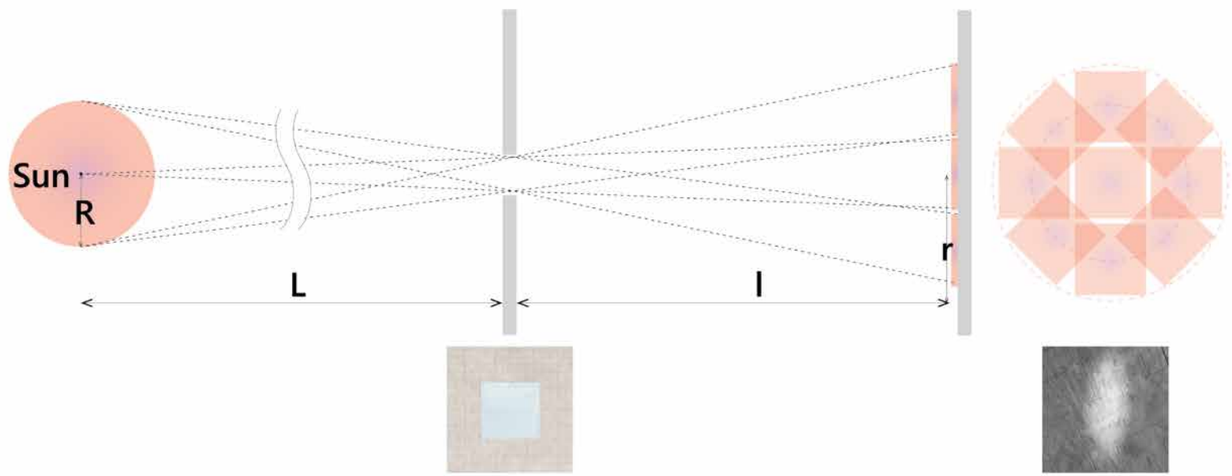
Komorebi in nature, pinhole effect of the sun



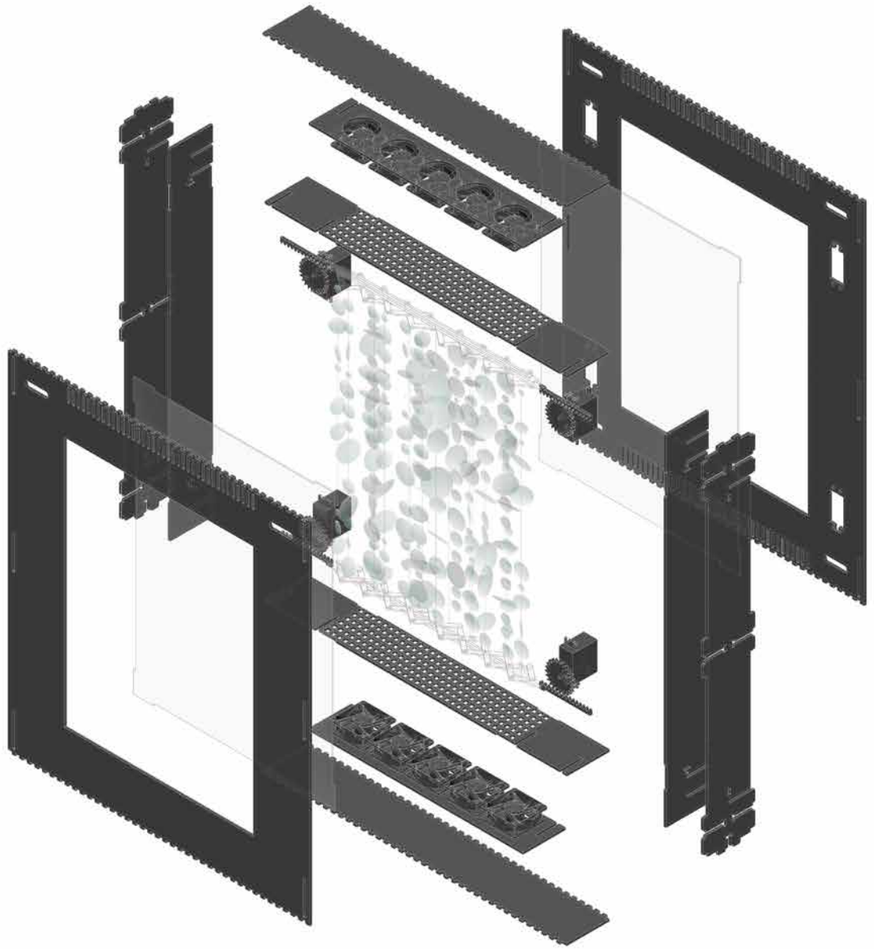
Sun path study @ MIT building 7 Steam Cafe

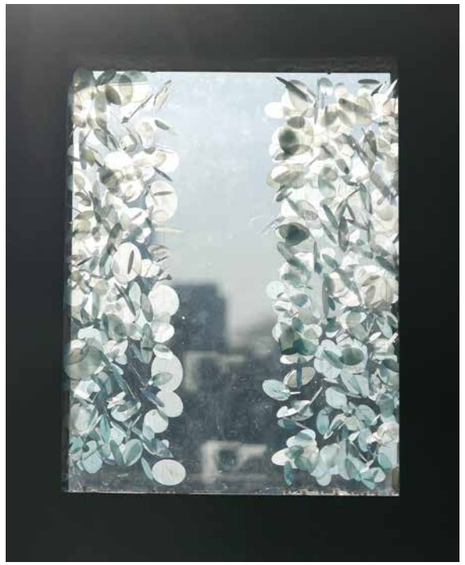


Pinhole test on site

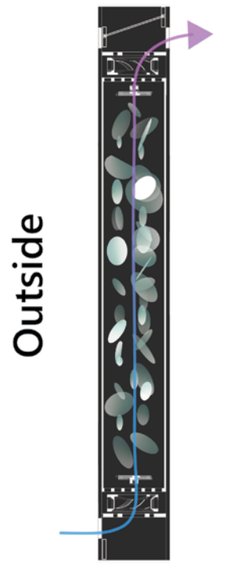


Pinhole effect of the sun

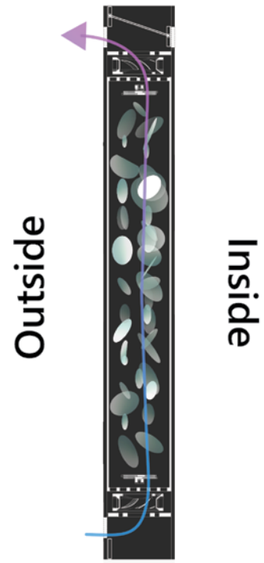


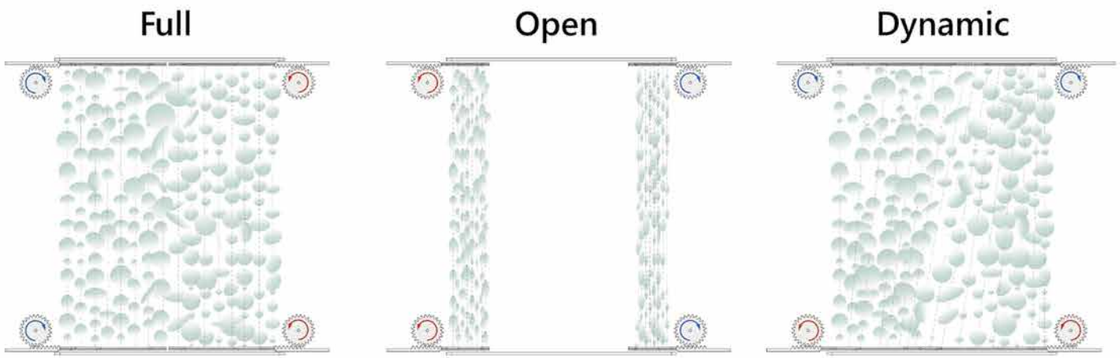


Prototype model

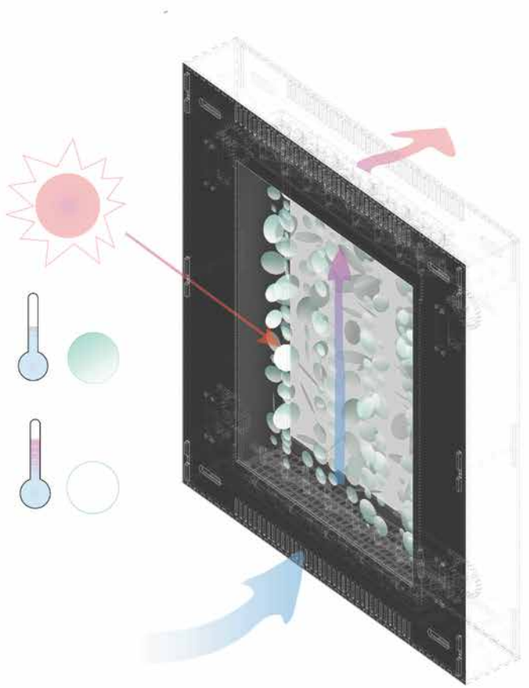


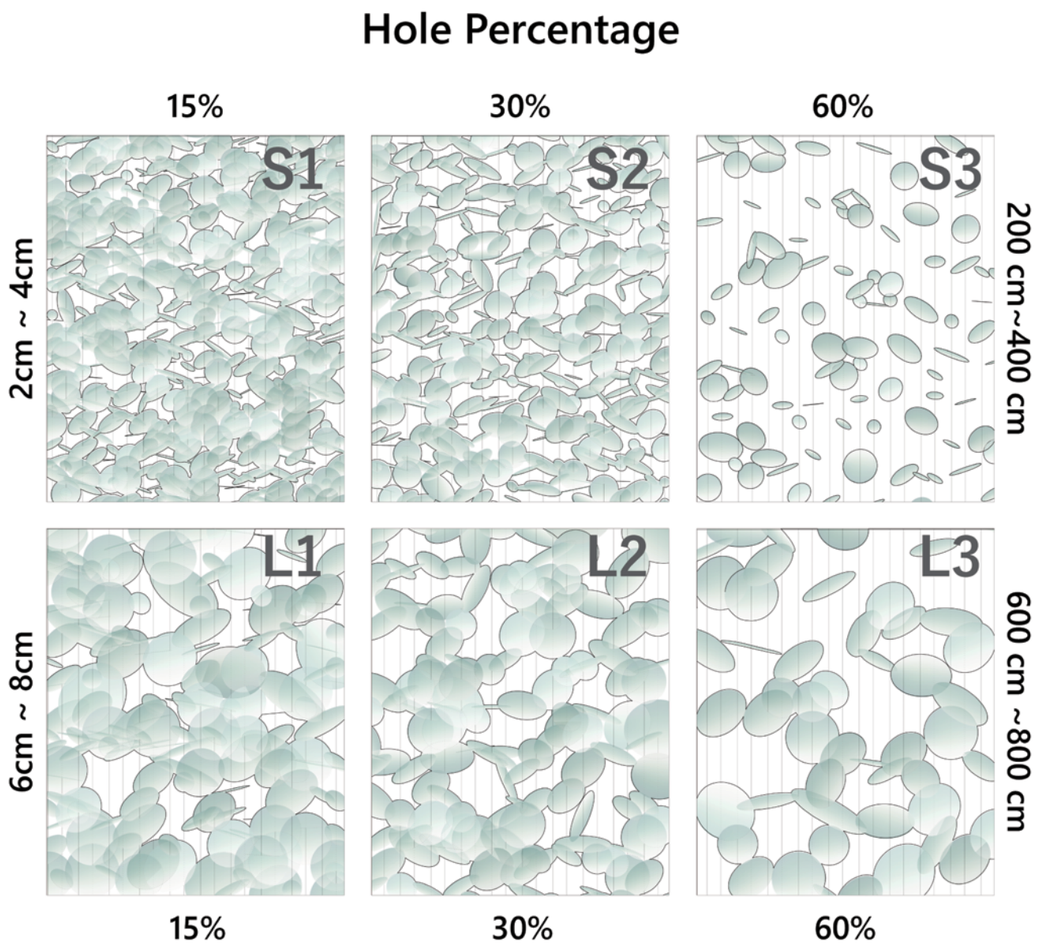
Control of air circulation





Controllable motion of Komorebi elements

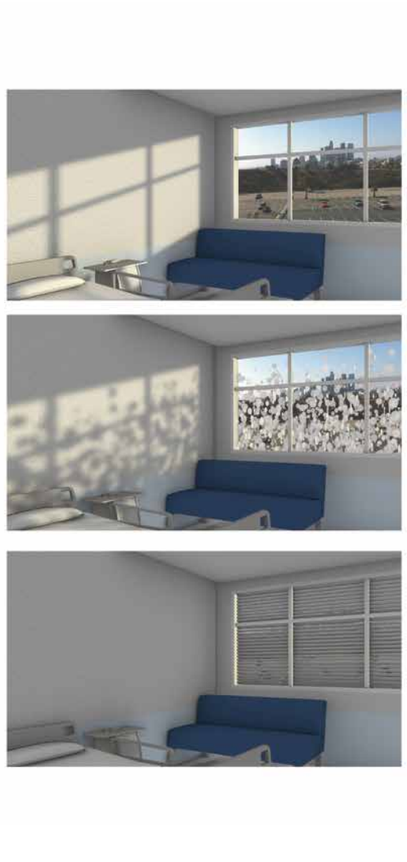


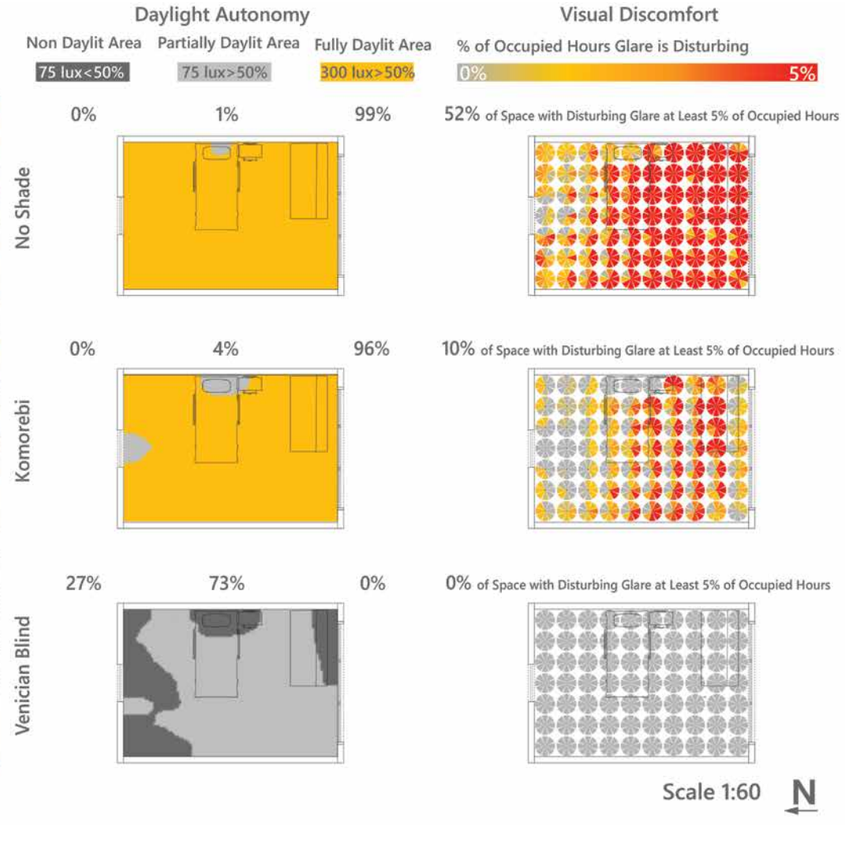


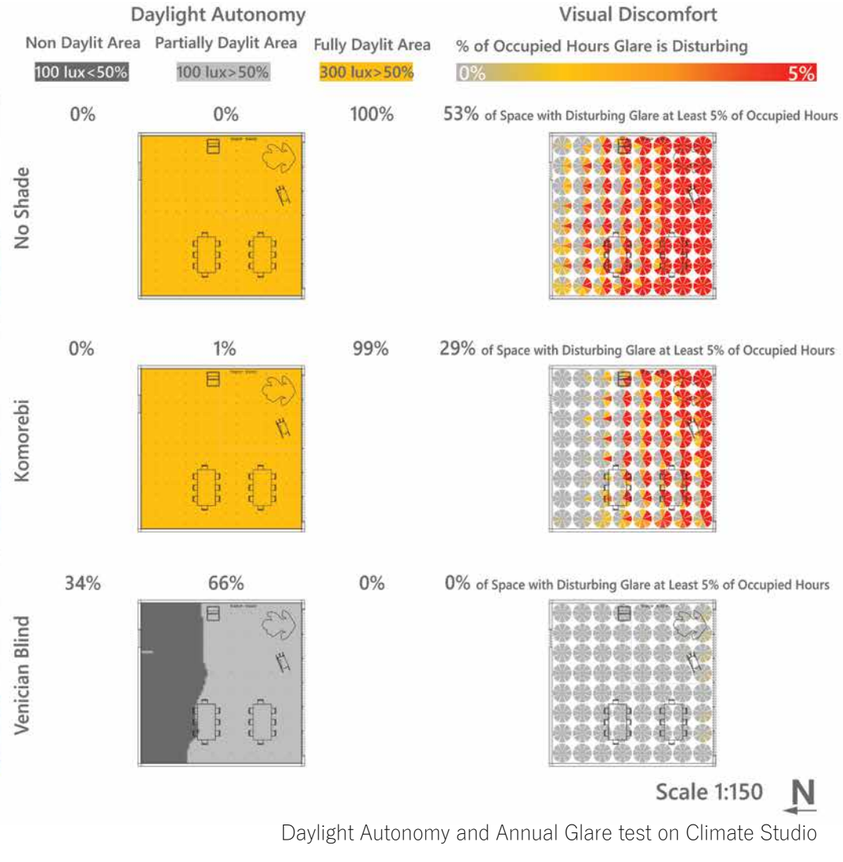
Variation of the Komorebi system

Prototype test on site

Daylight Autonomy and Annual Glare test on Climate Studio







Daylight Autonomy and Annual Glare test on Climate Studio