Creating the Unreal: Speculative Visions for Future Living Structures

Taro Narahara
New Jersey Institute of Technology
Newark, NJ
narahara@njit.edu

Figure 1: Possible ideas for speculative structures for living supported by anticipated new technologies.

CCS CONCEPTS

• **Applied computing → Computer-aided design**

KEYWORDS

Architecture (buildings), Game engines, Arts and humanities

ACM Reference format:

Taro Narahara. 2018. Creating the Unreal: Speculative Visions for Future Living Structures. In *Proceedings of SIGGRAPH '18 Talks, Vancouver, BC, Canada, August 12-16, 2018*, 2 pages. https://doi.org/10.1145/3214745.3214799

1 INTRODUCTION

Science fiction films such as Blade Runner have taken us to worlds where we can experience and share future visions of cities, structures, and life styles conceived by prominent creators. Not only for experts in leading production studios, it is an exciting moment for many digital designers as new game engine technologies allow us to create and walk through imaginary virtual environments almost on the fly. However, how much those spectacular visions are really feasible and credible—based on speculative yet thoroughly rigorous (not sci-fi) scientific studies—is a good question.

From the standpoint of an author who has practiced professionally, dealing with real physical materials such as concrete and steel and their techtonics as an architect, this talk introduces possible ideas for speculative structures for living supported by anticipated new technologies and discusses how new possibilities for visualization can help us envision such structures that have yet to exist. The talk also presents how game engines can benefit validation of such imaginary structures in the context of education by allowing students to quickly and iteratively reshape their visions as their understanding of techtonics for physical worlds improves from the standpoint of a design instructor.

2 MEGASTRUCTURES: PAST, PRESENT, AND FUTURE

Since more than half a century ago, architects and theorists such as Yona Friedman have proposed ideas for mobile architecture such that the inhabitant should be the sole conceiver of his own living premises within a structure that would allow individual variations [Friedman 2016]. He sketched floating space-frame-like superstructures over existing cities that provide flexibility for inhabitants to construct their dwellings freely while maintaining a physical integrity of the community. His vision appeared to be unrealistic, as there were no technological means

SIGGRAPH '18 Talks, August 12-16, 2018, Vancouver, BC, Canada
ACM 978-1-4503-5820-0/18/08.
10.1145/3214745.3214799

for suspension of such structures or transportation of individual dwelling units.

During the 60's, megastructures with pluggable prefabricated pods on the infrastructural core, proposed by Japanese Metabolists such as Kisho Kurokawa, had a practical limitation due to their need for transportability for reconfiguration and the obsolescence of their infrastructural systems for adaptation [Yastuka and Yoshimatsu 1997]. However, anticipated new technologies for the 21st century—hyper-strength materials such as carbon nanotubes, space elevators, wireless communications and energy transfer, autonomous drones, and artificial intelligence—could realize a transformative vision for a new kind of living for future generations.

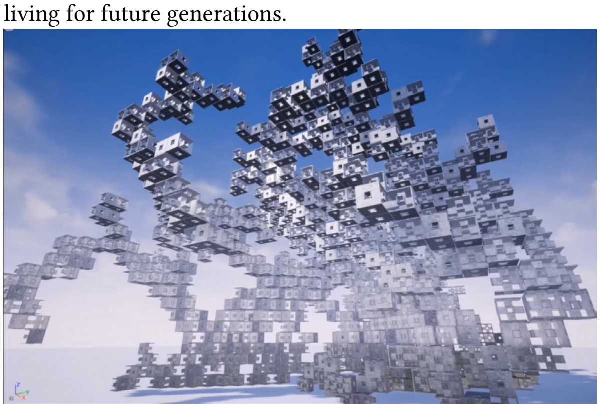

Figure 2: Procedural generations of structures.

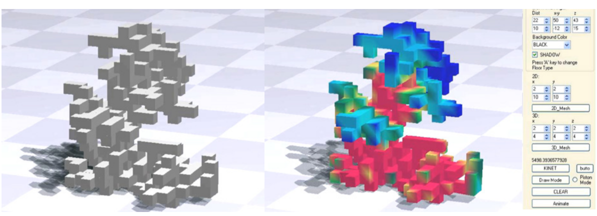

Figure 3: Dynamic structural behaviors in game engines.

3 PROPOSED STRUCTURES

Following in the footsteps of these predecessors, this talk introduces some possible visions for flexible habitable structures that can be constructed using innovative technologies and ideas that had yet to be fully introduced in their times. Some theoretical physicists foresee that the invention and realization of a space elevator could provide gravity-free spatial structures supported by the balance between the centrifugal force and gravity of the earth and connected through space elevators. The introduced visions will be based on the premise that high-strength lightweight materials such as carbon nanotubes will become available for manufacturing the required length of a space elevator. In theory, such a gravity-free structure, with auxiliary uplift support from helium-based high-altitude solar platforms, would establish a second "ground" for future residents of Earth without harming natural and artificial resources on the existing ground. In fact, the Japanese general construction company Obayashi Corporation has announced that they will have a space elevator constructed by 2050 due to the advances in carbon nanotubes [Ishikawa 2016], and witnessing such structures might not be too far away from our time. The elevator will reach 96,000km into space and will transport people and cargo to a new space station.

Unlike in the era of the Metabolists in the 60's, transfer of resources, including energy, can be done wirelessly using the conductivity of carbon nanotubes or laser power beaming, which reduces the heavy reliance on infrastructures that has been preventing faster updating of systems. The talk presents proposed habitable modular pods that can be aggregated, rearranged, and disconnected based on each resident's needs, and that can be transported and reconfigured using advanced autonomous drones working as assemblers of the whole system (Fig 1). Inventions of hyper-strength materials could suspend portions of structures and allow them to use more lightweight materials for members only under tension. Thus, more dynamic reconfigurations of pods can be done. Modular pods have internal 3-D corridors that internally connect residents and circulate physical resources such as fresh water and air. Autonomous drones would allow us to live, work, and travel anywhere we like by functioning as transporters and assemblers of habitable mobile pods that can be connected to the floating structures. In such hypothetical circumstances, we will develop and acquire very different lifestyles, values, ethics, and social structures. It might take many years to witness those changes. However, as a design instructor and architect, the author would like to take a small yet positive step toward these society-changing technologies by investigating feasibilities of such hypothetical structures based on speculative yet thoroughly rigorous (not sci-fi) scientific studies.

4 VISUALIZATION

Visualizing, validating, and communicating such speculative visions and ideas could be quite challenging and time-consuming by requiring the use of separate multiple application platforms. However, the recent development in game engines using real-time shaders allows us to create and explore unbuilt and unseen speculative structures almost on the fly inside visually stunning immersive environments without requiring us to spend many hours on rendering frame by frame. Such production platforms allow for quick iterations and reshaping of three-dimensional constructs and enable us to virtually walk through inside of them by becoming avatars.

In the context of design education, the author encourages students to use game engine platforms for any time-based production to introduce their ideas for future structures. Component-based design, commonly practiced in game design, allows for procedural generations of structures composed of building blocks with certain behaviors, characteristics, and logics through custom scripts (Fig. 2), and, for example, computational physics can help suggest material properties and dynamics associated with components or growth and development of their designed objects over time by demonstrating possible performance and behaviors at a conceptual level (Fig. 3). The talk introduces these possibilities through some results from the author's digital design courses as well.

REFERENCES

Yona Friedman. 2016. *Imaginary Cities.* Quodlibet, Macerata, Italy.

Yoji Ishikawa. 2016. *Obayashi Corporation's space elevator construction concept.* Journal of the British Interplanetary Society, Vol. 69, No. 6/7, June/July, pp. 227-239.

Hajime Yatsuka and Hideki Yoshimatsu. 1997. *Metabolism: senkyūhyaku rokujū-nendai Nihon no kenchiku avangyarudo.* Inakkusu Shuppan, Tokyo.