# One Minute Architecture

*Simulating at the planetary pace of building construction.*

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ABSTRACT: One Minute Architecture is an architecture engine that simulates alternative versions of planetary building production. At the rate of one minute of built space in one minute of walking time, the AI creates a set of building ensembles to gain insights into new urban forms. The project is an application example of the method I developed through my dissertation. The interplay between architecture and computation, I formalize through set-theoretical considerations. In my dissertation, I proposed the term Mereology for analogous comparisons within the history of architecture. The thesis described the underlying part-relations in modernistic urban schemes through the close reading of Ludwig Hilberseimer. Applied to contemporary conditions, the mereological approach allowed me to re-design AI-driven simulation software for building assemblies.

In the next 20 years, 2 billion houses will be built. That's 127 homes per minute for 300 people and another 18,000m² of urban space. That may sound a lot, but the planetary demand for architecture can be simulated today on a single laptop. One Minute Architecture is an architecture machine that

arranges one minute of built space every minute. If for the world of architecture one laptop is enough, then building buildings is no longer complicated. Why don't we use the new simplicity to solve complex tasks? To create affordable yet abundant and sustainable environments for all?

Proposals for carbon-neutral building are hard to find in the city, which is not. One Minute Architecture therefore simulates alternative neighborhood models to gain insights for new urban forms. Building on the urban design principle of mixed-use development, the AI mixes building parts, spatial parts, building parts in different ratios and consensus. Architectural parts themselves become artificial machines, which integrate construction methods, requirements, demands, and figure spaces accordingly. Each simulation, as a parliament of parts, imposes only one condition: Each space should be accessible to everyone in one minute. The resulting data collection answers in different ways: How much of what can be integrated into which form of city?

When one can compute everything, then one can no longer exclude anything. A data-rich environment will mesh everything that the traditional city has always excluded. To understand the disruptive potential of digitization, one should turn to the AI-driven enhancements in urban farming. With the synergy of robotics, machine vision, and learning, new farming models are emerging that are, according to today's standards, up to 100x more efficient than traditional farming. As a result, the land needed per person would decrease from 20.000sqf to 200sqf – into another room within our immediate environment. Throughout history, a city was separated from but dependent upon a hinterland. AI-driven farming fundamentally redefines that, including the rural within the urban. AI in architecture offers the ability to completely rethink our modes of living in the city, synchronous with its emerging technological developments like urban farming, distributed manufacturing, or automated construction.

The project merges design with simulation and ML supported data comparisons in the interplay between deductive projections and inductive findings from the simulated building arrangements. Ultimately, it visualizes a design method grounded in Data Science. This study links to an understanding of urban design that synthesizes design strategies through data analysis. Between architecture and the city, by thinking of the city as an interior space in architecture, this research finds precedents in the work of Ildefons Cerda, Ernst May, Ludwig Hilberseimer, Moisei Ginzburg, Roland Rainer, Lionel March, Philip Steadman, Fumihiko Maki, Eckard Schultze-Fielitz, Yona Friedman, Konstantinos Doxiadis, Leslie Martin, Peter Eisenman, and Natalie de Vries. Closing the loop between analysis and proposition, those architects built on a method named "mixed-settlement." Literally referring to the shuffling of built form "mixed-settlement" investigates the combinatorial synergies between different building types. By mixing the ratios and proportions of types and their arrangements, those researchers derived urban design principles applied that resulted over time to the most livable environments. Simulating the physical form architecture design contributes critically to economic, environmental, and social-driven discourses already at the phase

of communal decision making. Virtual but physical simulated environments allow us to quantify housing trends and predict their impact on urban forms. The figures for emerging developments vary widely. Simulations are ideal for exploring multiple sets of parameter spaces. Subsequently, simulated datasets provide a source for a data-driven comparison of digitization's physical impact on urban functions and distribution. In this way, simulated arrangement visualize hyper-local relationships between human scale interventions and urban scales.

The One-Minute-Architecture dwellings visualize first and foremost the interdependencies of modern living. The representations alone are a critique of the modernist image of the city that excluded its own necessities. The spatial inclusion of all needs encourages discussing circular ways of living and sustainable life cycles. By this, the panorama exposes a number of unfolding questions: what programs can we imagine integrating into our communities? How much space and which adjacencies does a program need? Which programs are likely to be compressed by their digitization; which will spatial computation add? Additionally, non-human actors will be added to a living environment by the Internet of Things. Already today, a house is a dwelling and a retirement fund, with solar cells, an energy provider, and with urban farming, a grocery store. What synergies can result from it?

**REFERENCES**

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