

Abstract

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The current demand for living in cities necessitates us to reflect on how this densification is to be done. By analysis of a current densification project in Rotterdam different problems with current densification designs are formulated. Firstly, the bounding volume of the building does not take into account the negative impact on its surroundings, for example with regards to shading. Secondly, the configuration of the apartments themselves does not take into account the limited space available. Ideally, in a high-density environment we would assign as much volume to every space that it needs. However, in current designs, the volume of the space is determined by the continuity of the floors and ease of manufacturing. Thirdly, current densification designs often replace green areas within the city. This greatly worsens the urban heat island effect, especially in Rotterdam.

Based on these three problems I propose an alternative densification strategy, materialized as an alternative design for an apartment building which is currently on hold due to its negative impact on its surroundings. This densification strategy broadly consists of three main scale levels. Each of the scale levels focuses on a challenge concerning densification. On the macro scale level, a bounding volume is generated which ensures minimal shading impact on surrounding buildings and public spaces. On the meso scale level a generative algorithm is developed which populates this bounding volume with apartment spaces of different sizes, with exactly the dimensions they require; functional areas are minimized, while living quarters are maximized. This ensures a better functional division of the limited space available. The need for such an algorithm becomes apparent when looking at the complexity of fitting a multiplicity of differently sized spaces in a non-orthogonal bounding volume. On the micro scale level, a building system is developed using 3D printing which allows the production of the resulting non-standard building. 3D printing is chosen because this removes the need for custom built formwork for each unique element in the building.

These efforts result in an alternative design on the site of Rotta Nova. On one hand, this is site specific; the bounding volume of the generative model is based on local site conditions. However, the workflows on all three scale levels are applicable in other dense urban areas as well, be it with slight modifications.