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Building a Parametric Link between Mapping and Planning: A Sunlight-Adaptive Urban Green System Plan Formation Process

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Abstract : Quantitative mapping is playing a growing role in guiding urban planning, such as using a heat map created by CFX, CFD2000, or Envi-met, to adjust the master plan. However, there is no effective quantitative link between the mappings and planning formation. So, in many cases, the decision-making is still based on the planner's subjective interpretation and understanding of these mappings, which limits the improvement of scientific and accuracy brought by the quantitative mapping. Therefore, in this paper, an effort has been made to give a methodology of building a parametric link between the mapping and planning formation. A parametric planning process based on radiant mapping has been proposed for creating an urban green system. In the first step, a script is written in Grasshopper to build a road network and form the block, while the Ladybug Plug-in is used to conduct a radiant analysis in the form of mapping. Then, the research creatively transforms the radiant mapping from a polygon into a data point matrix, because polygon is hard to engage in the design formation. Next, another script is created to select the main green spaces from the road network based on the criteria of radiant intensity and connect the green spaces' central points to generate a green corridor. After that, a control parameter is introduced to adjust the corridor's form based on the radiant intensity. Finally, a green system containing greenspace and green corridor is generated under the quantitative control of the data matrix. The designer only needs to modify the control parameter according to the relevant research results and actual conditions to realize the optimization of the green system. This method can also be applied to much other mapping-based analysis, such as wind environment analysis, thermal environment analysis, and even environmental sensitivity analysis. The parameterized link between the mapping and planning will bring about a more accurate, objective, and scientific planning.

Keywords : parametric link, mapping, urban green system, radiant intensity, planning strategy, grasshopper
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