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AN IMPLICATION OF ARCHITECTURAL MORPHOGENESIS WITHIN ALLOMETRIC PRINCIPLES

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1. Embedding allometric principles in digital morphogenesis

For a long time, natural systems have been deconstructed to uncover the similarities between architectural and natural morphogenesis; and used to adjust some these similarities to generate effective forms or organisations through different design scenarios. In these approaches, there are some biological notions which play significant role in natural morphogenesis. One of them is called allometry, the size and scale relationship in growth. For the different proportions of design parts in overall form, allometric principles limit and manipulate the formation progress within specific constraints. In this regard, our research proposes embedding these principles as determinative factors in digital morphogenesis for reaching the efficient complex heterogeneity in architectural organisations in different scales.

Allometry refers to "a biological scaling, the change in organisms in relation to proportional changes in body size" (Britannica, 2013). It can be seen in two different ways: comparison different parts' growth of same species or same body parts' growth of different species (Steadman, 2006). Either way, each part grows depending on its characteristic behaviour and topological position in the overall system. As the size of the body changes, the proportion of its parts changes in a certain scale for the fitness of final form.

Steadman (1983) mentions the idea of embedding allometric principles to a built form within the following example: while the number of rooms changes depending on the spatial design program, the size of these rooms also changes depending on the size of the house; if there is not a certain functional program for the design, rooms' size comes from the overall form. Regarding the importance of allometric relations of built forms over architectural morphology, it is inevitable that to consider the same principles in architectural morphogenesis. Within this view, the topological relations, which are defined through a design scenario, may be used to manipulate the spatial organisation and control the complexity of an architectural form. To exploit the capabilities the idea of embedding allometric relations in digital morphogenesis, we offered adapting these relations to digital morphogenesis by using network topologies and Octree technique from spatial data structures (Figure 1).

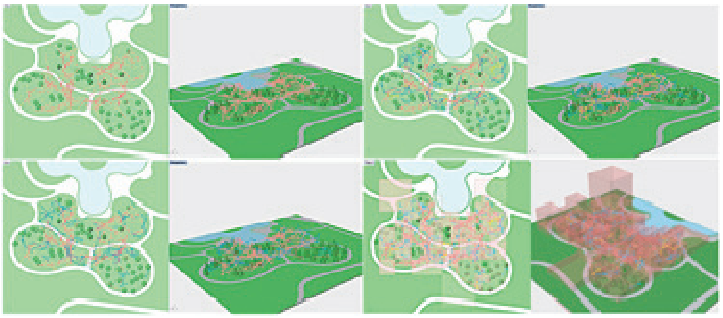

Figure 1. Topological organisation of emergence points for each group and division of space through their topological relations (Oksuz, Cagdas 2013).

In this design example, while network topologies were used to define and control the design relations within specified parameters; the point-based Octree technique was used to divide the parts of whole also in specified extents. Within this way, the distribution of spaces was held properly through their topological relations and allometric principles. The division of space would be gathered through the position and the capacity of each cluster. Only by controlling the growth of morphogenesis referring to allometric notions, affects the topological organisation of design form in an efficient way. For future scenarios, allometry in digital morphogenesis would be used for generating new forms or continuous patterns in different architectural scales.

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