FRACTAL GEOMETRY CONCEPTS
AS A BASIS FOR
STUDYING
PROPORTION AND RHYTHM
IN ARCHITECTURE

by

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ABSTRACT

Our perception of architecture is bounded by our Euclidean and Cartesian
principles. There is a new scientific paradigm that has changed our perceptions
of nature and the state of our universe, and this is fractal geometry. It states that
the universe is predictably unpredictable, but yet follows deterministic patterns
governed by unexpectedly simple rules.

Fractal geometry proposes that the natural universe is more complex than
mere absolutes. For example, if a line convolutes, twists and turns, such that it
travels and crisscrosses over itself, it may start to approximate the plane itself.
Hence, the line is still a line, but now possesses the near properties of a plane.
Such an object would then more accurately be given a dimension of say 1.5 or
1.6, 1.45 etc., according to its complexity.

What this means is that now scientists, engineers, geologists, botanists
and the like have a new tool for measuring and approximating nature. There are
now fractal dimensions for everything in our known universe from the expanse
of the cosmos to coal bits, trees, concrete mixes, coastlines, sponges, and all
other aspects of nature that conventional science has ignored simply because it
did not have the tools to do so.

Yet even while Euclidean geometry is a simple construct of a means by
which we apprehend our universe, the same must also be said for fractal
geometry, that though it is a more complex mechanism, yet it too is an ideal
construct.

It is the intention of this dissertation to look into this new scientific
paradigm and its potential in architecture. This look at fractal geometry is not to
philosophise about the impact it may have on a theoretical level, but to see how
it may help in the practical formulation of architecture.
The objective of this dissertation is to research into the potential of using fractal geometry concepts as a basis for comparing and studying the proportions and the rhythm of building facades. The dissertation will choose two different types of building to study as case studies. Using fractal geometry concepts, this dissertation will show that there is a commonality in the fractal order between the two culturally different forms. Through the case studies, the dissertation will show that the two culturally different forms actually have a commonality in their fractal dimensions. The two building types that will be chosen as case studies are Gothic Cathedrals and Chinese Temples. It is the intention of this dissertation to choose contrasting examples and to show that despite their differences, there is a commonality in the fractal order.

The fractal dimension of a composition signifies:
1) the extent of the progression of textural depth.
2) the rhythmic progression.
3) the underlying rhythmic structure.

Having shown that both the case studies have a common fractal dimension, it means that these buildings behave the same way with respect to the three aspects mentioned above. The significance of this is that fractal geometry concepts allow us to quantify and determine the fractal dimension of a composition and subsequently reproduce the underlying rhythmic structure of a composition. Every single value of a fractal dimension can produce a particular fractal rhythm distribution. As such, both types of building will produce a similar fractal rhythm distribution due to their commonality in fractal dimensions. This fractal rhythm distribution can then be used as an ordering principle in design in future.

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