

TOWARDS EXHAUSTIVE ENUMERATION OF 3D SPACE UNIFORM NETWORKS

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ABSTRACT

The mainstay of structural morphology systems in architecture and Engineering (and in chemistry-crystallography as well) are 3D network configurations.

The exhaustive enumeration of Uniform (equi vertex-edge) Networks in 3D space was never attempted and never accomplished in the past. The author's personal efforts of approaching this issue started about 50 years ago and by now he can state with confidence that all related theoretical issues are already resolved, and the exhaustive enumeration of 3D space networks could be accomplished.

The most glaring deficiency in the supportive theory domain was in the inherited symmetry groups theory, according to which: “**networks with a number of symmetrically identical (uniform) vertices per one translation unit, reaching beyond 48, are a theoretical impossibility**”. As a fact, the author has developed about 50 years ago some uniform 3D - space networks with 96 symmetrically identical vertex figures per one translation unit of a cubic lattice system.

After investing in the systematic research of the topic, the author claims enumerating and graphically representing about **~~730 uniform 3D Space Networks** (so far), providing for their categorization, developing their notation system and arranging according to their density characteristics.

A critical development was performed with the progress toward the exhaustive enumeration of 3D symmetry space groups (evolving from the traditional 230 to the expanded array of 562! Surrey IASS conference, 09/2021). Being aware of a method of deriving uniform network vertex figures from any fundamental symmetry domain, associated with a particular symmetry space group, the stage is now set for the ultimate effort of accomplishing the exhaustive enumeration of 3D networks. The paper will provide for few case – studies of some network categories and their associated symmetry systems.

The presentation is meant to support an evolution of new imagery which might influence scientific exploration and inspire art, architecture and development of innovative space structures.

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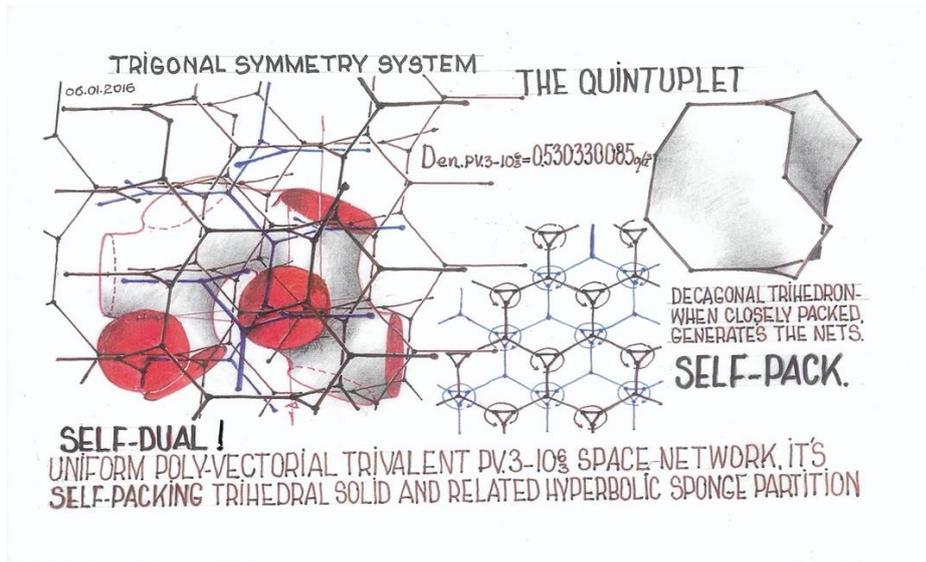
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