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The maximum volume of hyperbolic polyhedra. (English)  

With $\mathbb{H}^3$ the unit ball of $\mathbb{R}^3$, a projective polyhedron $P \subseteq \mathbb{R}^3 \subseteq \mathbb{RP}^3$ is a generalized hyperbolic polyhedron if each edge of $P$ intersects $\mathbb{H}^3$. A projective polyhedron $\Gamma$ is a rectification of a 3-connected planar graph $\Gamma$ if the 1-skeleton of $\Gamma$ is equal to $\Gamma$ and all the edges of $\Gamma$ are tangent to $\partial \mathbb{H}^3$ (which is $S^2$). Although $\Gamma$ is not a generalized hyperbolic polyhedron, it is still possible to provide a definition for the volume of $\Gamma$ as for any proper polyhedron.

The paper’s main result states:

For any 3-connected planar graph $\Gamma$, $\sup_P \text{Vol}(P) = \text{Vol}(\Gamma)$, where $P$ varies among all proper generalized hyperbolic polyhedra with 1-skeleton $\Gamma$ and $\Gamma$ is the rectification of $\Gamma$.

“The theorem is proved by applying a sort of volume-increasing flow to any hyperbolic polyhedron.”

Reviewer: Victor V. Pambuccian (Glendale)

MSC:

52B10 Three-dimensional polytopes
51M25 Length, area and volume in real or complex geometry

Keywords:

volume; hyperbolic polyhedra

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References:


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