On the border of geometry and topology - fractal dimension, fractal star bodies and star metrics

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Abstract

K. J Falconer lists several properties of fractal dimensions - Hausdorff dimension, box - counting dimension, packing dimension, and comments that any function serving as a fractal dimension should be modeled after those basic properties. Inspired by the Falconer comments, Maria Moszyńska and I. Herburt selected the list of axioms for fractal dimension functions defined on the class of nonempty separable metric spaces. We shall discuss the independence of these axioms. In particular, using the Continuum Hypothesis, we associate to each nonempty separable metric space X a non-negative integer $d(X)$ so that the function d is Lipschitz subinvariant, stable under finite unions, $d([0,1]^n) = n$, but still, for some $E \subset [0,1]^3$, $d(E) < \dim E$ - the topological dimension. Moreover we shall present some results concerning fractal star bodies and star metrics.

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