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Variational Properties of the Discrete Hilbert-Einstein Functional

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The discrete Hilbert-Einstein functional (also known as Regge action) for a 3-manifold glued from euclidean simplices is the sum of edge lengths multiplied with angular defects at the edges. There is an analog for hyperbolic cone-manifolds; a discrete total mean curvature term appears if the manifold has a non-empty boundary. Variational properties of this functional are similar to those of its smooth counterpart. In particular, critical points correspond to vanishing angular defects, i.e. to metrics of constant curvature. I survey isometric embeddings and rigidity results that can be obtained by studying the second derivative of the discrete Hilbert-Einstein and speak about possible future developments.
