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On topological image analysis

ETopological (homological) properties aim at describing the global shape of the object, given by the number β_0 of connected components and the number β_1 of holes for 2D objects, and by the number β_0 of components, β_1 of tunnels and β_2 of holes (cavities) for 3D ones. The determination of these Betti numbers requires the knowledge of the whole object. In contrast, the Euler characteristic, which is equal to the alternating sum of the Betti numbers, can be computed locally. We will present several approaches to the computation of the Euler characteristic of 2D and 3D digital objects.