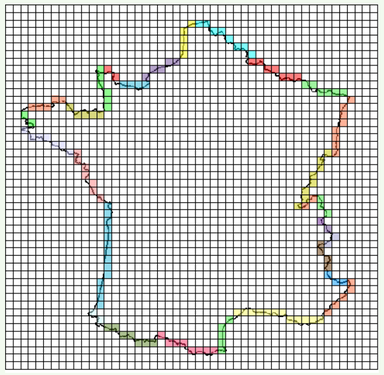
Discrete geometry

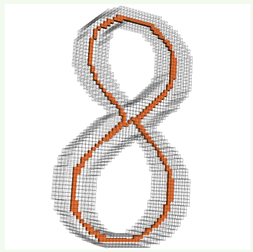
Geometric simplification

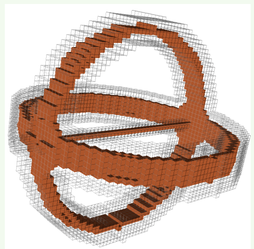


Conversion between curves in the plane or Euclidean space and discrete geometric objects is a recurring problem in many applications of image processing, computer vision and computer graphics.

We propose new algorithms allowing to achieve linear or nearly linear complexities.

Discrete topology

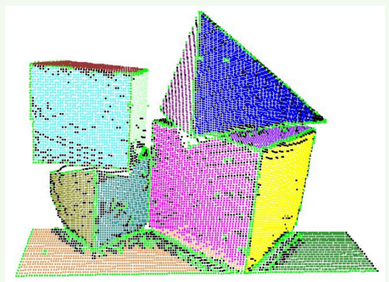




We study topological notions (continuous transformations, invariants, ...) in discrete spaces such as simplicial or cubical complexes. We have developed the framework of critical kernels which is, to our knowledge, the most general framework to study and design parallel thinning algorithms in any dimension.

In this context, we can generate new algorithms for which topological soundness is guaranteed by construction.

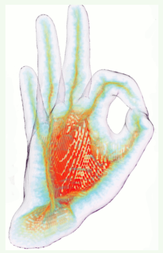
Discrete geometry and applications to computer vision



We study the geometric properties of sets of discrete points, which are discretized objects in digital images.

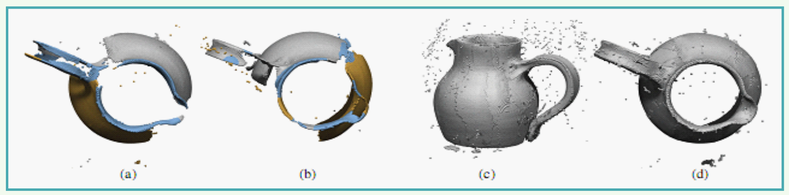
We propose efficient algorithms to perform several operations (filtering, recognition, ...), using only exacts calculations with integers.

Topological operators for image processing



The operation of skeletonization is notoriously sensitive to contour irregularities, there is therefore a need for filtering methods to eliminate noise while preserving essential geometrical characteristics. We develop methods to obtain families of nested filtered skeletons with topological and geometrical properties.

Matching and pattern recognition



We look for specific geometric configurations in scenes composed of geometric objects. We have proposed low complexity algorithms to solve such problems, they improve the state of the art by one order of magnitude.

Contact: Michel Couprie

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