1 DGtal: a software library for the discrete geometry community

1.1 Objectives
- to make easier discrete geometry for the neophyte (student, researcher from another field, ...)
- to test quickly new ideas, with objective comparison wrt existant works
- to make easier the implementation of demonstrators
- to help spread our research results to other domains
- to pursue a federative project...

1.2 Main features
- to define digital objects in arbitrary dimension
- to propose algorithms for topological and geometric analysis
- to facilitate image analysis with data structures
- to provide I/O mechanisms and visualization tools

1.3 Philosophy
- Genericity and efficiency
- C++ library, concepts, generic programming with templates
- open-source, LGPL or GPL with restrictions
- user friendly, not necessarily kernel-developer friendly

1.4 A collaborative effort

1.5 The current DGtal team
- David Coeurjolly (LIRIS): infrastructure, kernel, images, volumetric geometry
- Jacques-Olivier Lachaud (LAMA): kernel, topology, 2D display (board)
- Bertrand Kerautret (LORIA): contours, 3D viewer
- Tristan Roussillon (LIRIS): 2D geometry
- Guillaume Damiand (LIRIS): kernel
- Sébastien Fourey (GREYC): kernel, board
- Isabelle Sivignon (Gipsa-lab): DSS

2 Structure

Basic types, data structures
- digital space, point, set, etc
- software infrastructure: trace, compiler validation

Images
- generic container
- several implementations: standard, other adapted to big images

Kernel

Topological module
- digital topology: connected components, border, simple points
- grid topology: cells, contours, surfaces, tracking

Geometry module
- precision, DSS recognition
- correct analysis: disconnectedness, convexity, etc
- volumetric analysis: distance transforms, medial axis

3 Features and examples

3.1 Generic spaces, domain, sets, etc
- arbitrary spaces, spanning iterators, adaptative type of sets

3.2 Generic images, adaptative containers
- several image containers (vector, hashTree), ITK backend

3.3 Digital (Rosenfeld's) topology
- digital topologies, connected components, borders, simple points, homotopic thinning

3.4 Geometry analysis
- 2D contours, primitives, DSL and DSS, decomposition, tangential cover
- 3D volumetric distance transforms

3.5 Additional features
- simple 2D vector display and export with stream mechanism
- 3D viewer with stream mechanism based on QGLviewer (New in 0.3)
- image, volumes import/export
- grid or interpixel topology, cells, digital surfaces, surface tracking (New in 0.3)
- Forge (trac), unit tests, cmake/crab/cdash, mailing lists
- User and developer documentation (doxygen)
- Cross-platform (Linux, MacOS, Windows)
- Join DGtal !