Geomlib®
geometryproccesing

High Performance **Geometry Processing Library**

Geomlib is a high performance geometry processing SDK designed for industrial applications. Its implementation can handle different levels of geometrical, topological and parametrical representations of 3D objects including point clouds, triangle meshes and CAD surfaces.

Geomlib includes state of the art algorithms to work with these representations in a unified framework. This approach simplifies the development of custom CAD/CAM applications and other geometry processing software where the performance and accuracy are critical.

Geomlib is cross-platform and has been compiled and tested on Linux and Windows.
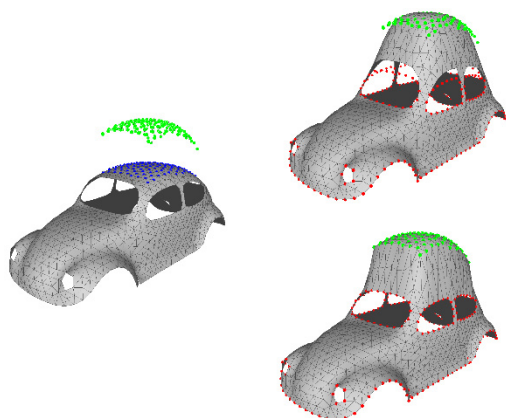
Constrained mesh deformation preserving geometry and topology

Features

- CAD model tessellation and format conversion
- Point cloud reconstruction
- Noise detection and reduction
- Mesh inspection and comparison
- Primitive automatic fitting
- Mesh simplification
- Boolean operations between solids
    - Slicing
   - Interactive boolean operations
- Geometry healing

Applications

Geomlib can be used to develop computational geometry applications like CAD/CAM, CAE or 3D design software that make extensive use of algorithms which can be posed in terms of geometry. All the algorithms have been implemented using cutting edge techniques that guarantee fast execution times while obtaining the accuracy required by industry standards.

The research and development activity around this SDK is oriented to industry 4.0 applications but it can be extended to other areas like architecture, videogames, robotics, etc.

Use Cases

At present Geomlib is being successfully applied for dimensional inspection tasks, where it has allowed to reduce significantly the time needed to inspect the surface of components acquired by structured light scanners, laser scanners or coordinate measurement machines if compared to standard commercial solutions.
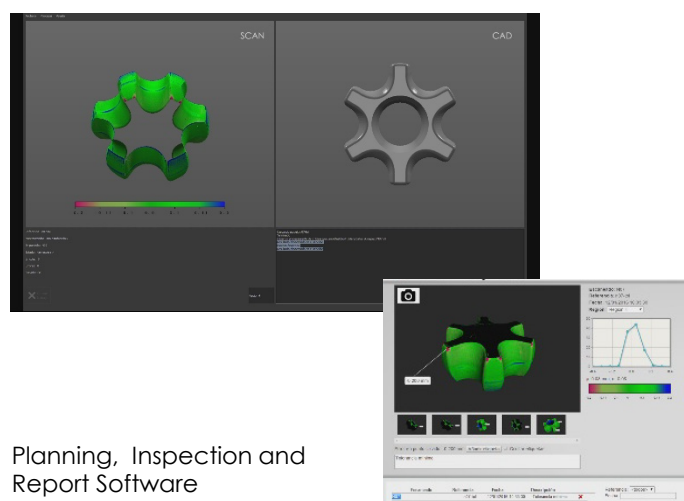
Planning, Inspection and Report Software

powered by:

vicomtech
visual interaction & communication technologies

Geomlib Modules and Architecture

Geomlib is composed by several software modules that can be integrated as required giving to the developer a high level of flexibility.

It has three core modules for the entity representation:

- **cloud_core:** basic functionalities for point cloud representation and manipulation. It can be used to manipulate dense clouds like data captured from 3D acquisition devices.

- **mesh_core:** adds topological information to point clouds as triangular meshes. Implements an efficient representation by half-edge structures that give better performance compared to standard approaches. It can import and export standard formats like STL, PLY, OBJ, etc.

- **cad_core:** basic functionalities for the representation and manipulation of 2D and 3D CAD entities. It can work with industrial standard formats like IGES and STEP.

Additionally Geomlib has other horizontal modules that implement more specific features:

- **registration:** mesh and cloud alignment and registration that can be used to fuse 3D scans together.

- **partition:** mesh and cloud partitioning allowing efficient point and triangle search using octrees and kdtrees.

- **slicing:** slice generation for 3D printing from surface meshes.

- **parameterisation:** mesh segmentation and parameterisation for reverse engineering, texture mapping, path planning for machining processes, etc.

- **deformation:** mesh manipulation including constrained deformations preserving geometry and topology.

- **tessellator:** CAD model tessellation that can be used to obtain its triangle representation.

- **workspace:** structures to handle relationships between cloud, mesh and cad entities

- **inspection:** dimensional inspection module that implements alignment and analysis algorithms needed by metrology applications.

- **interop_lana3d:** interoperability module with **Lana3D** graphics engine that allows to visualise easily **Geomlib** 3D entities.

Relationship between modules