Description
The Computer Vision and Reverse Engineering laboratory is specialized in the Reverse Engineering pipeline for study, research and industrial applications: 3D devices calibration and characterization, 3D acquisition and processing, redrawing of CAD models based on 3D data. The 3D capturing equipment permits to acquire industrial components, structures, Cultural Heritage objects with a wide range of geometries, sizes and materials.

References
The laboratory has contributed to the production of reality-based 3D models for the following patrons:
- Scuola Normale Superiore di Pisa.
- Comune di Milano - Castello Sforzesco.
- Comune di Milano - Civico Museo Archeologico.
- Several professors of the Department of Mechanical Engineering.
Instrumentation & Facilities

- Minolta Vivid 9i: triangulation laser scanner with rotating table, and 1 laptop pc Dell M90 for Vivid Minolta controller.
- GOM Atos: pattern projection scanner.
- NextEngine 3D HD: laser scanner mounted on Manfrotto Tripods.
- Calibrated Target for 3D metrology.
- Software tools for the post-processing of 3D models.
- 2 Kuka KL3: robot for handling 3D scanning systems.

Activities

Camera calibration for photogrammetry and 3D Vision
- Radial distortions assessment.
- Tangential distortion assessment.
- Affine distortion assessment.

Active 3D range sensors characterization (Triangulation and TOF/PS) according to ASTM Committee E57 draft
- Global uncertainty assessment.
- Precision assessment.
- Accuracy assessment.

3D acquisition and modeling based on
- Traditional photogrammetry with sparse clouds.
- SFM/Image matching with dense clouds/meshes.
- Triangulation based laser scanning and dense mesh generation.
- TOF/PS laser scanning and dense mesh generation.
- CAD drawing on 3D data gathered manually or automatically.

3D models optimization for Virtual Navigation
- Mesh optimization.
- Texturing/Displacement mapping.
- 3D segmentation.