PROTO-LAB

Laboratory for CAD/CAM Design Methodologies and new 3D design techniques

CAD/CAM technologies for SMEs

rapid prototyping rapid manufacturing

CAD 3D

generative modelling

reverse engineering

The Proto-Lab Laboratory performs innovation, research and technology transfer activities to support SMEs in various sectors on national interest in the CAD/CAM technology sphere, with a special focus on CAD 3D modelling, rapid prototyping and reverse engineering, with the aim of raising the technological level and competitiveness of enterprises both from the point of view of product development and production. The aim of the Laboratory is to assess the methodologies to be adopted based on the particular sector and the actual impact of adopting CAD/CAM technologies within SMEs' productive processes and the methods for their correct integration with traditional ones. The flexibility of the technologies considered makes it possible to operate across the sectors driving the country's economy such as fashion accessories, Cultural Heritage, biomedical, mechanics and industrial design.

Application fields

MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.

PRODUCTION OF SOFTWARE, IT CONSULTING AND RELATED ACTIVITIES;

LIBRARIES, ARCHIVES, MUSEUMS AND OTHER CULTURAL ACTIVITIES

Platform

ICT AND DESIGN

Example of CAD 3D modelling and prototyping application in the footwear sector

Modello cad_3D

Tecnologia di deposizione layer MJM

Modello fisico

CROSS-TEC

Contacts Sergio Petronilli, sergio.petronilli@enea.it

PROTO-LAB - Laboratory for CAD/CAM Design Methodologies and new 3D design techniques

DESCRIPTION OF THE SERVICE

The whole set of skills acquired by the Proto-Lab Laboratory in CAD/CAM technologies allows actions to be undertaken at several levels:

1. **Support to SMEs for integrated use of CAD/CAM technologies, with special focus on rapid prototyping, advanced 3D CAD modelling and reverse engineering.**
2. **Awareness-raising actions by facilitating seminars and workshops, possibly by involving institutions and trade associations active in the region;**
3. **Innovation and technological transfer actions that entail implementing tailor-made case studies, depending on specific needs and requirements of the enterprises;**
4. **Industrial research and experimental development activities in the realm of CAD/CAM technologies, with special focus on 3D modelling, reverse engineering and prototyping.**
5. **Participating in national and European projects, where CAD/CAM technologies play a leading role.**

INNOVATIVE ASPECTS

The use of 3D CAD design technologies is increasingly playing a key role in SMEs, owing both to the resulting advantages from the design point of view, and to the ability to interface with rapid prototyping systems to make even complex prototypes with no need for additional equipment. The introduction of these technologies in the company's production system essentially translates into a reduction of design times and costs, quality improvement and increased efficiency, as well as enhanced ability to follow market trends. Furthermore, the integration of 3D CAD modelling with innovative generative modelling instruments allows SMEs to be competitive, in terms of developing models with a high design content as well as introducing non standard variables in the design to solve complex problems, with no need to resort to programming.

POTENTIAL APPLICATIONS

The application of the technologies pertaining to the Proto-Lab laboratory such as 3D modelling, rapid prototyping and reverse engineering cut across a variety of fields and is able to provide an important competitive advantage, especially for all those sectors where the shape of models and design are an important aspect. The business sectors of "Made in Italy" such as fashion accessories, footwear, leather ware, goldsmith and jewellery are the ones that may reap the biggest competitive benefits, also in view of the strong craftsmanship component in these sectors. Other applications include industrial design, metal working for pre-production, biomedical (engineered prosthesis customisation) and Cultural Heritage (virtual restoration, museum bookshops, interactive artwork viewing).

Application of advanced 3D CAD modelling for the goldsmith sector

PROTO-LAB - Laboratory for CAD/CAM Design Methodologies and new 3D design techniques

APPLICATION EXAMPLE

Designing gemstone pavè on double-curved surfaces and support creation

DESCRIPTION OF THE APPLICATION

The Proto-Lab laboratory has developed advanced plug-ins resulting in a methodology for arranging 3D models (namely gemstones) on a double-curved surface in an independent manner from the configuration of the surface itself. The application may also be used in the footwear or leather ware sector to develop decorations in the product development stage and in production planning. Furthermore, in view of the increasingly widespread "consumer prototyping" systems, the application example of generative modelling is highlighted to automatically create supports for the rapid prototyping stage, with no need to model them using conventional 3D modelling tools.

INVOLVED PARTNERS

Company 121 Gioielli SPA,

14 companies in the goldsmith and jewellery sector in the province of Bologna

IMPLEMENTATION TIMES

6 months

RESULTS OBTAINED

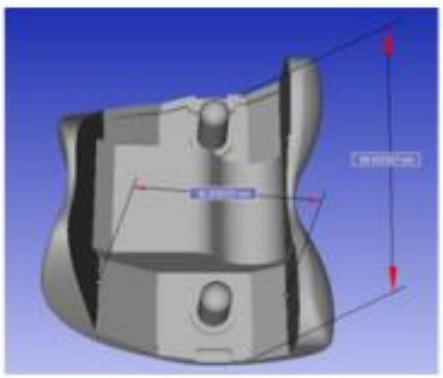
The Proto-Lab laboratory has developed an optimised technology transfer pathway to apply 3D CAD modelling, rapid prototyping and reverse engineering technologies to SMEs and handicraft enterprises in the sector of fashion accessories, allowing them to rapidly integrate these technologies with traditional ones. More than 80% of involved companies currently adopts CAD/CAM technologies to design their models.

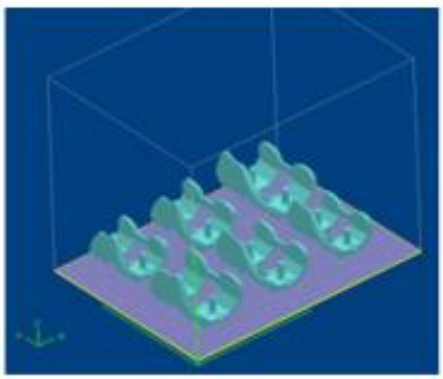
EXPLOITATION

With regards to the fashion accessories, goldsmith and jewellery sector:

- development of a patented design with the subdivision surface CAD technique
- involvement of more than 50 companies of the sector in the use of CAD modelling, rapid prototyping and reverse engineering

Application of CAD 3D modelling and prototyping in the production of knee endoprosthesis





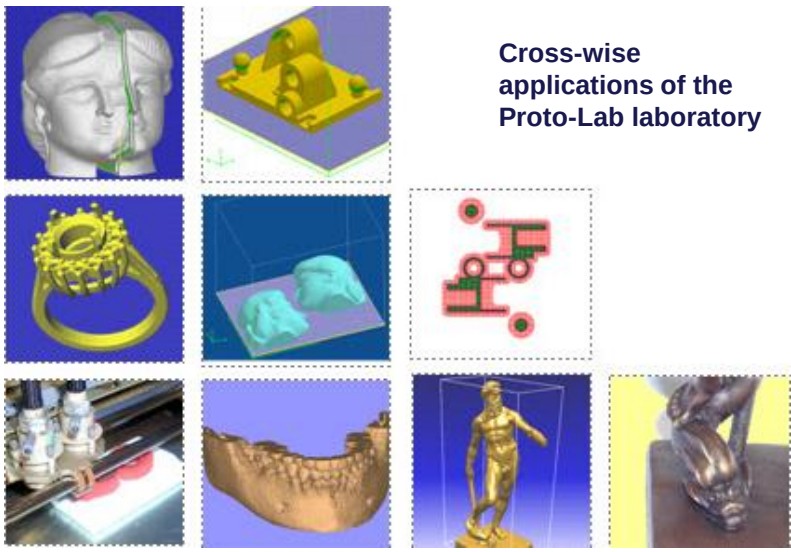
CROSS-TEC

DESCRIPTION OF THE LABORATORY

CROSS-TEC is a laboratory of the ENEA Technopole of Bologna belonging to the Emilia-Romagna region's High Technology Network. CROSS-TEC's background consists in two laboratories for technological transfer that have been operating at ENEA for over 10 years, X-LAB (Interoperability technologies and enterprise networks) and Proto-Lab (CAD/CAM Design methodologies and new production techniques).
The Proto-Lab Laboratory has in-depth knowledge in the sphere of 3D CAD modelling with nurbs and mesh and of generative modelling. It has three rapid prototyping systems whose features are complementary with regards to fields of application, dimensional precision and model construction times. It also has two high resolution 3D scanners at structured light and laser to perform reverse engineering activities leading to the relevant 3D model from a real prototype, on which any modifications may then be made according to the project's specifications.

REFERENCES

- 50 companies in the fashion accessories, goldsmith and jewellery sectors in Emilia-Romagna
- 80 companies in the Arezzo Goldsmith District
- Assoservizi of Arezzo
- Ecipar Bologna
- SCINTEC Association for New Technologies in Bologna
- University of Bologna, School of Engineering and Cultural Heritage Preservation
- MEDEA Association (Arezzo Model Makers and Designers)
- Civic Archaeological Museum of Bologna
- Venturi Arte Foundry
- SAMO spa
- INAIL Prosthetic Centre
- Provincial Authority of Arezzo
- CNA Bologna - CNA Arezzo
- Arezzo Chamber of Commerce
- University of Udine
- Department of Mathematics at the University of Bologna



Cross-wise applications of the Proto-Lab laboratory

http://www.protolab.enea.it

Contacts Piero De Sabbata, piero.desabbata@enea.it