ITALY Genova

CNR - IMA

Istituto di Matematica Applicata e Tecnologie Informatiche (IMA)
Geometric Modelling and Computer Graphics Group
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Core Competence

Shape Modelling, Geometric Modelling, Computational Geometry, Computer Aided Design, Computer Aided Styling, Digital Terrain Modelling, Geographic Information Systems, Parallel processing for Computer Graphics, Product Data Modelling

Head of the Institute
Bianca Falcidieno

History

The Computer Graphics Group of IMATI Genova (former IMA) has been involved in shape modelling for more than 20 years, in correlation with mathematical and computer science techniques such as geometry or computational topology, and focusing on applications to Geographical Information Systems, 3D visualization and Industrial Design. Many international and national projects have been carried on, involving more than 11 people per year on the average (here including permanent and temporary researchers and PhD students). About 300 international papers have been published, and about 50 young researchers have been trained, 15 out of them from foreign countries. 18 international conferences and several specialized schools have been organized in order to transfer the developed technological expertise.

Financing

As an institute of the Italian National Research Council, the basic staff, the rooms and other infrastructures are financed by the Italian government. The research assistants and some special equipment are paid from projects funded by the EU, and from contracts with private industries.

Rooms and Locations

The Computer Graphics Group occupies some 600 square meters and is located in the sixth and fourteenth floor of the CNR Research Area building. This includes special labs for visualization and high performance computing.

Staff

Head researcher: Bianca Falcidieno
2 Senior researchers: Franca Giannini, Michela Spagnuolo
2 Researchers: Monica De Martino, Marina Monti
6 Research assistants: Marco Attene, Silvia Biasotti, Chiara Catalano, Simone Marini, Michela Mortara, Giuseppe Patané
2 Technicians: Caterina Pienovi, Corrado Pizzi

Current Structure and Important Partners

The Computer Graphics Group is one of the groups of the institute, other groups work on high performance computing, information and communication technology in education, and computational mathematics.
The Computer Graphics Group works both in fundamental and applied

research fields. Fundamental research is performed on algorithmic and computational methods for shape modelling, in co-operation with international and national universities and research centers. Applied research is mainly performed within EU projects, in the fields of environmental modelling, industrial design, and information technologies, and it is carried on in co-operation with industrial and societal partners.

Current Research

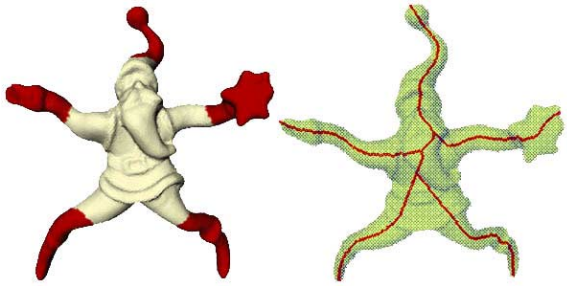
Currently the main research interests at IMATI cover the following fields: shape modelling of 3D objects and surfaces. Traditional shape modelling techniques are investigated, as well as innovative shape-based methods. topological modelling of objects and surfaces, aiming at the definition of high level models coding both the topology and the critical point configuration (Morse's theory, surface networks, Reeb's graphs). constrained modelling. Methods are investigated for the construction and updating of 3D meshes. shape feature analysis and synthesis in geometric models of surfaces, by means of methods based on gaussian and media curvature analysis, on multi-resolution analysis, on Medial Axis Transformation, and on Voronoi's diagrams. methods for spatial data analysis and filtering based on shape features (classical generalization, multi-resolution techniques). definition of multi-level models. Besides the traditional geometric approach based on a hierarchical representation, a global approach based on computational topology is investigated. computer graphics techniques, scientific visualization, and virtual reality as a man-machine interface. reverse engineering techniques. definition of new methodologies for aesthetic design of industrial products.

Important Recent Project Participations

- "FIORES-II: Character Preservation and Modelling in Aesthetic and Engineering Design", EU-GROWTH, www.fiores.com
- "ARION: An advanced lightweight architecture for accessing scientific collections", www.arion-dl.org
- "INVISIP: Information Visualization for Site Planning" EU-IST, www.invisip.de/invisip/index.html
- "COWORK: COncurrent project development IT tools for small-medium enterprises netWORKs" EU-Esprit, www.tekniker.es/cowork
- "High-quality Digital Terrain Modelling" Japan-Italy joint project

Important Recent Industrial Partners

think3 S.r.l., Technimold, Pininfarina Ricerca e Sviluppo, Saab, Alessi, BMW, Samtech, Philips, Democenter, Wallingford Ltd.



Future of the Lab

The institute will continue close cooperation with its current partners, in particular within the frame of international projects. Specific research topics will be addressed for the definition and development of methods and models for:

- Representation of curves, surfaces and volumes;
- Similarity analysis and shape equivalence,
- Uncertainty coding and representation;
- Definition of reverse engineering techniques;
    - Spatial data modelling;
    - Redundant data simplification and incomplete data enrichment;
    - Definition of techniques for surface interference detection.

Both consolidated applications (such as industrial design and production, environmental monitoring) and up-and-coming ones (such as rapid prototyping, aesthetic design, cultural heritage) will be considered.