

VISGRAF: Vision and Graphics Laboratory

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1. Lab Name

VISGRAF: Vision and Graphics Laboratory

2. Lab Responsible

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3. Lab Address and link to the Lab Web page

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4. Lab History and Mission

The VISGRAF Lab was created in 1989 with the purpose of developing research in computer graphics at IMPA.

The motto of Visgraf is that computer graphics is applied mathematics and that problems in computer graphics are better understood and solved by identifying the core mathematical concepts in a problem and applying or creating appropriate mathematical tools for its solution.

Visgraf was founded by Jonas Gomes and Paulo Carvalho with the collaboration of Luiz Velho and Geovan Tavares. Some members of the Visgraf Laboratory are pioneers of computer graphics research in Brazil. Jonas Gomes in his 1984 PhD thesis at IMPA already employed computer-generated drawings that helped him during his research on hypersurfaces in hyperbolic spaces. Luiz Velho in his 1979 undergraduate project at ESDI produced the first computer-animated film made in Brazil.

A graduate program in computer graphics at IMPA was created at the same time as Visgraf, although initially as part of the traditional IMPA program. Its first DSc was granted in 1992 to Luiz Henrique de Figueiredo, and Visgraf has since granted 9 DSc degrees and over 20 MSc degrees, some to PUC-Rio students. There are currently 12 DSc students and 12 MSc students.

Visgraf organizes one of oldest regular computer graphics seminar in the country: every Wednesday at 1:30 pm. The Lab has also contributed to the dissemination through Internet in Brazil: Visgraf's website runs since 1992.

Visgraf was the first Brazilian lab to have its research published and presented at SIGGRAPH in 1991. Since then, Visgraf members have published their research in the best conferences and journals.

5. Lab Objectives

The VISGRAF Lab has four main objectives:

- Conduct original research in Computer Graphics; in particular investigate opportunities for interaction between problems in Computer Graphics and mathematical tools developed for applications in other areas.
- Form new specialists in Computer Graphics, particularly through its M.Sc. and Ph.D. programs.
- Contribute to the literature in Computer Graphics by writing textbooks on key subjects.
- Engage in technological development projects that make use of state-of-the-art research in Computer Graphics.

6. Lab Running Projects

There are currently several ongoing projects at Visgraf. These projects involve the participation of MS and DSc students, technical staff and researchers of IMPA, as well as collaborators from other institutions in Brazil and abroad.

As a whole, the projects under study at Visgraf encompass some of the most relevant topics for the state-of-art in computer graphics. The results obtained and the perspectives of future development place the Laboratory at the forefront of research in the area.

It important to note that, despite their diversity, these projects are highly interrelated, both in terms of methods and technologies, but also, in terms of complementarities and scope. This creates a strong synergy that results in great productivity and makes possible a natural continuity of the research.

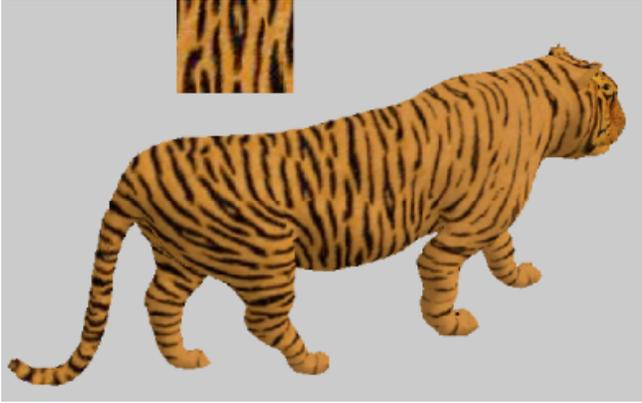


Figure 1: Texture Synthesis on Surfaces.



Figure 3: Real-time ocean rendering.

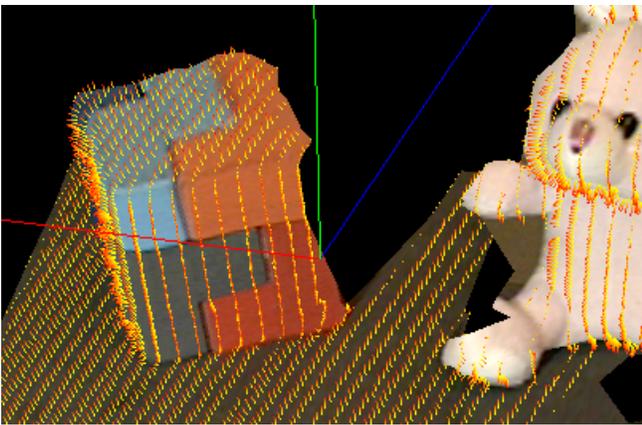


Figure 2: 3D Video Acquisition.



Figure 4: NPR Filtering for Animation.

A brief summary of the current projects and topics, organized by area, is as follows:

In *Geometric Modeling* we are investigating Subdivision Surfaces, Geometric and Topological Data Structures, Discrete Differential Geometry, Robust Numerical Methods, and Point-Based Graphics (Figure 1).

In *Vision-Based Graphics* we are working on projects of Fourth Generation Digital Video, 3D Photography, and Augmented Reality (Figure 2).

In *Image Synthesis* we have projects on Virtual Panoramas, Real-Time Processing of Graphics Objects, Reliable Fractal Images, and Terrain Visualization (Figure 3)

In *Animation* we are researching Synthesis of Facial Expressions and Speech, Analysis of Head Movement, 2D Cartoon Animation - NPR, Stop Motion and Tracking with Retro reflective Markers (Figure 4).

The Laboratory has also developed applications in Medical Imaging, Multimedia, Education and Cultural Heritage