

Introduction to Computational Manifolds and Applications

September, October, and November 2011

Lecturers:

Prof. Jean Gallier, University of Pennsylvania, USA

Prof. Luis Gustavo Nonato, Universidade de São Paulo, Brazil

Prof. Luiz Velho, IMPA, Brazil

Prof. Marcelo Siqueira, Universidade Federal do Rio Grande do Norte, Brazil

Course Overview

The course is designed to teach you, at graduate level, the theoretical foundations and computational aspects of surface constructions based on a constructive notion of manifolds.

The course also covers some modern applications of manifold-based surface constructions to graphics and engineering problems. At the end of the course, you should:

- be familiar with the mathematical foundations underlying manifold-based surface constructions,
- be familiar with the computational aspects of the main manifold-based surface constructions, and
- be able to apply a manifold-based surface construction to problems in graphics and engineering.

Course Overview

The course is divided into three main parts:

FOUNDATIONS

CONSTRUCTIONS

APPLICATIONS

Pre-Requisites

Linear algebra, multivariate calculus, and programming

DESIRABLE BUT NOT REQUIRED:

Topology, Analysis, and Differential Geometry

Course URL

<http://www.visgraf.impa.br/cma2011/course>

Lectures

Tuesdays and Thursdays, 1:30PM to 3PM, IMPA, Conference room 3

References

FOR THE “FOUNDATIONS” PART:

- L. W. Tu. An Introduction to Manifolds, Springer-Verlag, 2nd Edition, 2010.
- M. P. do Carmo. Differential Geometry of Curves and Surfaces, Prentice-Hall, 1976.
- J. R. Munkres. Topology, Prentice-Hall, 1976.
- J. Gallier. Geometric Methods and Applications, Springer, 2nd Edition, 2011.

WE WILL PROVIDE YOU WITH NOTES. THE ABOVE TEXTBOOKS SHOULD BE REGARDED AS REFERENCES IN CASE YOU NEED MORE EXAMPLES OR DETAILS ON A SPECIFIC TOPIC OR NOTION.

References

FOR THE “CONSTRUCTIONS” PART:

- Cindy M. Grimm and Denis Zorin. Surface modeling and parameterization with manifolds. ACM SIGGRAPH 2006 Courses, pages 1–81, 2006. ACM Press. ([download it](#)).
- Original papers for the constructions covered in the course.

FOR THE “APPLICATIONS” PART:

- Research papers describing the applications.

Grading

Your grade will consist of 3 components:

- homework - 30%
- project - 40%
- presentation - 30%

Calendar

Sept. 6, 8, 13, 15, 20, 22, 27: Foundations

Sept. 29, Oct. 4, 6, 11, 13 : Constructions

Oct. 18, 20: NO CLASS - Attend the “experts” seminar

Oct. 25, 27: Constructions

Nov. 1, 3, 8, 10: Applications

Nov. 17, 22: Student’s presentations

ENJOY IT!