PROGRAMA DE VERÃO 2024 - 709

ESCOLA DE MATEMÁTICA APLICADA FGV EMAp

DISCIPLINA: Numerical Methods for Nonlinear Dynamical Systems and Their Application in Computer Graphics

PROFESSOR: Uri Ascher

CARGA HORÁRIA: 05

PRÉ-REQUISITO:

PERÍODO: 26/02 a 01/03/24 (Segunda, quarta e sexta-feira)

HORÁRIO: 14h às 15h40

PLANO DE ENSINO

1. Ementa

Abstract: We will consider computational methods for solving challenging nonlinear time-dependent differential equation problems in the context of geometric integration and related diffusive models.

Such models arise in many applications. We will pay special attention to challenges in the context of simulating the motion of deformable objects in 3D subject to contact and friction constraints. Problems of this sort arise frequently in computer animation and robotics applications.

Here is a tentative list of topics:

- Methods for stiff ODEs and PDEs

- Conservative methods for geometric integration

- Semi-implicit methods, exponential methods and fractional step methods

- Pitfalls in conservative methods: wrong solutions

- Handling constraints and solving nonlinear problems by optimization

- Constrained deformable object simulation in computer graphics and robotics

2. Procedimentos de avaliação

Não será aplicado avaliação durante o curso.

3. Bibliografia Obrigatória

4. Mini Currículo

The focus of my work is on the investigation and promotion of novel, efficient and reliable methods in scientific

computation, particularly for approximation problems involving differential equations with constraints. Thus, I have been involved, in addition to genrally investigating properties of numerical methods, also in writing general-purpose mathematical software; investigating parallel algorithms and optimization techniques; solving inverse problems involving differential equations; considering hybrid systems; and getting more specifically involved in particular application areas such as multibody systems simulation, virtual reality, robotics, data inversion in geophysics, 3D electromagnetic modeling, geometric integration methods for Hamiltonian differential equations, image reconstruction, 3D mesh denoising, cloth simulation and computational fluid dynamics. For more information and full publication list please see the URL http://www.cs.ubc.ca/~ascher/