UNIVERSITÀ DI PISA

SCIENTIFIC AND LARGE DATA VISUALIZATION

DANIELA GIORGI

Anno accademico	2020/21
CdS	INFORMATICA
Codice	656AA
CFU	6

Moduli	Settore/i	Tipo	Ore	Docente/i
SCIENTIFIC AND LARGE DATA VISUALIZATION	INF/01	LEZIONI	48	MASSIMILIANO CORSINI DANIELA GIORGI

Obiettivi di apprendimento

Conoscenze

Throughout the class, the students will acquire knowledge in two different fields:

- 3D Computer Graphics,

- Scientific visualization, Information visualization and infographics.

3D Computer Graphics:
Representation models for geometric data. Basics of 3D rendering, lighting, and texturing.
Visualization:
Fundamentals of data visualization. Visual perception. Best practices in data visualization. Visualization techniques for both scientific phenomena and abstract data.

Capacità

By the end of the course, the students will be able to

- represent, manipulate and display 3D data;
- illustrate and communicate data and results using visualization, also for complex and large datasets;
- use existing visualization libraries and software tools (e.g. Seaborn, D3.js).

Prerequisiti (conoscenze iniziali)

Basic notions of Linear Algebra, Geometry, Statistics.
Basic knowledge of Python, JavaScript+HTML, C++.

Indicazioni metodologiche

The course will consist of both frontal lessons and hands-on labs.

Programma (contenuti dell'insegnamento)

The availability of data has been growing and growing in recent years, generated from sensors, mobiles, and so on. Visualization is what one needs to put data to good use: it allows one to analyse, explore and communicate possibly large and complex data in a meaningful way.
The first part of the course will deal with data in low-dimensional spaces, mainly 2D and 3D: we will discuss discrete models for 3D data representation (with an emphasis on polygonal meshes), and the fundamentals of Computer Graphics (including rendering, lighting, and texturing techniques).
Then, we will talk about scientific visualization, which concerns the graphical illustration of scientific data (for example, biological data), with the purpose of understanding and gleaning insights on the underlying phenomena.
Finally, the last part of the course will introduce the fundamentals of information visualization. Differently from scientific visualization, where data have an immediate physical representation, information visualization often deals with abstract data, which do not have an obvious visual representation: think of the network connections of a social network. We will learn to decide what to visualize, how to abstract and encode data using different charts and graph types and how to evaluate different solutions according to perception rules.

Modalità d'esame

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The exam will consist of a practical part (a project) and a theoretical part (an oral examination, after the delivery of the project).
The practical part is worth 20/30, and the theoretical part 10/30.
Sample written examinations and examples of successful projects from last year edition can be found
at http://vcg.isti.cnr.it/~cignoni/SciViz1920/index.html

Note
First lesson: Tuesday, 15 September, 2020

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