Computer Graphics

General Course Information

Edirlei Soares de Lima
<edirlei.lima@universidadeeuropeia.pt>

Computer Graphics

- Professor: Edirlei Soares de Lima
  - Education:
    - B.Sc. in Computer Science – UnC
    - M.Sc. in Computer Science – UFSM
    - Ph.D. in Computer Science – PUC-Rio
  - Teaching Experience: PUC-Rio, UNIRIO, UERJ, UE-IADE
  - Game Experience:
    - Game Engines: RPG Builder, 3D Game Builder (http://www.3dgamebuilder.com.br/);
    - Research Projects: Logtell (http://www.icad.puc-rio.br/~logtell/);
    - Games: Krimson (Best Game Award at SBGames 2010 – Indie Game Development Festival), and several other prototype games.
  - More Information: http://www.inf.puc-rio.br/~elima/

What is Computer Graphics?

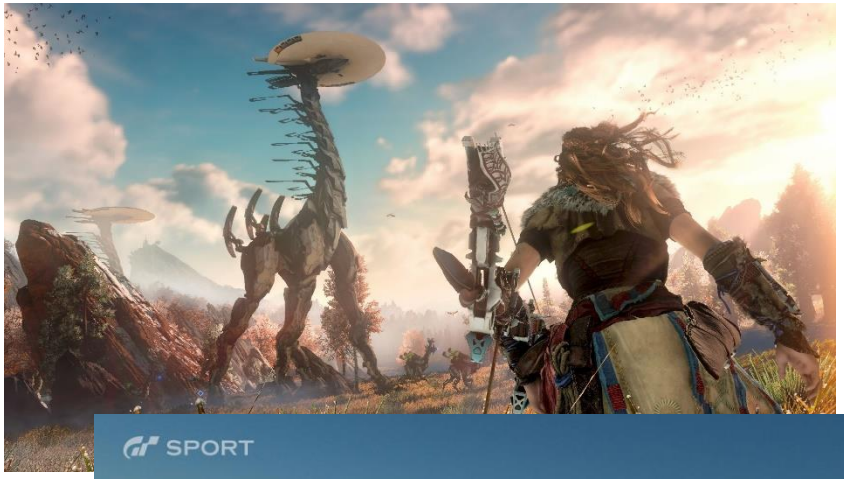
- The term computer graphics describes any use of computers to create and manipulate images [Marschner, S., et al., 2015].

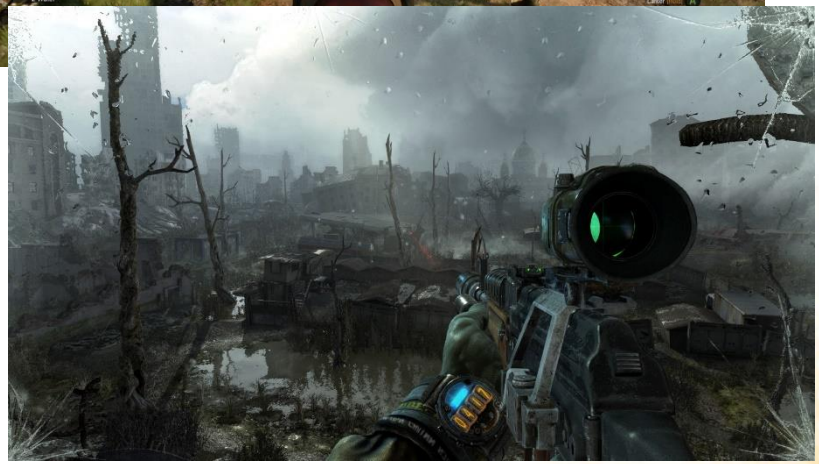
- Computer graphics is the science and art of communicating visually via a computer's display and its interaction devices [Hughes, J. F., et al., 2013].

What is Computer Graphics?

- **Computer graphics is a cross-disciplinary field:**
  - Physics (e.g.: model light behavior);
  - Mathematics (e.g.: describe shapes);
  - Human Perception (e.g.: only render things that will be noticed);
  - Human-Computer Interaction (e.g.: interaction devices);
  - Engineering (e.g.: optimize allocation of memory, and processor time);
  - Graphic Design and Art (e.g.: make the computer-to-human communication more effective);

What is the Importance of Computer Graphics in Games?





Computer Graphics

- Games & Apps Development – Computer Graphics: learn common and fundamental computer graphics concepts and techniques.

- Module Content:

1. Concepts of computer graphics;
2. Graphics hardware and pipeline;
3. 2D and 3D transformations;
4. Projections and 3D visualization;
5. Shaders;
6. Direct illumination;
7. Real time and pre-calculated global illumination;
8. Shadowing;
9. Textures and materials;
10. Particle systems;
11. Procedural geometry;

Method

- Active and experiential learning:
  - Theoretical concepts;
  - Practical examples;
  - Implementation exercises;
- Game framework: Unity
- Semester's PBL team project:
  - Implementation of the game graphics using the concepts and techniques learned during the course.

Evaluation

- Continuous Assessment (bipartite):
  - [60%] Intermediate assessment:
    - [40%] Individual exercises on the concepts learned;
    - [20%] Mini-Project with Math, Physics and Games III;
    - [40%] Two intermediate deliveries of the team project (within the semester's PBL team project).
  - [40%] End of term assessment:
    - [100%] Final delivery of the team project (within the semester's PBL team project) with individual discussion.

- Final Assessment:
  - [100%] Individual project development, delivery, and discussion.

Evaluation

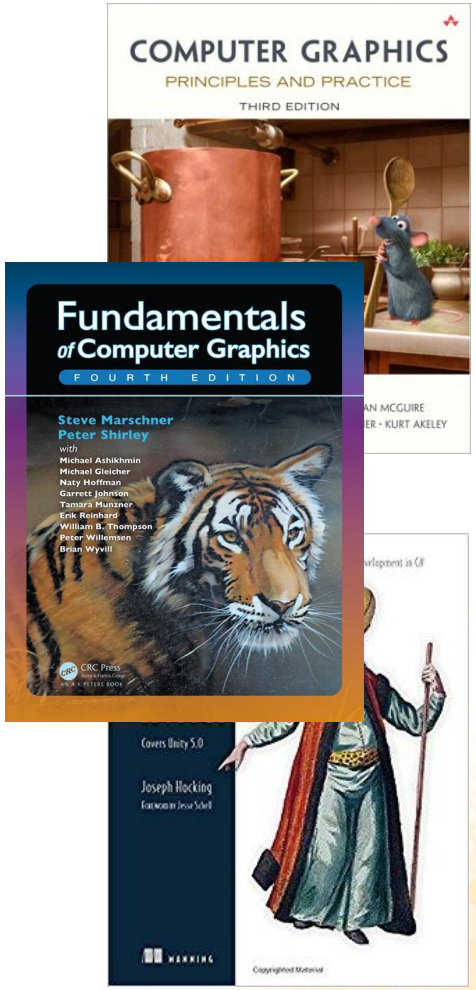
- Project Deliveries:
  - **1st delivery**: identification of the computer graphics necessities:
    - Definition of the visual aspects of the game;
    - What is required: lighting? shadows? basic shaders? new shaders? visual effects? particle systems? procedural geometry?
  - **2nd delivery**: no evaluation for computer graphics in this delivery;
  - **3rd delivery**: basic implementation of the computer graphics elements:
    - Lighting, shadows, basic shaders, new shaders, visual effects, particle systems, procedural geometry, …
  - **4th delivery**: final version of the game:
    - Overall implementation and integration of the computer graphics elements;
    - Performance analysis.

Bibliography

- Hughes, J. F., et al. (2013). **Computer Graphics: Principles and Practice** (3rd ed.). Upper Saddle River, NJ: Addison-Wesley Professional. ISBN: 978-0-321-39952-6.

- Marschner, S., et al. (2015). **Fundamentals of Computer Graphics** (4th ed.). A K Peters/CRC Press. ISBN: 978-1482229394.

- Hocking, J. (2015). **Unity in Action: Multiplatform Game Development in C# with Unity 5**. Shelter Island, NY: Manning Publications. ISBN: 978-1-61729-232-3.



Computer Graphics

- Course webpage:
  - http://www.inf.puc-rio.br/~elima/cg/

- Contact:
  - edirlei.lima@universidadeeuropeia.pt
  - edirlei.slima@gmail.com