

# Games and Simulation

2021-2022  
Fernando Birra  
Rui Nóbrega

# Overview

# Goals

- Learn how to program video games
  - What are the key concepts of game design
  - What is involved in the process of game development
  - What are the key components of a game engine
  - How the game engine components work together
  - How to use game engines for game development
  - What are the key techniques and algorithms inside a game engine

# Required Knowledge

- Programming (Java, JS, **C#**, **C++**, ...)
- Data structures
- Geometry and trigonometry
- Linear algebra

# Assessment

- 2 Written tests (T1 e T2) - Can be replaced by the Exam (E)
  - $\text{CompTP} = 0.5 * T1 + 0.5 * T2$  |  $\text{CompTP} = E$
  - $\text{CompTP} \geq 8.0$  required
- An Individual project (TI) and a group project (PG) in groups of **3** students
  - $\text{CompL} = 0.2 * TI + 0.8 * PG$
- Final Grade (FG)
  - $\text{FG} = 0.4 * \text{CompTP} + 0.6 * \text{CompL}$  (if  $\text{CompTP} \geq 8.0$ )
  - $\text{FG} = \text{CompTP}$  (if  $\text{CompTP} < 8.0$ )

**Note:** All grades are rounded to the first decimal place and are in the range [0,20]. Final grade is rounded to the nearest integer.

- To pass, FG must be  $\geq 9.5$

# Calendar

2022

< Today >

- 1st test: 21/4 
- 2nd test: 3/6 
- Individual Project: 9/4 
- Game Design Document: 7/5 
- Developed Game: 11/6 
- Discussions 14/6, 15/6 

January

S	M	T	W	T	F	S
26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5

February

S	M	T	W	T	F	S
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	1	2	3	4	5
6	7	8	9	10	11	12

March

S	M	T	W	T	F	S
27	28	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9

April

S	M	T	W	T	F	S
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
1	2	3	4	5	6	7

May

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4
5	6	7	8	9	10	11

June

S	M	T	W	T	F	S
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	1	2
3	4	5	6	7	8	9

All dates are subject to confirmation

# References

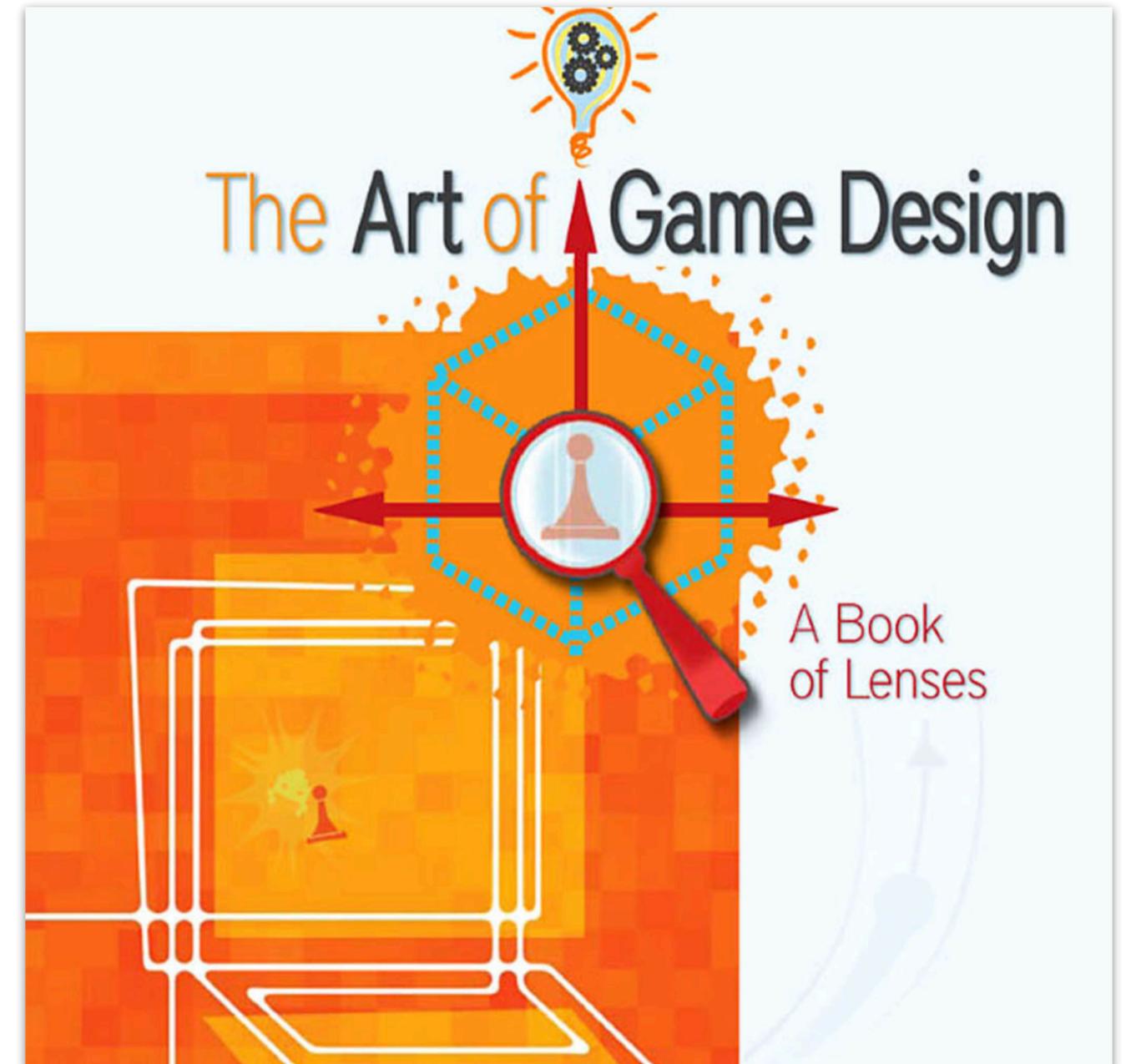
- **The Art of Game Design**

A Book of Lenses

Jesse Schell, 2008

ISBN-13:

978-0-12-369496-6



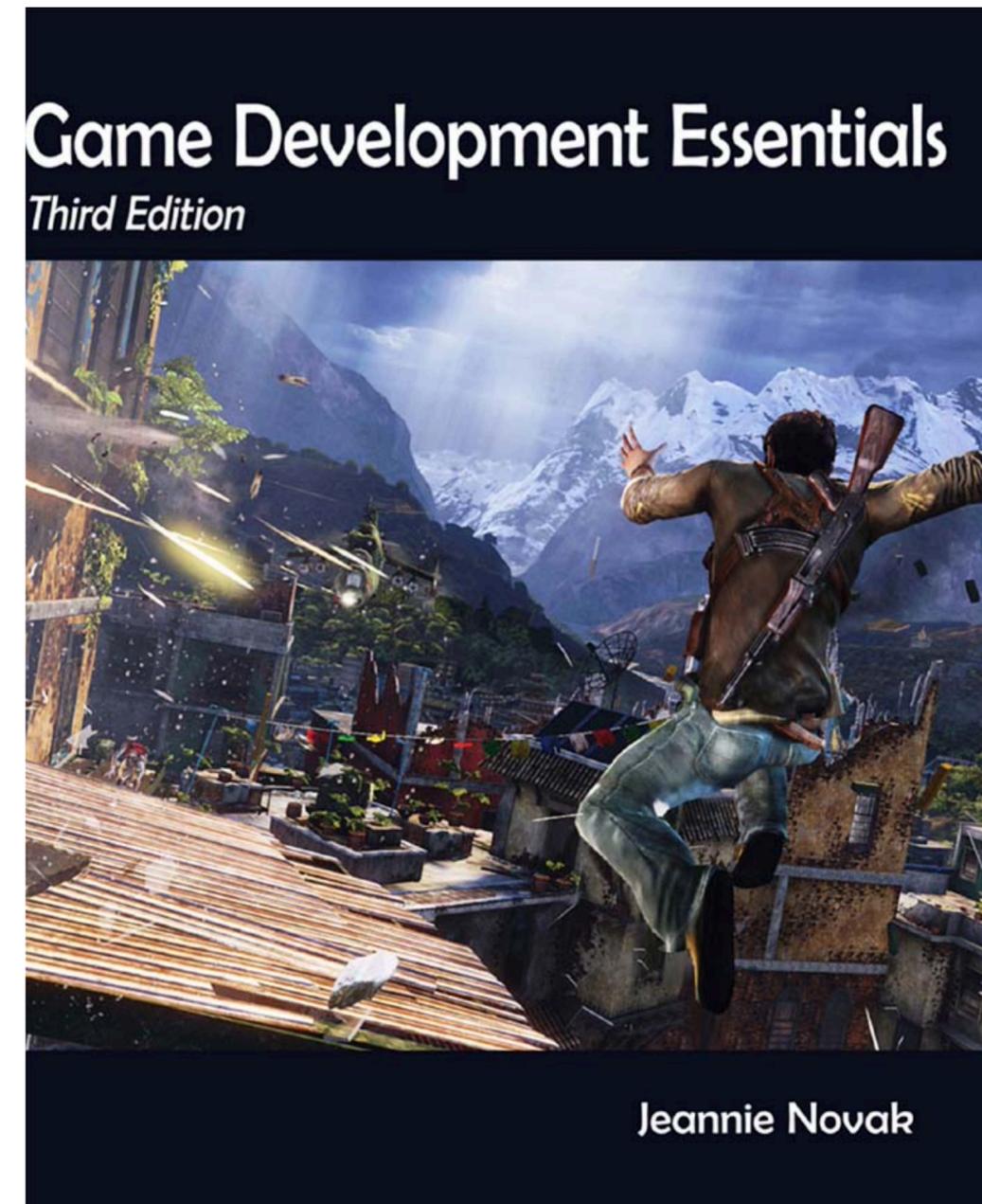
# References

- **Game Development Essentials**

A Practical Approach to Real-Time  
Computer Graphics

3rd Edition, 2012  
Jeannie Novak

ISBN-13:  
978-1-1113-0765-3



# References

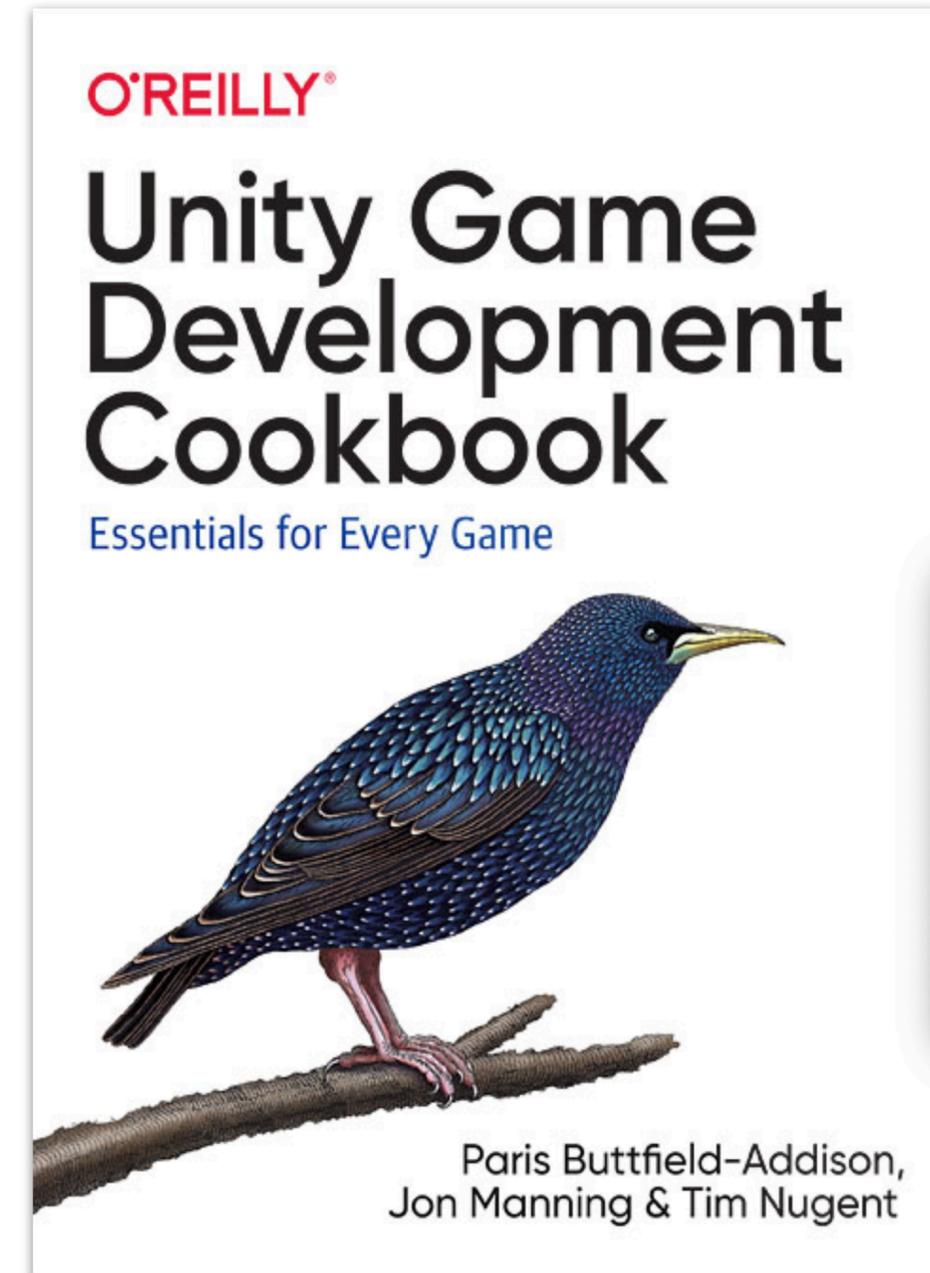
- **Unity Game Development Cookbook**

Essentials for Every Game

Paris Buttfield-Addison, Jon Manning, Tim Nugent, 2019

ISBN-13:

978-1-491-99915-8

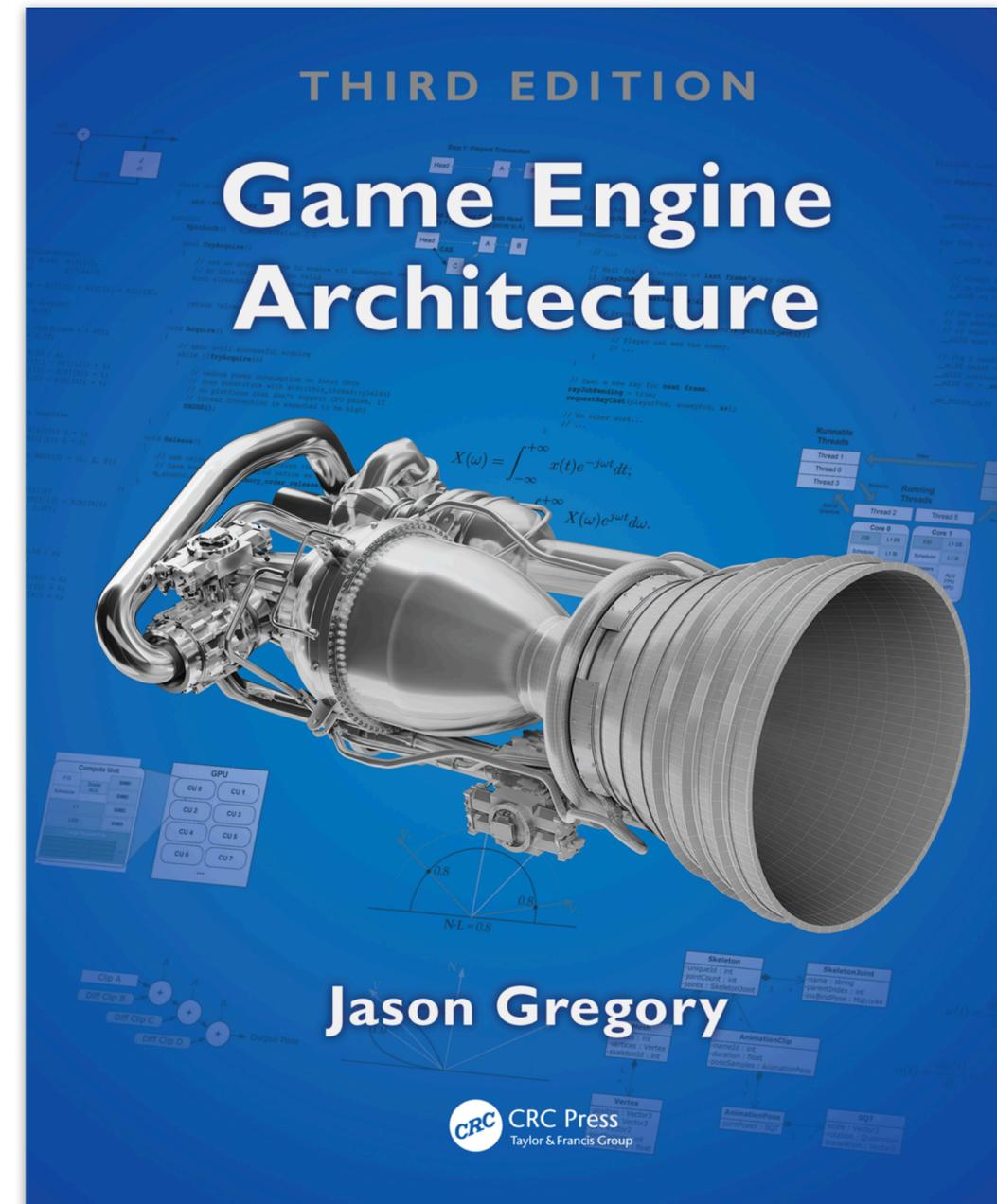


# References

- **Game Engine Architecture**

3rd Edition, 2018  
Jason Gregory

ISBN-13:  
978-1138035454



# References

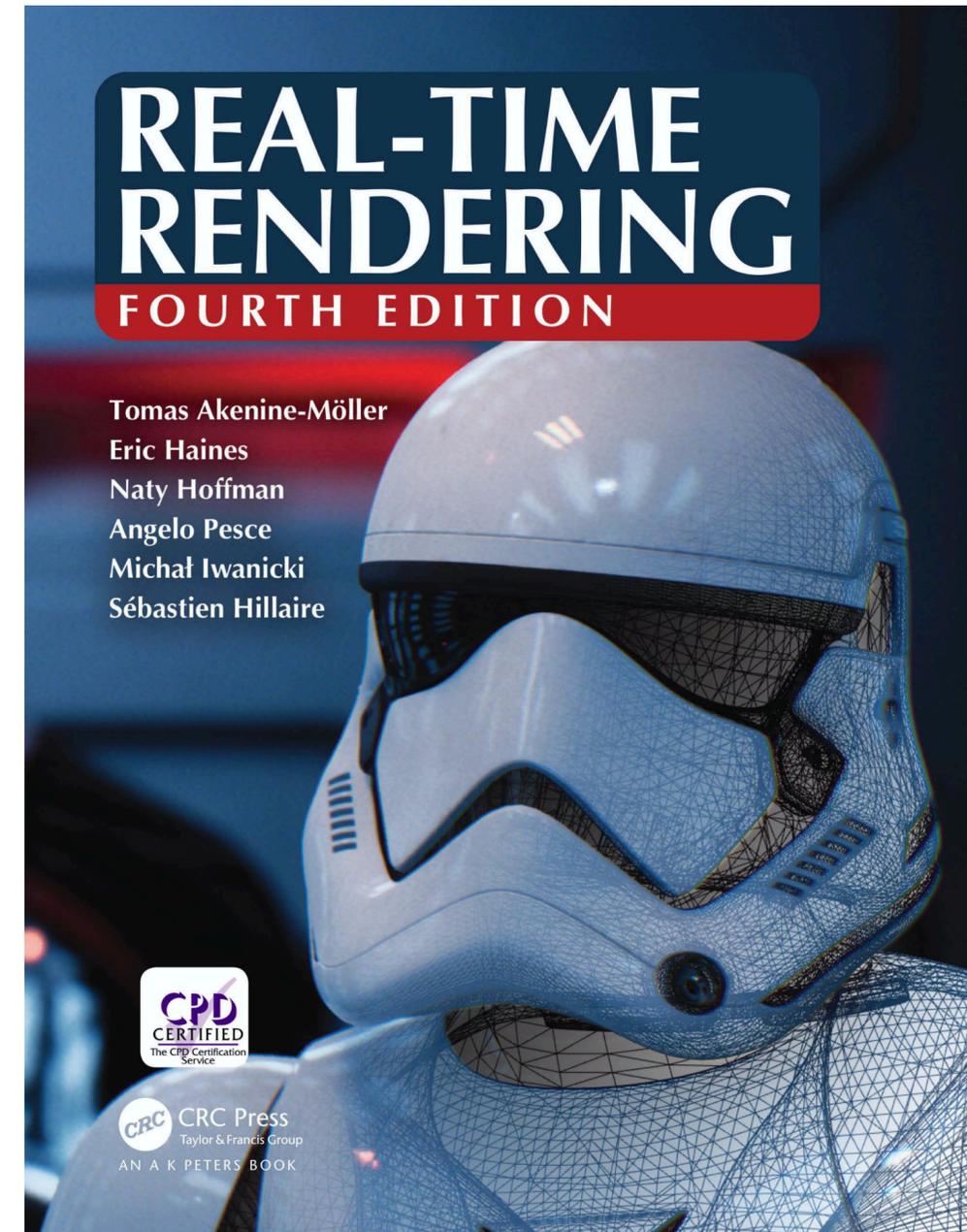
- **Realtime Rendering**

4th Edition, 2018

Tomas Akenine-Möller et al.

ISBN-13:

978-1138627000



# Covered topics

- Game Design Concepts
- Game Development Process
- 3D graphics hardware and 3D graphics pipeline
- 3D Modeling Techniques and Animation
- Scene Management
- Lighting Models, Shadows, Texture Mapping applications
- Physics for 3D games and Collisions

# Demos from 2020/21