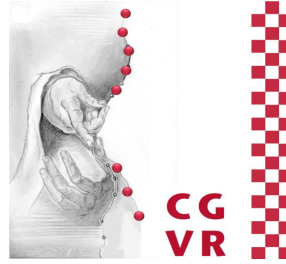


Bremen



# Virtual Reality & Physically-Based Simulation Organization



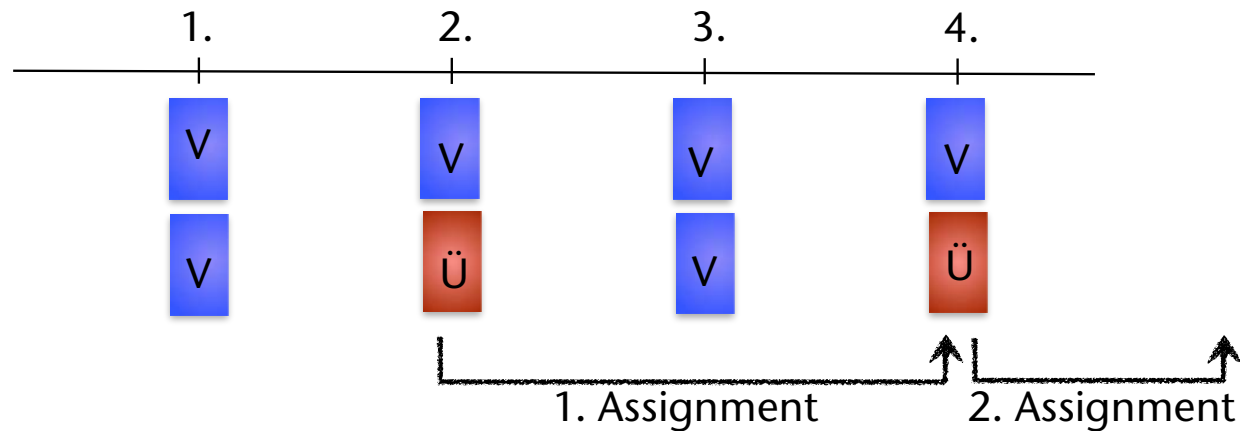
G. Zachmann  
University of Bremen, Germany  
[cgvr.cs.uni-bremen.de](http://cgvr.cs.uni-bremen.de)

# Where to Find Information on This Course

- The course's homepage:  
<http://cgvr.cs.uni-bremen.de/>  
→ "Teaching" → "Virtual Reality"
- Slides (a.k.a. Script) & Assignments
- Suggestions for text books, online documentation
- Announcements (rarely)
- Please register in StudIP!
  - Announcements will be communicated through StudIP
- Student chat: <https://discord.gg/YGUZFxf> → "Virtual Reality"
  - Note: I am **not** a member of the chat group!

# Schedule of Lecture and "Lab" Meeting

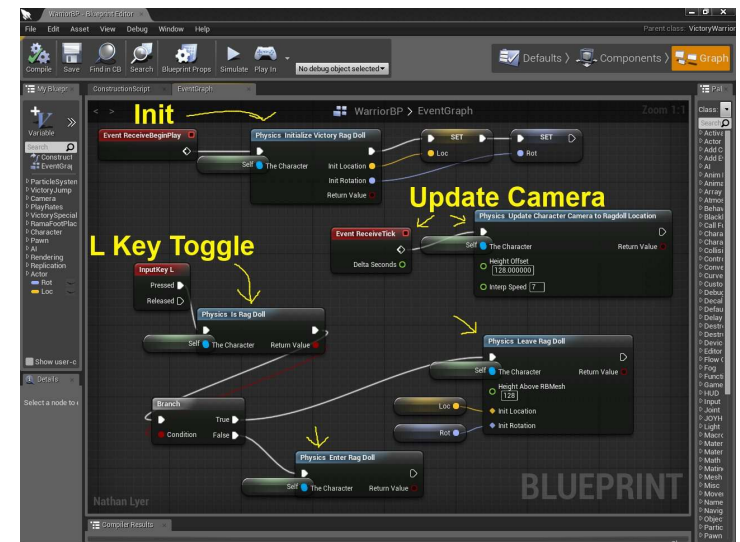
- Approximately once every two weeks: assignment meeting



- Deadline for assignments: specified by tutor!
  - Latecomers get 0 points
  - Plagiarism → 0 points and warning

# Assignments

- Mix of theoretical (a few) and practical (mostly) exercises
- Practical = Unreal engine
  - Using "blueprints" first
  - Later some C programming
- Unreal engine: version 5.x
  - Download: [www.unrealengine.com](http://www.unrealengine.com)
  - See also the links on the course homepage!
- Recommendation: work in groups of 3-4
- If personal hardware insufficient: talk to Sabine Dolhs → [sdohls@uni-bremen.de](mailto:sdohls@uni-bremen.de)



# Introduction to Unreal Engine

- Tutorial on Thursday, Oct 19, 16 ct, room MZH 1100
- More tutorials on <https://wiki.unrealengine.com/Videos>
- Start installing UE beforehand!

# The Exam

1. Either: long oral exam (= ½ hour per student)
2. Or: points from the assignments + short oral exam
  - Assignments → grade A , short exam → grade B
    - 95% of the points from all assignments → grade A = 1.0
    - 40% of the points from all assignments → grade A = 4.0
  - Total =  $\min\left\{\frac{1}{2} \cdot A + \frac{1}{2} \cdot B, B\right\}$ 
    - Precondition: grade A  $\geq$  4.0 && grade B  $\geq$  4.0 !  
(Allgemeiner Teil der Bachelorprüfungsordnungen der Universität Bremen, 2010)
- Note: in all variants, all of the course material could be topics in the exam!

- Criteria for grading the practical assignments:
  - Good (= labelling) variable and function names
  - Sufficient in-line comments
  - Documentation of the function and its parameters (in/out, pre-/post-condition, what does the function do, ...)
  - Functionality (solves assignments? no bugs? ...)

# Tentative Overview

- Introduction, immersion/presence/fidelity
- Scenegraphs, game engines, VR frameworks
- Devices
- Stereo rendering
- Techniques for real-time rendering
- Basic 3D interaction techniques: navigation, selection, object manipulation, ...
- High-level 3D interaction techniques: WIM, action-at-a-distance, RDW, ..
- Collision detection
- Haptics, Force feedback algorithms
- Sound rendering algorithms
- Particle systems
- Physically-based simulation using spring-mass systems



# Text Books

- No single one will do
- Check out some of the text books given on the course web page
- Use the online documents given on the course web page!
- Make comments in the slide PDFs!

# Helpful Knowledge (But Not Formal Prerequisites)

- A little bit of math (just first year)
  - Only needed for the second half
  - A little bit of linear algebra
  - At the end: easy differential equations ☺
- A bit of programming in C/C++, also only towards end of course needed

# High-Level Goals of This Course

## Cognitive Processes

"Enablement"



"Empowerment"

Remember  
Understand  
Apply  
Analyze  
Evaluate  
Create

