Virtual Reality & Physically-Based Simulation
Organization

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cgvr.cs.uni-bremen.de

Helpful Knowledge (no Formal Prerequisites)

- A little bit of math (just first year)
  - After a few weeks: a little bit of linear algebra
  - At the end: easy differential equations ☺
- A little bit of programming (C/C++)

Where to Find Information for This Course

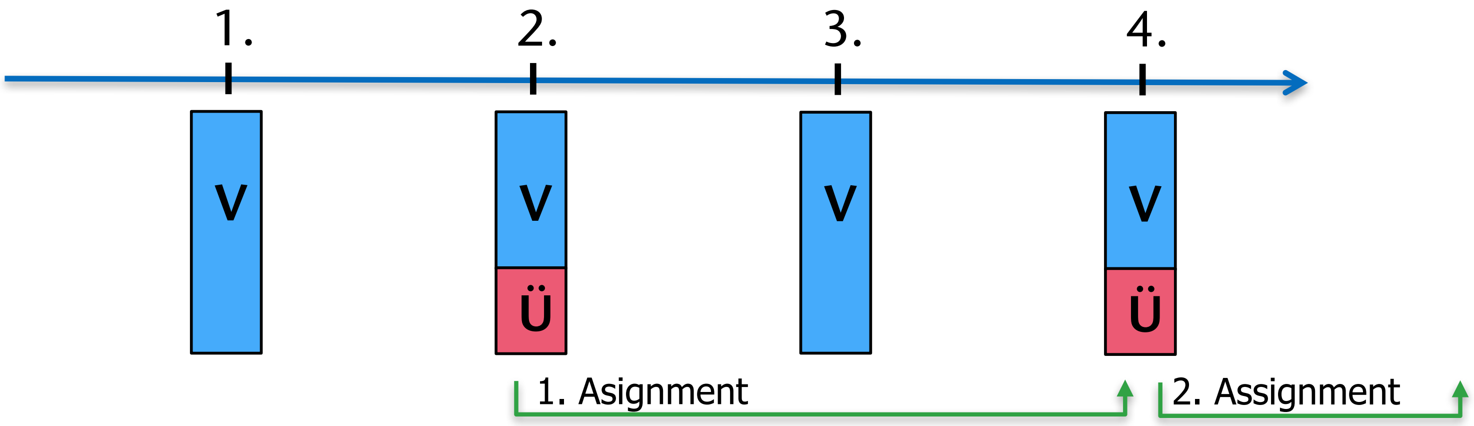
- The course's homepage:

  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!

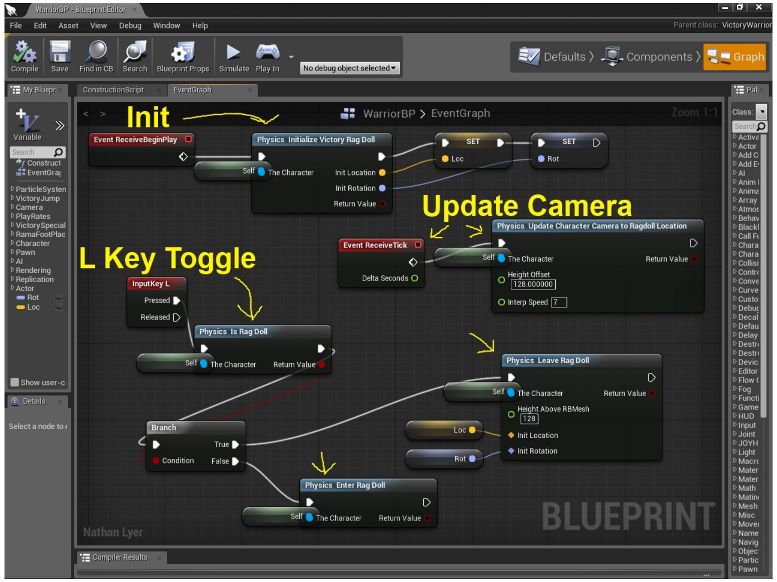
Time of the Class

- Wednesdays: alternatingly
  - Two lectures in one row (8 ct — 12)
  - Then, 1 lecture and 1 lab meting



Exercises

- Mix of theoretical (a few) and practical (mostly) exercises
- Theoretical = pencil & paper
- Practical = Unreal engine
  - Using "blueprints" first
  - Later some C programming
- Unreal engine: version 4.9
  - Download: www.unrealengine.com
  - Tutorials at https://wiki.unrealengine.com/Videos
  - See also the links on the course homepage!
- Recommendation: work in groups of 3-4



The Exam

1. Either: long exam (= ½ hour per student)
2. Or: points from the assignments + short 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 ≥ 4.0 && grade B ≥ 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:
  1. Good (= speaking) variable and function names
  2. Sufficient in-line comments
  3. Documentation of the function and its parameters (in/out, pre-/post-condition, what does the function do, ...)
  4. Functionality (solves assignments? no bugs? ...)

Tentative Overview

1. Introduction, immersion/presence/fidelity
2. Scenegraphs, game engines, VR frameworks
3. Devices
4. Stereo rendering
5. Techniques for real-time rendering
6. Simple 3D interaction: navigation, selection, object manipulation, …
7. Complex 3D interaction: WIM, action-at-a-distance, RDW, ..
8. Collision detection
9. Force feedback
10. Sound rendering
11. Particle systems
12. Spring-mass systems