



Virtual Reality & Physically-Based Simulation Organization



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Helpful Knowledge (But Not Formal Prerequisites)

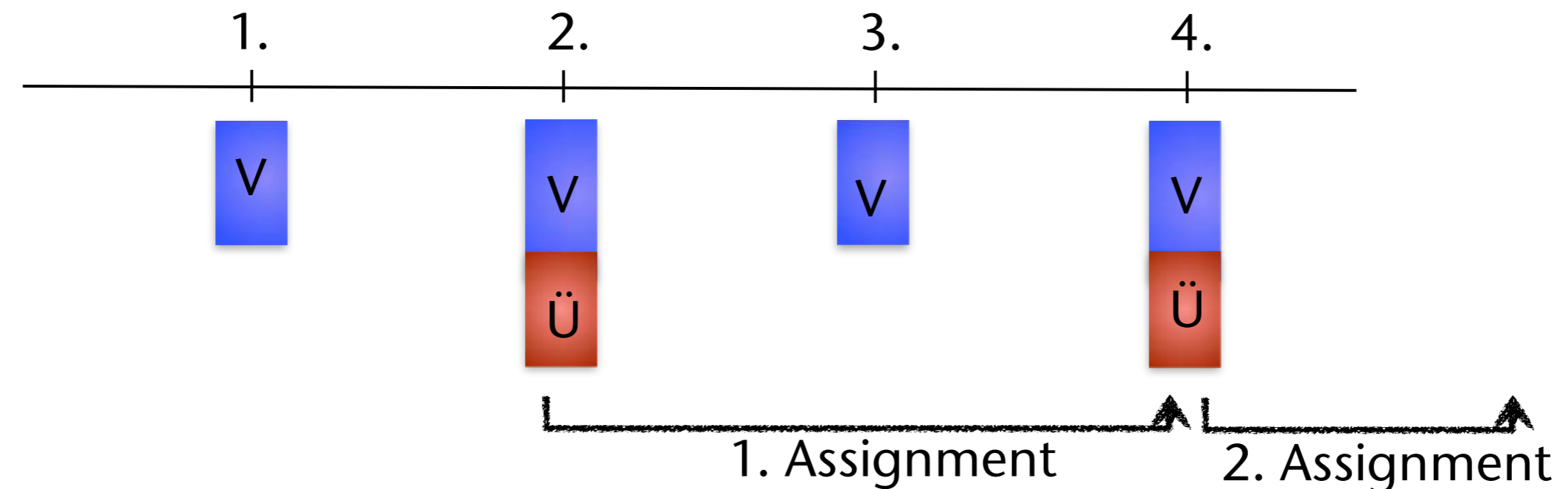
- A little bit of math (just first year)
 - Only needed for the second half
 - A little bit of linear algebra
 - At the end: easy differential equations 😊
- A bit of programming in C/C++, also only towards end of course needed

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!
- Student chat: <https://discord.gg/YGUZFxf> → "Virtual Reality"
 - Note: I am **not** a member of the chat group!

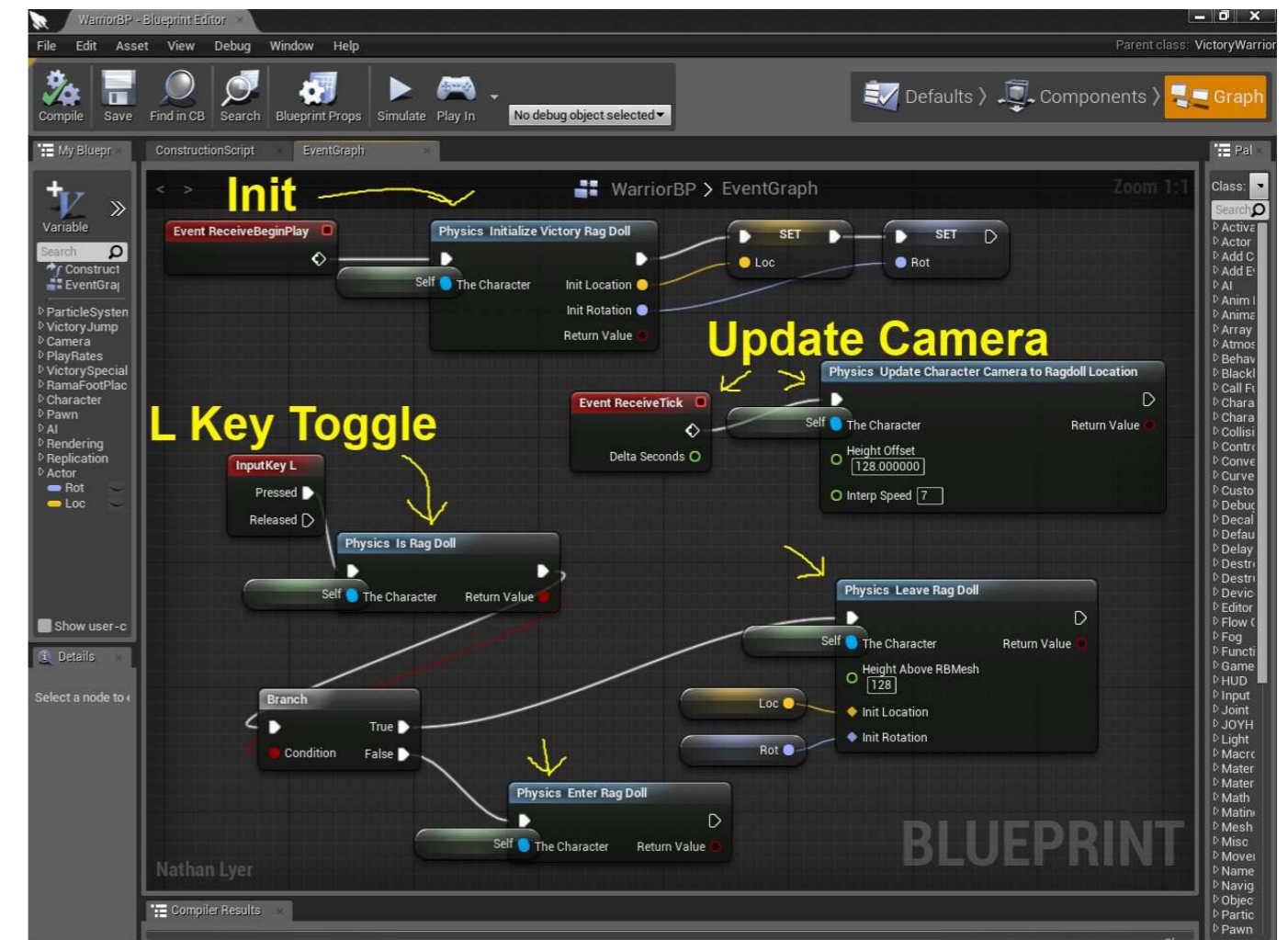
Time of the Class

- Wednesdays: lecture
- Thursdays: alternating, this week: lecture
- Deadline for assignments: when you show your solution to the tutor!
 - Latecomers get 0 points
 - Plagiarism → 0 points and warning



Assignments

- 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.x
 - 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
- If personal hardware insufficient: talk to Sabine Dolhs → sdohls@uni-bremen.de



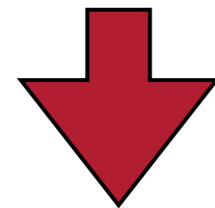
- Either: long oral exam (= ½ hour per student)
- Or: points from the assignments + short oral exam
 - Assignments \longrightarrow grade A , short exam \longrightarrow grade B
 - 95% of the points from all assignments \longrightarrow grade A = 1.0
 - 40% of the points from all assignments \longrightarrow 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? ...)

High-Level Goals of This Course

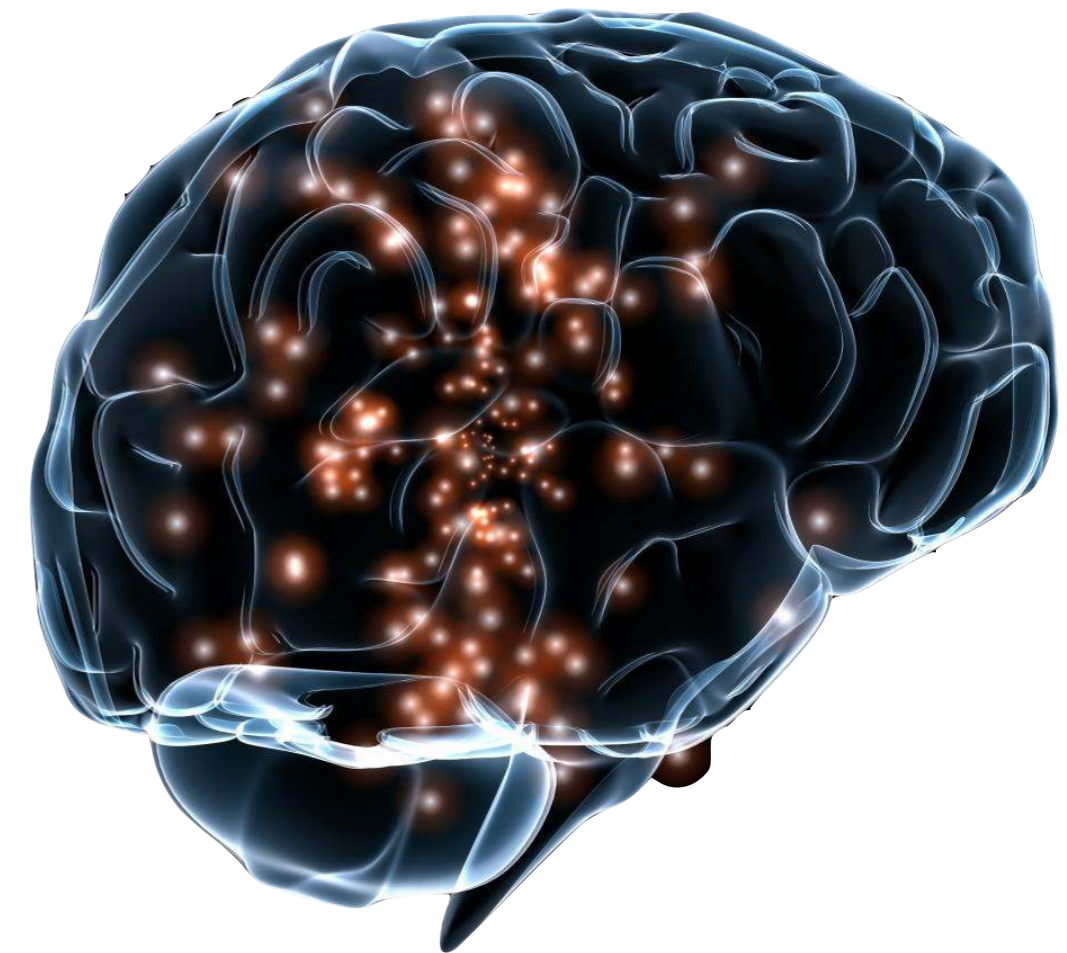
Cognitive Processes

"Enablement"



"Empowerment"

Remember
Understand
Apply
Analyze
Evaluate
Create



Tentative Overview

- Introduction, immersion/presence/fidelity
- Scenegraphs, game engines, VR frameworks
- Devices
- Stereo rendering
- Techniques for real-time rendering
- Simple 3D interaction: navigation, selection, object manipulation, ...
- Complex 3D interaction: WIM, action-at-a-distance, RDW, ..
- Collision detection
- Force feedback
- Sound rendering
- Particle systems
- 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!

Teaching Mode: Inverted

Next Week: First "Assignment Meeting"

- Please come to our VR lab, room MZH 3590 (3rd floor), at 8:30 am on Thursday
- Demo time! → first assignment
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A Few Questions For You

<https://www.menti.com/?????>