

Introduction to Virtual Reality

CS 498VR

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Welcome to CS 498 - Virtual Reality

Instructor: Eric Shaffer

Office: 2209 Siebel Center

Office Hours: Tues 1pm-2pm

Instructor: Dan Cermak

Location: 4107 Siebel Center (VR Lab)

Office Hour: Thurs. 11am-noon

VR Lab - SC4107

20 workstations with Oculus Rift CV1s

6GB RAM

NVidia GeForce Titan Blacks

Dual 27 inch monitors

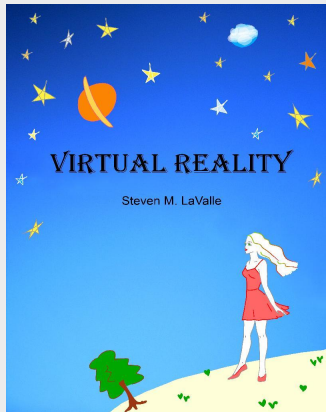
Windows. Unity3d.

Work in pairs on 4 assignments + final project

We are working to upgrade the hardware...hopefully some new stuff this semester



Course Materials



- Webpage:
<https://courses.engr.illinois.edu/cs498vr3/>
- Piazza:
<https://piazza.com/illinois/spring2019/cs498vr>
- Textbook: Virtual Reality, S.M. Lavalle, 2016
(free online)
- VR Lab: Siebel Center 4107

History Lessons: This is the Second Wave of VR



History Lessons: The First Wave



The Sensorama was released in the 1950s...it was a totally mechanical device.



A VPL Research DataSuit, a full-body outfit with sensors for measuring the movement of arms, legs, and trunk. Developed circa 1989. Displayed at the Nissho Iwai showroom in Tokyo

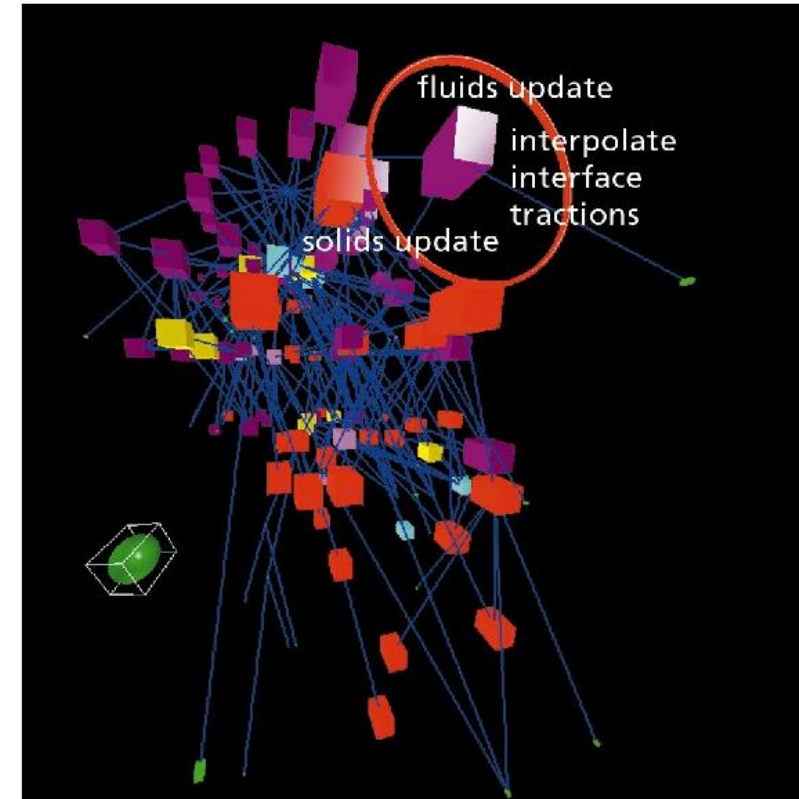
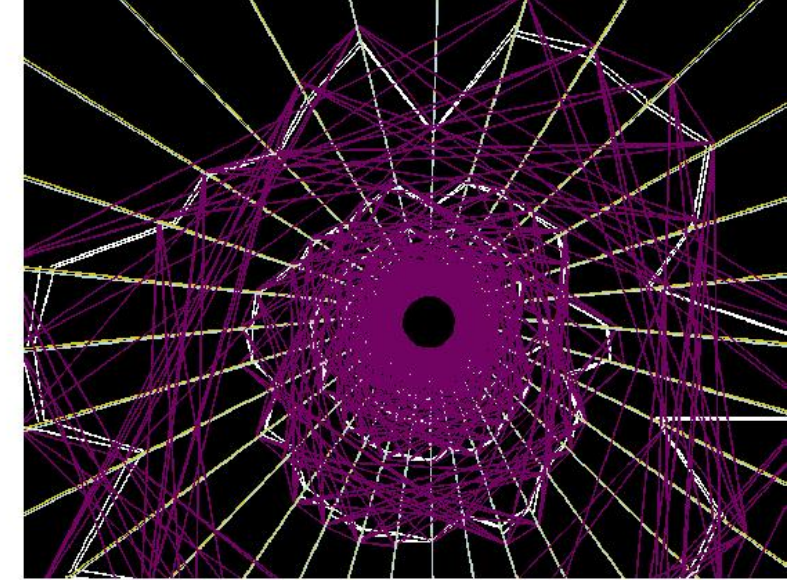
A Little More About Me....

It turns out I actually wrote (part of) of VR-based info vis system in 1999

- **Virtue: Performance visualization of parallel and distributed applications**
E Shaffer, DA Reed, S Whitmore, B Schaeffer
Computer, 44-51

60

1999



A Bit About Oculus



- Early 2012, Palmer Luckey made a prototype headset (duct taped!!)
- Aug 2012, John Carmack improved it and showed at E3
- Aug 2012, Oculus was founded
(Brendan Iribe, Michael Antonov, Nate Mitchell, and Jack McCauley)
- Sept 2012, Kickstarter very successful
- 2012 - 2014, over 60,000 headsets sold
- Mar 2014, Facebook acquires Oculus for \$2 billion

“Prediction is Hard, Especially About the Future” - Niels Bohr

VR Sales Are Tanking, But Is the Market In a Tailspin?

By Joel Hruska on July 31, 2018 at 7:30 am | [92 Comments](#)

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Can anyone suggest some reasons why this might be happening?

- A BIT ABOUT YOU

- Have you tried VR before?
- Do you own a VR headset?
- Do you like rollercoasters?
- Do you get motion sickness?

What is this course about?

Learn how to build a*good* VR experience
Comfortable
Adequate for the task

Learn how VR works (engineering + psychology)

Learn how to criticize VR

Learn fundamentals to shape future of VR

Lecture, 4 MP's, 3 exams, project

What are some examples of
VR/AR tasks?

Exams

Three midterm exams and no final exam

Midterm 1: Feb. 10 - Feb. 12

Optional second chance exam for Midterm 1: Feb. 17 - Feb. 19

Midterm 2: Mar. 10 - Mar. 12

Optional second chance exam for Midterm 2: Mar. 25 Mar. 26

Midterm 3: Apr. 28 - Apr. 30

- Each exam is 50 minutes long and will be held in the CBTF.
- You will need to make a reservation in the [CBTF](#) to take the exam.
- All exams are closed-everything (no book, notes, calculator, etc.).
- See the [CBTF policies](#) for more detail.
- For DRES accommodations see [CBTF DRES Students](#)

Exams will be multiple choice and some fill-in-the-blank.

Little to no coding or code-related questions.

We will post topic lists of what to know on piazza prior to the exams.

Second Chance Exams

- For first two mid-term exams, you can take a second chance exam if you wish.
- **The maximum score you can achieve on the second chance exam is 88%.**
- If your second chance score is N% your final score will be $0.88 \times 0.N \times 100.0$
- Your second chance score will replace your first score, even if it is lower.
- The questions on the second chance exam will cover the same topics as first exam.
May not be identical to the questions on the first exam.
- To take the second chance exam, just make a reservation with CBTF.
You do not need to inform course staff that you are doing so.

Projects

- Projects are worth 40% of the course grade
- Due on the last day of the semester
- They are graded rigorously...
- You will work in teams of 3-5 people
- We will go over the team formation process later in the semester
- You will have a mentor/guide from the course staff
We want your project to be excellent...and will work to help you get there

Dan will provide more details today...and we will provide even more details in the 2 weeks

Definition of VR

Inducing targeted behavior in an organism by using artificial sensory stimulation, while the organism has little or no awareness of the interference

Examples of VR



Mouse in VR Maze

<https://www.youtube.com/watch?v=1DJOTEDBA2c>

VR Applications... Socializing in Virtual Spaces



Open Sim, Second Life, ...



VR Applications... Architecture and Real Estate



Do you wish your home were bigger?

VR Applications...Movies



VR Applications...Virtual Touristing



Pick your favorite street views and have a look around.

VR Applications...Interacting with Robots



Connect omnidirectional cameras to mobile robots, humanoids, quadrotors

VR Applications...Games



Team Fortress 2, Valve Inc.



Virtual amusement park rides!

VR Applications...Experiences




Ever wonder how Louis XVI must have felt?

VR Applications... Body Swapping



First Person Experience of Body Transfer in Virtual Reality

Mel Slater , Bernhard Spanlang, Maria V. Sanchez-Vives, Olaf Blanke

Published: May 12, 2010 • <https://doi.org/10.1371/journal.pone.0010564>

VR Applications...Flying Like in Your Dreams



Zurich University of the Arts

When did VR start? Paintings?



When did VR start?



When did VR start?

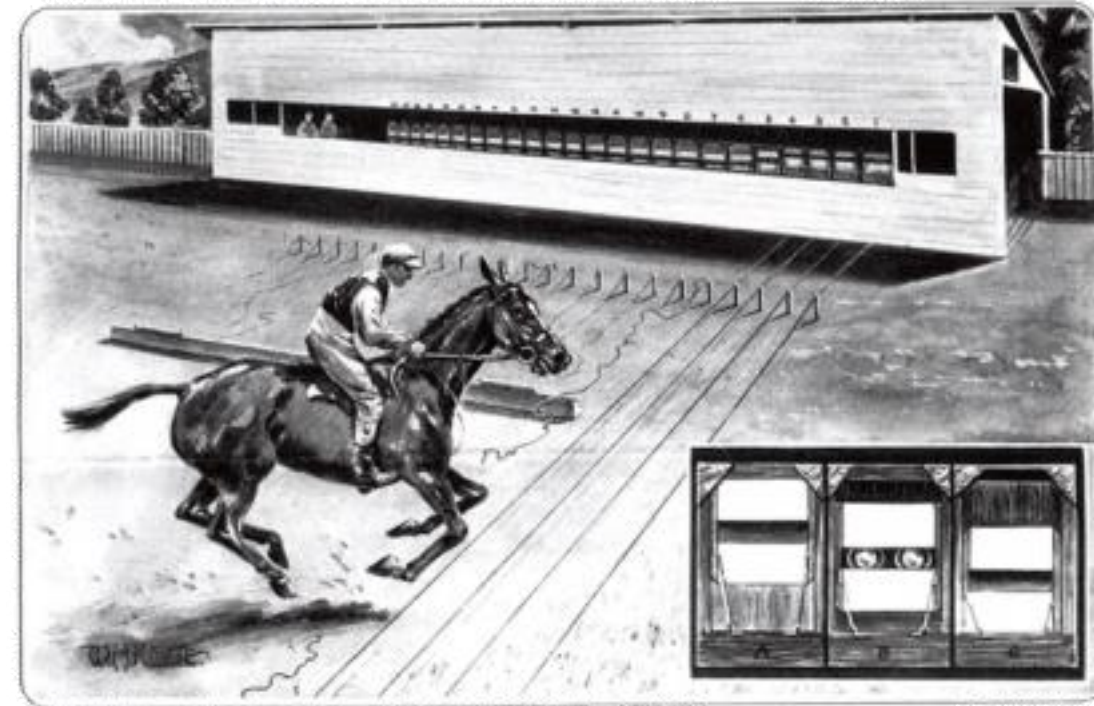
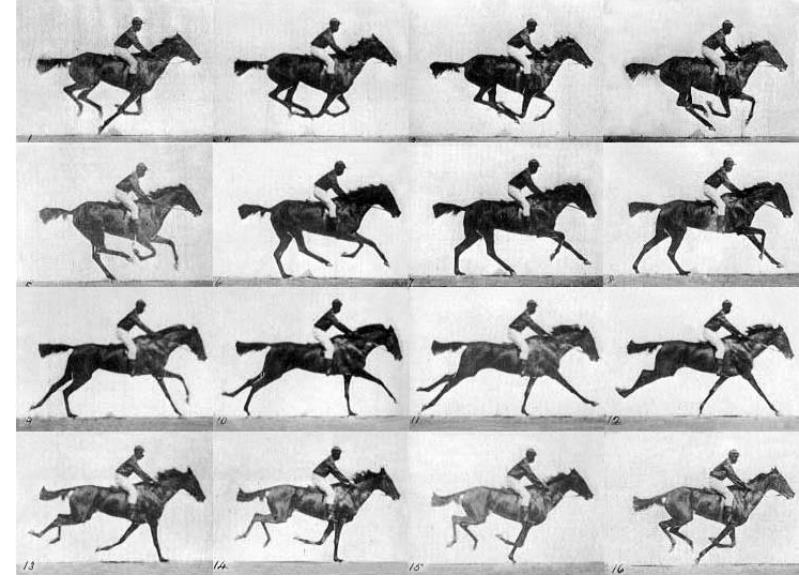


When did VR start?



When did VR start?

Motion pictures?



<https://www.youtube.com/watch?v=IEqccPhsqgA>

1878 Muybridge

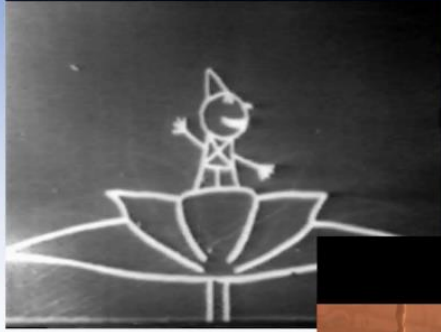
Compare to Modern Cinema...



"Gravity" continuous shot. Opening Scene. Space debris hits Explorer

https://youtube.com/watch?v=vKW-Gd_S_xc

Realism vs Simplicity in Cartoons



Realism vs Lower Cost and Portability



How many FPS are enough?



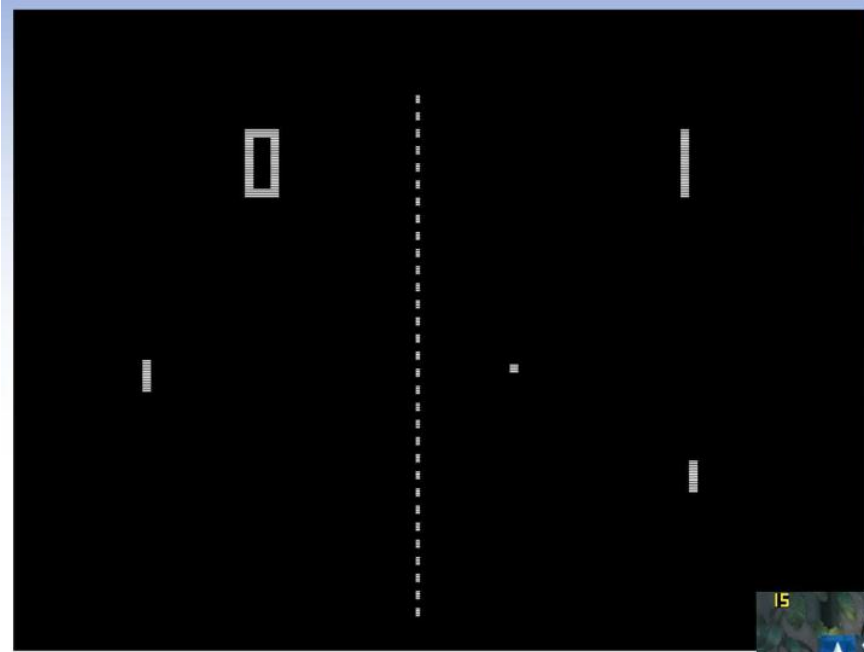
2 Frame Per Second Video! - Part 1

Studies have shown that in practice, any VR setup that generates frame rates below 90 frames per second (FPS) is likely to induce disorientation, nausea, and other negative user effects. The lower the frame rate, the worse the effects. Thus, the goal for VR developers is to target **90 FPS** at all times in their software.

[The Importance of Frame Rates – IrisVR](https://help.irisvr.com/hc/en-us/articles/215884547-The-Importance-of-Frame-Rates)

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Evolution of Computer Games

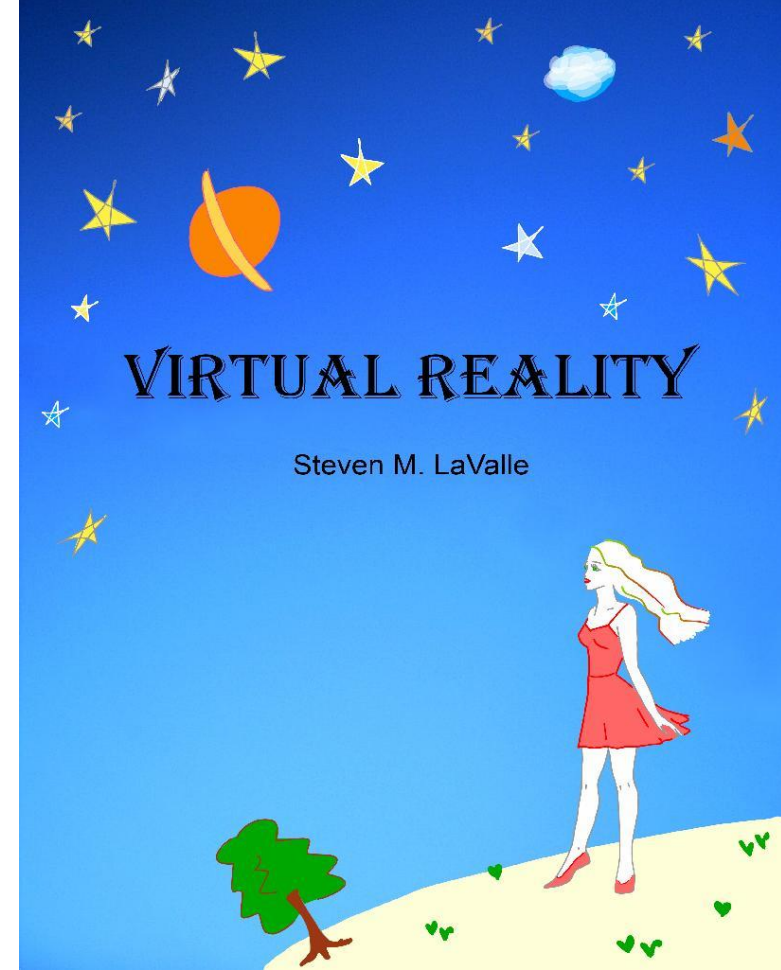


Realism vs Simplicity in Computer Games



Homework

- Chapter 1 of Steve LaValle's VR online book
Definition of VR, modern experiences,
historical perspective.
- Experiment on another student
(not in this course):
The Rubber Hand Illusion



Rubber Hand Illusion

