

# Introduction to Virtual Reality

DOM-E5161, Markku Reunanen & Tapio Takala



# Welcome!

This is the introductory course on Virtual Reality, and a foundation for other related courses (also part of the minor), such as:

- Coding Virtual Worlds
- Designing and Creating Virtual Worlds (not a prerequisite)
- Immersive Sound – this is why we don't cover sound on this course
- Independent Study in VR

First run of the course ever in this form, replaces former *3D User Interface Design*

# Practicalities

Homepage: <https://mycourses.aalto.fi/course/view.php?id=28381>

3 ECTS

80% Attendance and passed exam

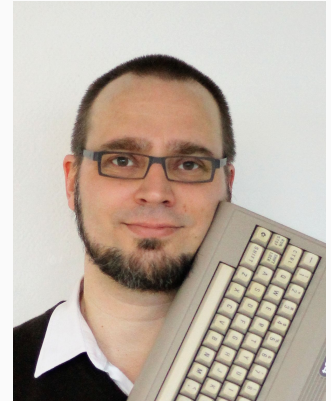
Graded 0–5 based on the exam – *who are in Finland?*

Course book: *Virtual Reality* by Steven M. Lavalle (freely available online)

# Teachers this year

Tapio "Tassu" Takala / Computer Science – short bio

Markku Reunanen / Dept. of Media – short bio likewise



# But what about you?

We're interested in hearing *why you* are taking the course?

("It's obligatory in the minor" not an acceptable answer, even if honest)

What do you expect to do with VR in the future? How does it relate to your studies and interests?

# Topics

The lectures will cover:

- Basic concepts and history
- Display devices and human vision
- Tracking methods
- Interaction in VR
- Augmented Reality
- Navigation in virtual environments

+ Some more in the course book

# Basic terminology

Virtual, Augmented, Mixed, Artificial, Cross Reality (and who knows what else)?



As defined by Milgram, Takemura, Utsumi and Kishino in 1994 in *Augmented Reality: A class of displays on the reality-virtuality continuum*

# Some more terminology

DOF – Degree of Freedom, 6DOF

HMD – Head-Mounted Display

Stereoscopy

Tracking

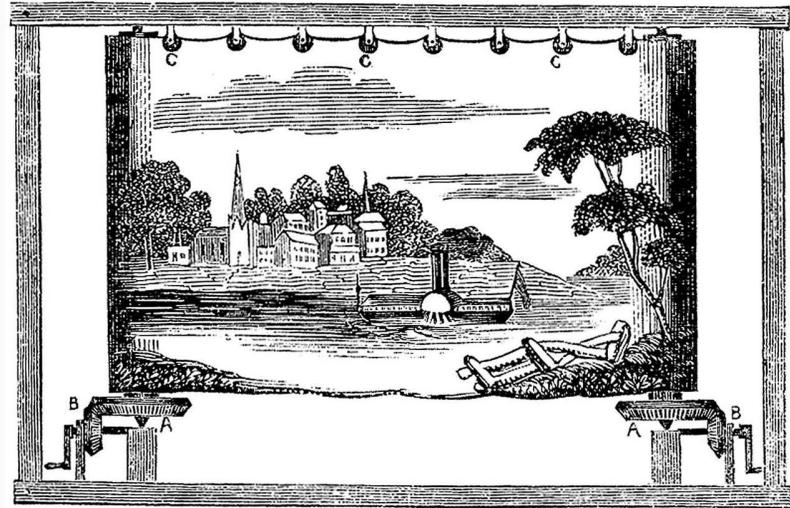
Immersion and presence

Simulator sickness (or cybersickness) – *not* just motion sickness!



# Brief history of virtuality

Stereograms, dioramas and panoramas popular already in the 1900th century



# Flight training simulators

Mechanical and electromechanical devices, one of the firsts uses of VR



# Sensorama (1962)

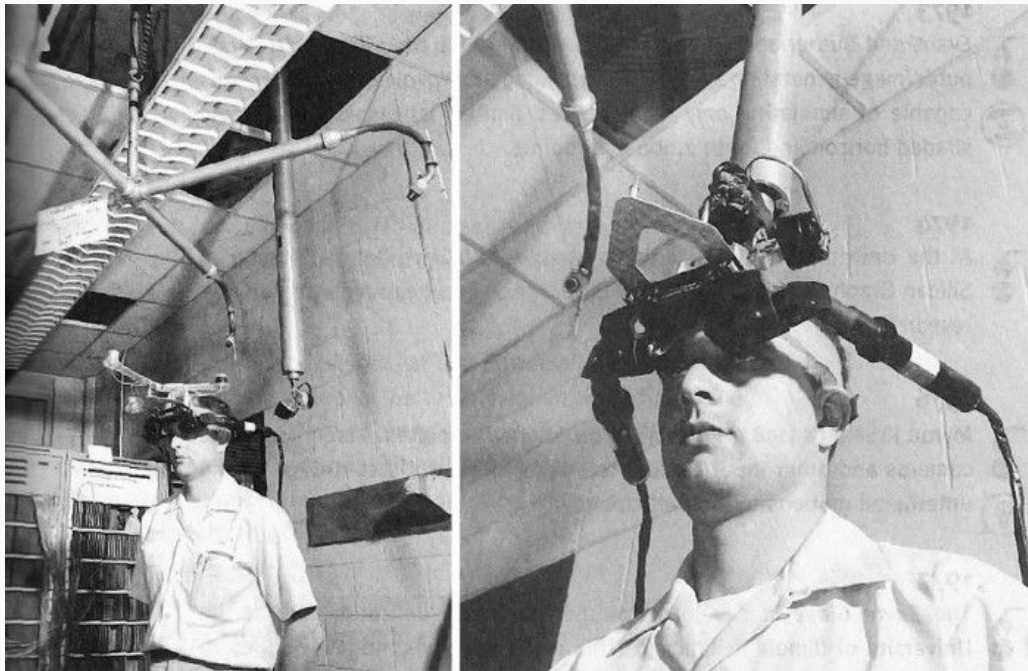
Morton Heilig's multisensory experience

Entertainment unlike military or other training simulators



# The Sword of Damocles (1968)

Ivan Sutherland & team



# Evolving technology

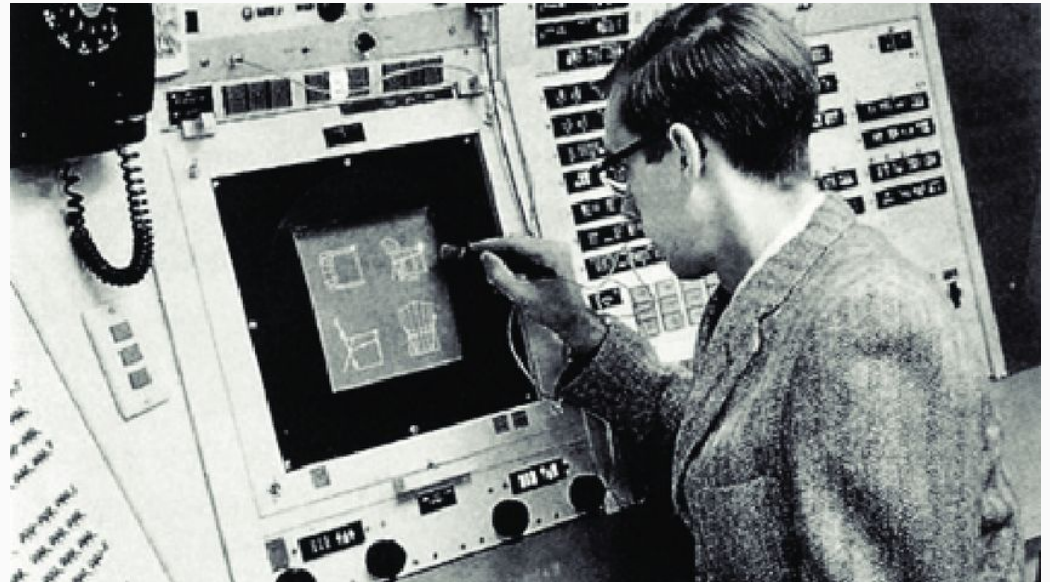
Transistor, 1947

Integrated circuit, 1958

Sketchpad, 1961

Microprocessor, 1971

Microcomputers, 1970s



# 1990s' VR (hype)

Silicon Graphics, CAVE (1992), 3D games and accelerators



# Virtual Reality Markup Language (1995)

Popularity of the WWW

HTML for text, why not VRML for 3D

Solution looking for a problem?

Incomplete and incompatible implementations



# For the masses – or maybe not yet

Nintendo Virtual Boy (1995) and Sega 3D Glasses (1987)





# Toward commodity hardware (2000-)

From expensive servers and workstations to everyday PCs

3dfx Voodoo, Matrox, Nvidia TNT and GeForce, AMD (ATI) Rage and Radeon

Game industry a big commercial driver

Game tools: *Unity* and *Unreal Engine* – "easy" VR authoring software existed before, for example *World Up* and *Quest3D*

Mobile phones get cameras and 3D hardware, notable boost for AR

# The HMD revival

Oculus Rift (2016), HTC Vive (2016), Varjo VR-1 (2019) and many others

Tracked HMD

Controllers and audio

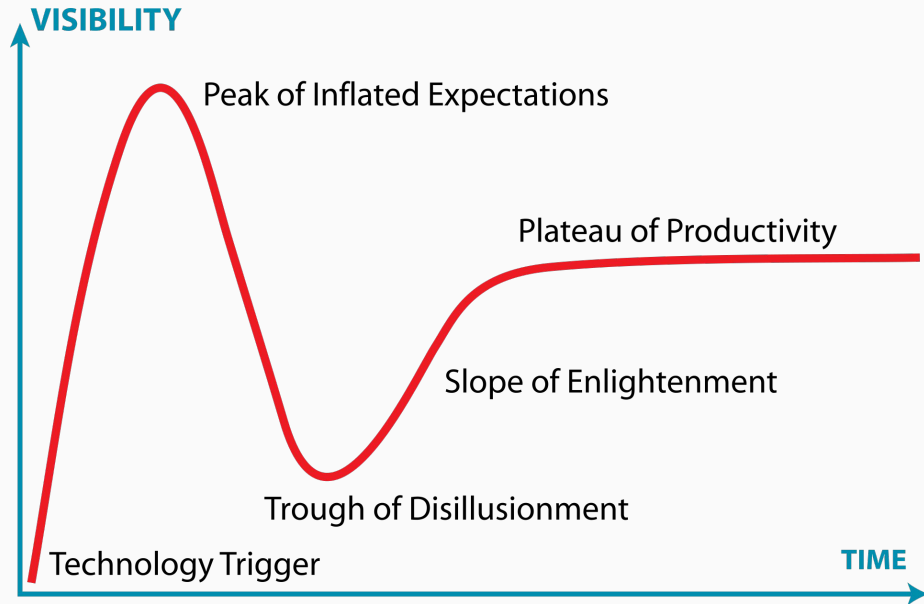
Content? Cost? Feasibility?



# Quo vadis, realitas virtualis?

The Gartner hype curve

Does it match?



# Media representations

Computers, robots, AI, space travel and VR likewise. Science fiction such as books, movies, games and comics

- Reflect hopes and fears of the time
- Introduce new technologies to wider audiences
- Build expectations
- Even steer the future in a new direction



# VR movies

What VR movies have you seen?

Let's make a little list with names, years and IMDb links like this:

The Lawnmower Man (1992), <https://www.imdb.com/title/tt0104692/>

Don't be too picky :)

Once we're done let's discuss how they portray VR and why?

# That's it!

We're done here. Next week: display devices and human vision.