Scuola universitaria professionale della Svizzera italiana
Dipartimento tecnologie innovative
Istituto sistemi informativi e networking

SUPSI

Computer Graphics and Virtual Reality at ISIN

(CG & VR @ISIN)

Achille Peternier, lecturer

“VR will grow 200-fold from 2014 to 2020: worldwide revenue for VR hardware and software is projected to increase from US $108.8 million to $21.8 billion”

IEEE Spectrum, January 2016

Microsoft announces Windows Holographic with HoloLens headset

"We're not talking about putting you into virtual worlds. We're beyond virtual worlds."

By Vlad Savov on January 21, 2015 01:41 pm Email @vladsavov

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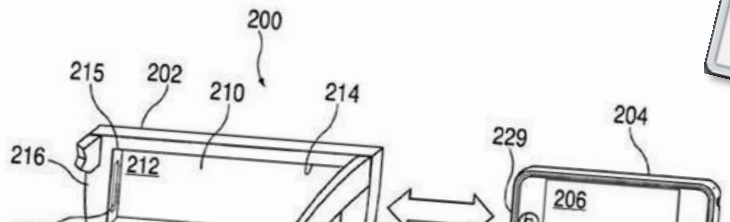
Actualités Vidéos Dossiers

Cupertino

18 février 2015 11:20; Act: 18.02.2015

Apple: vers des lunettes de réalité virtuelle?

La firme de Cupertino a obtenu un brevet qui pourrait être pour lancer un accessoire de réalité virtuelle proche de celu Samsung.



www.theguardian.com/technology/2014/jul/22/facebook-oculus-rift-a

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Facebook closes its $2bn Oculus Rift acquisition. What next?

Social network completes deal announced in March, so what does the future hold virtual reality division?

Definition of Virtual Reality (VR)

- *"VR is composed of an **interactive** computer simulation, which senses the user's state and operation and replaces or augments **sensory feedback** information to **one or more senses** in a way that the user gets a sense of **being immersed** in the simulation (virtual environment)."*

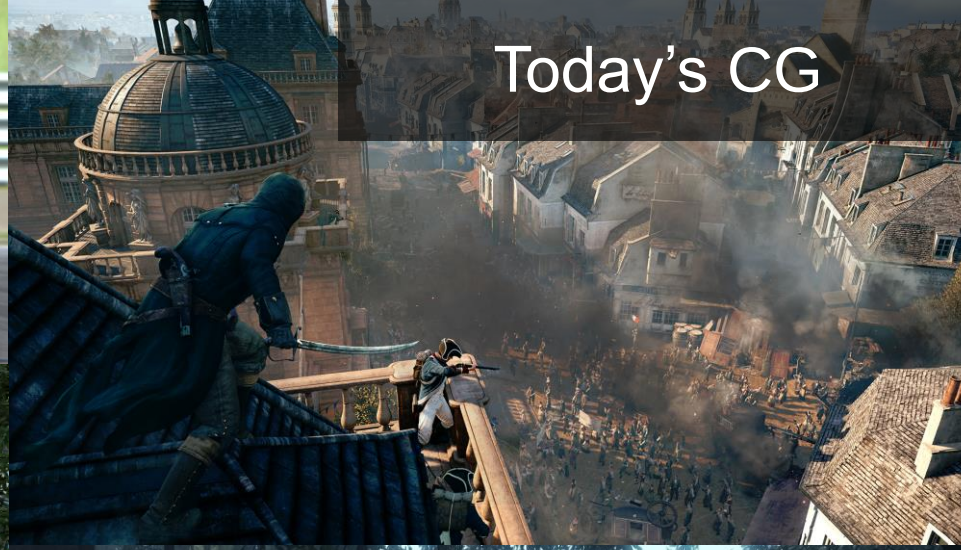
- Four key elements:
  - Virtual environment.
  - Virtual presence.
  - Sensory feedback (as response to user's actions);
    - Mainly (but not limited to) visual feedback.
  - Interactivity.

Sherman W. R. and Craig A. B., Understanding VR, 2003

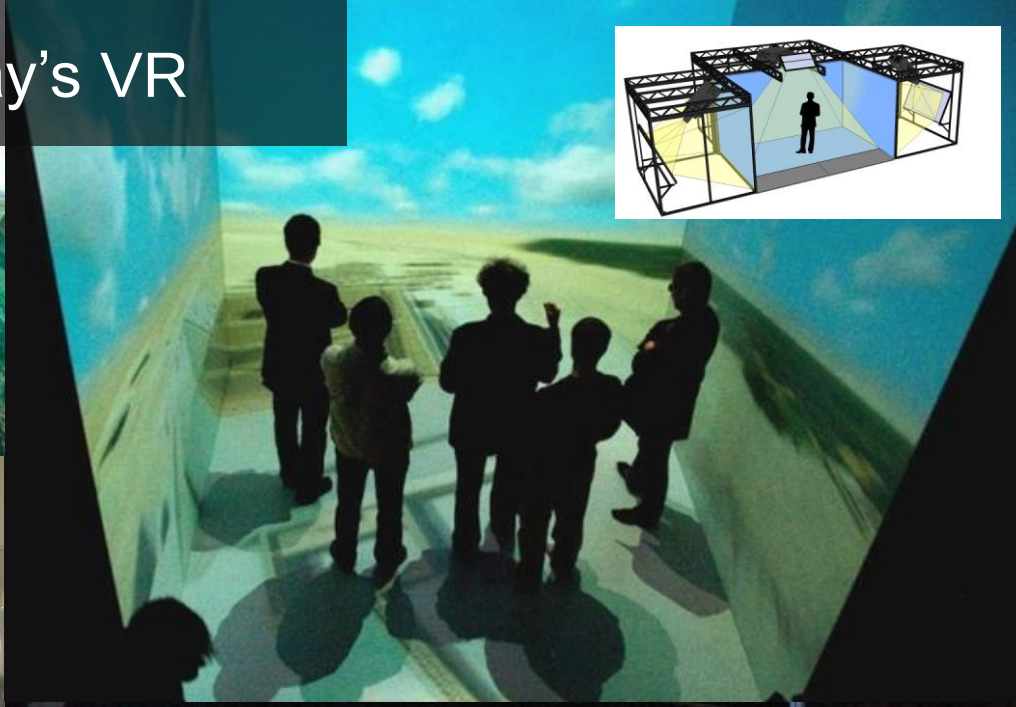
Why today?

- Cost-effective powerful GPUs:
  - e.g., AMD RX 480 for about $300.
- Accurate, low-cost tracking devices:
  - e.g., Microsoft Kinect, Leap Motion.
- Affordable VR-specific devices:
  - Head Mounted Displays for less than $1000.
- Mature software programming frameworks and libraries:
  - e.g., OpenGL, Bullet, OpenVR.

Today's CG



Today's VR



Virtual Reality applications

- A plethora of opportunities:
  - Education
  - Training
  - Entertainment
  - Healthcare
  - Tele-presence
  - Psychological disorder therapy
  - Cultural heritage
  - Modeling
  - Fashion
  - …

Head Mounted Display (HMD)

- Two off-the-shelf models currently available (more coming soon):
  - Oculus Rift, designed for a sitting experience
  - HTC Vive, built for room-sized interaction

Oculus Rift

HTC Vive

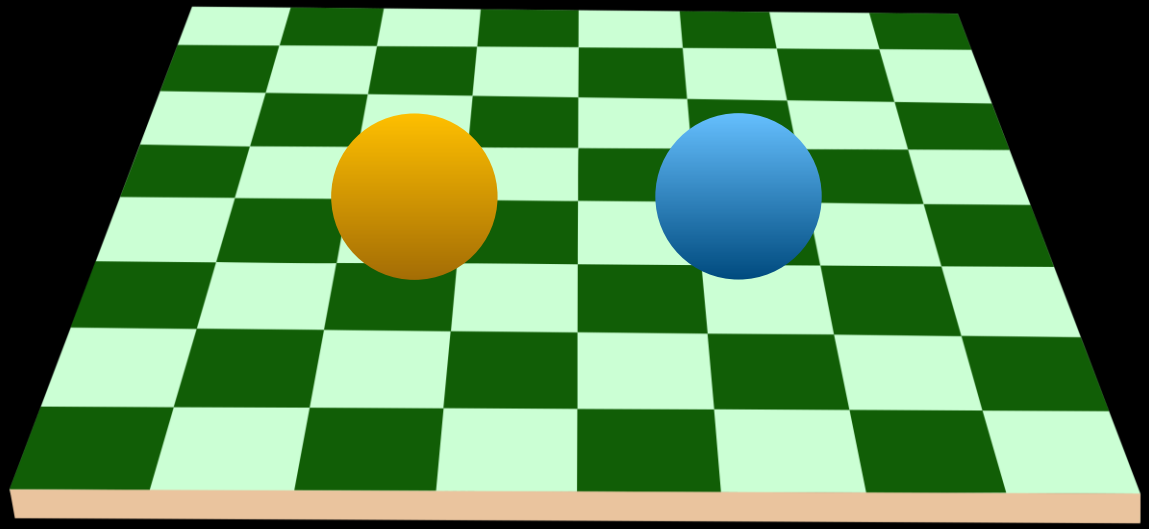
Virtual Reality checklist

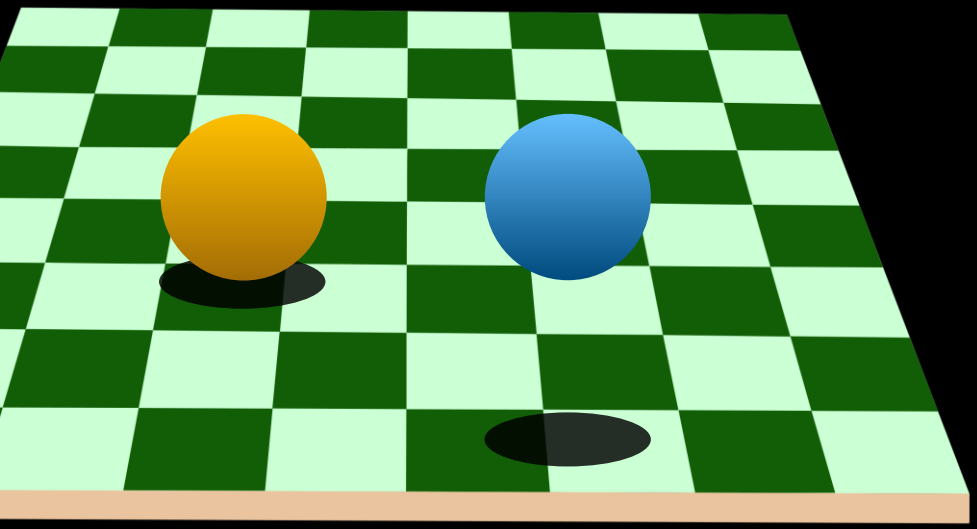
- A typical multisensorial virtual environment requires:
  - …on the hardware side:
    - HMD
    - Powerful PC with modern GPU
    - Audio device (3D headphones at best)
    - A head-tracking system (now integrated in the HMD)
    - An input device or additional body-tracking facilities
  - …on the software side:
    - Real-time 3D graphics engine (typically with support for audio and physics as well)
    - Media content for populating the VE (3D models, textures, animations, audio F/X, etc.)

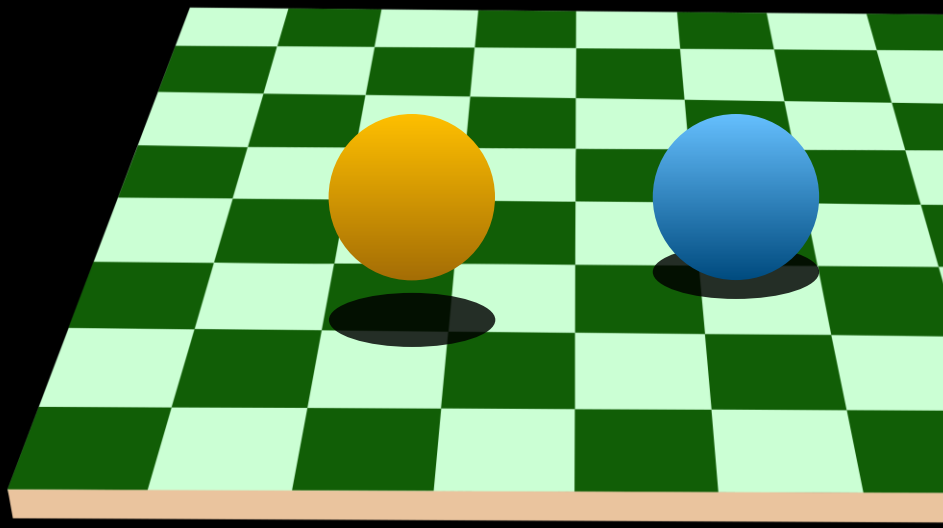
VR@ISIN – OverVision

- In-house, modern and highly-customizable graphics engine:
  - Compact and fast
  - No royalties
  - Gradual learning curve
  - VR-ready
    - OpenVR-compatible
    - **Multiscreen support**
  - Built on top of OpenGL 4+
  - **Dynamic lighting and shadowing**
  - Forward and deferred rendering
  - **Custom plugins for 3D Studio**
  - Support for animations
  - Etc…

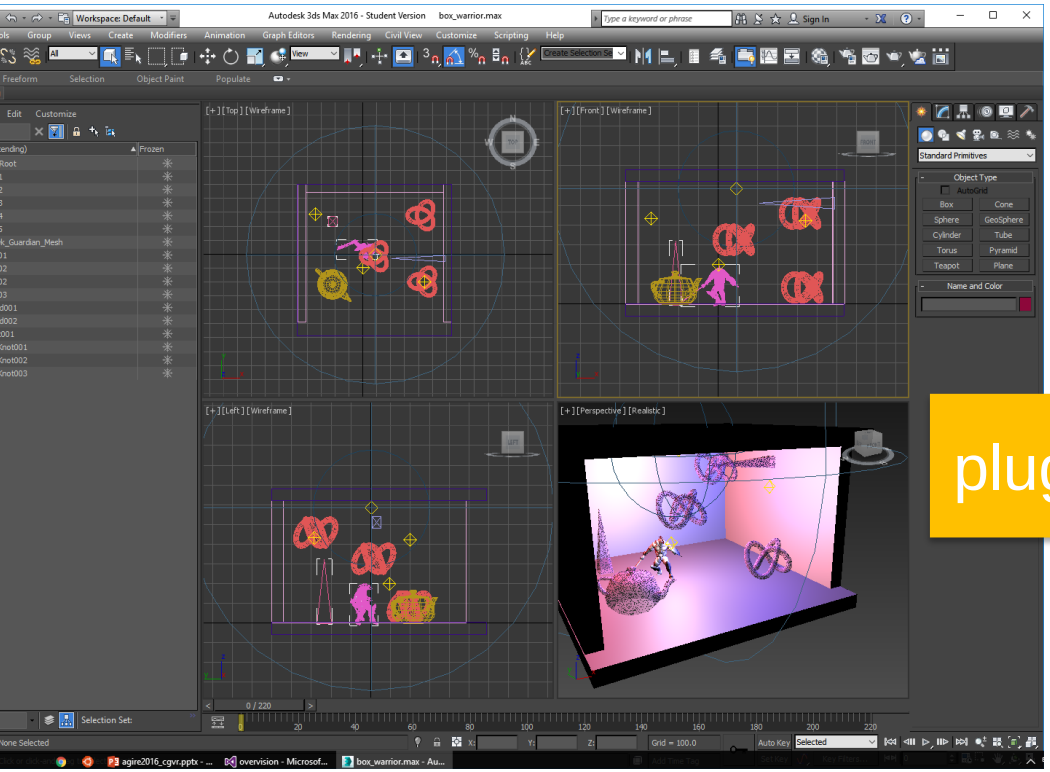
Dynamic lighting and shadowing are important!



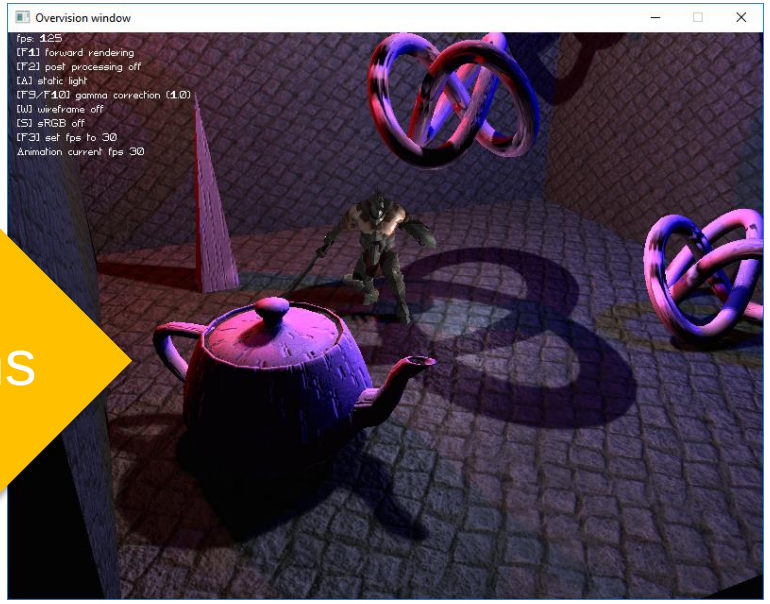




VR@ISIN – OverVision content management



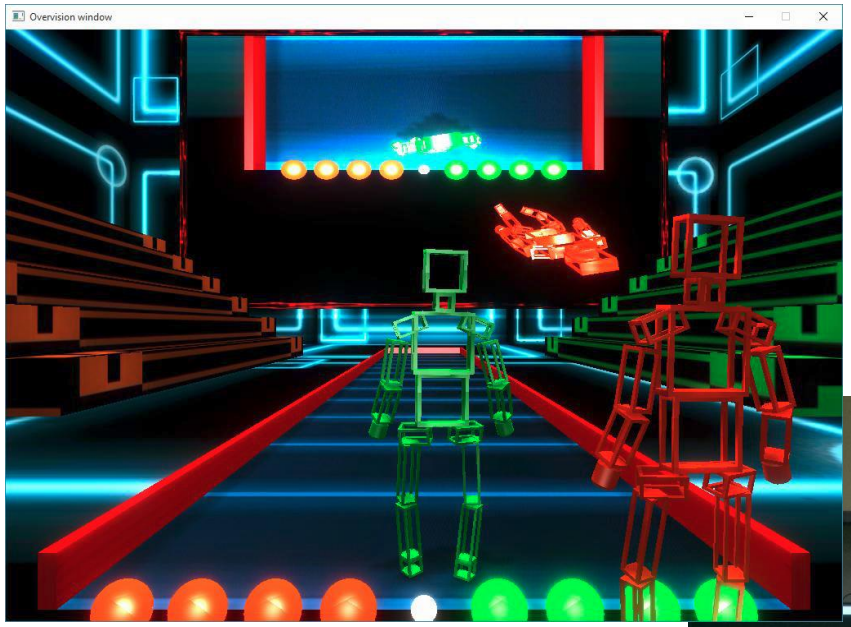
plugins



AUTODESK 3DS MAX

OverVision v0.2

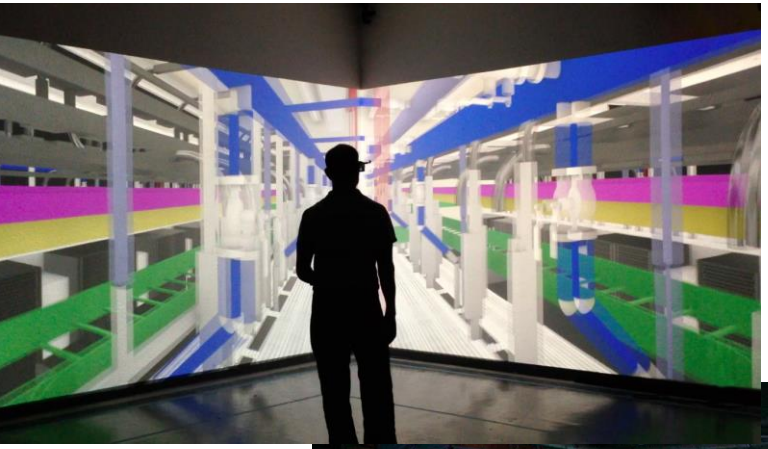
VR@ISIN – large displays, CAVEs



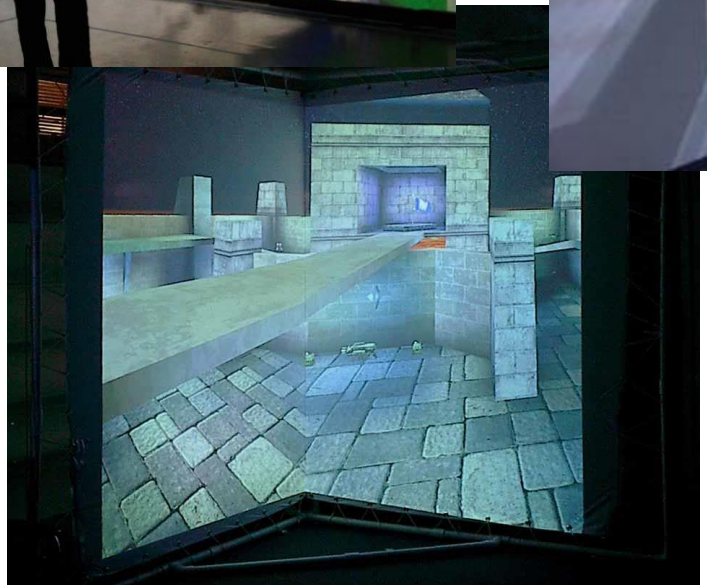
M. Paoliello, A. Peternier, Kbowl, 2016

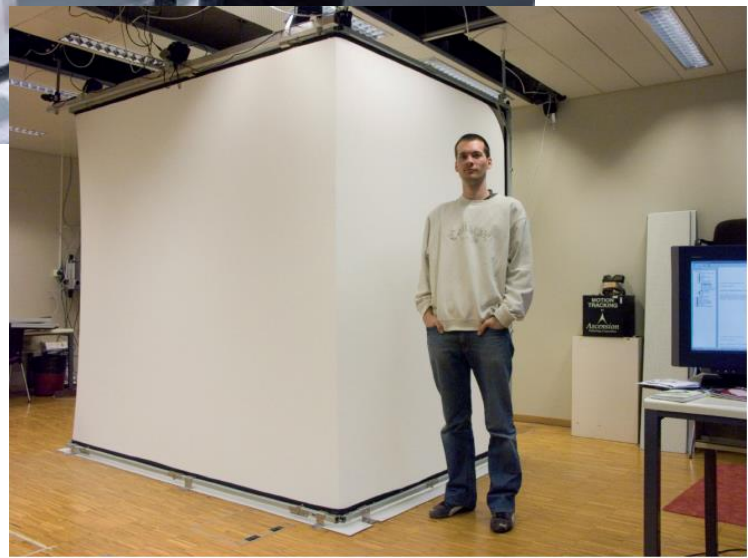
VR@ISIN – large displays, CAVEs

Low-cost CAVEs

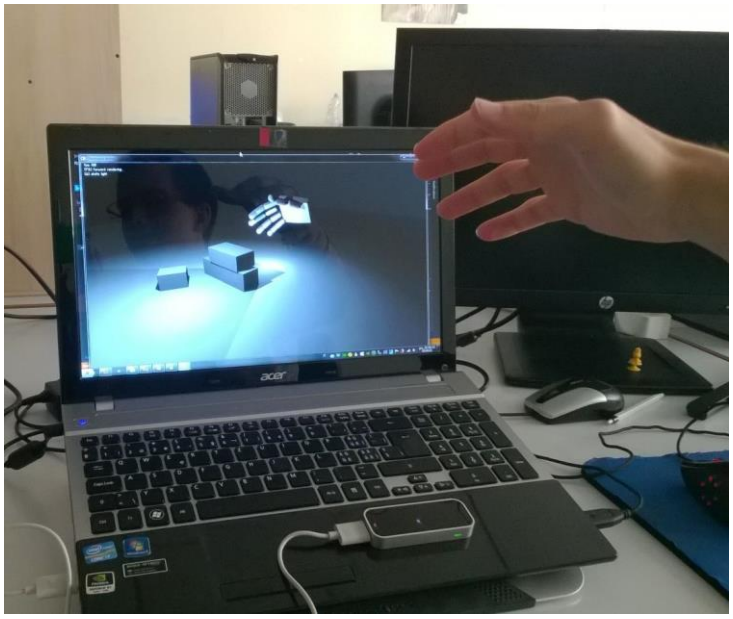


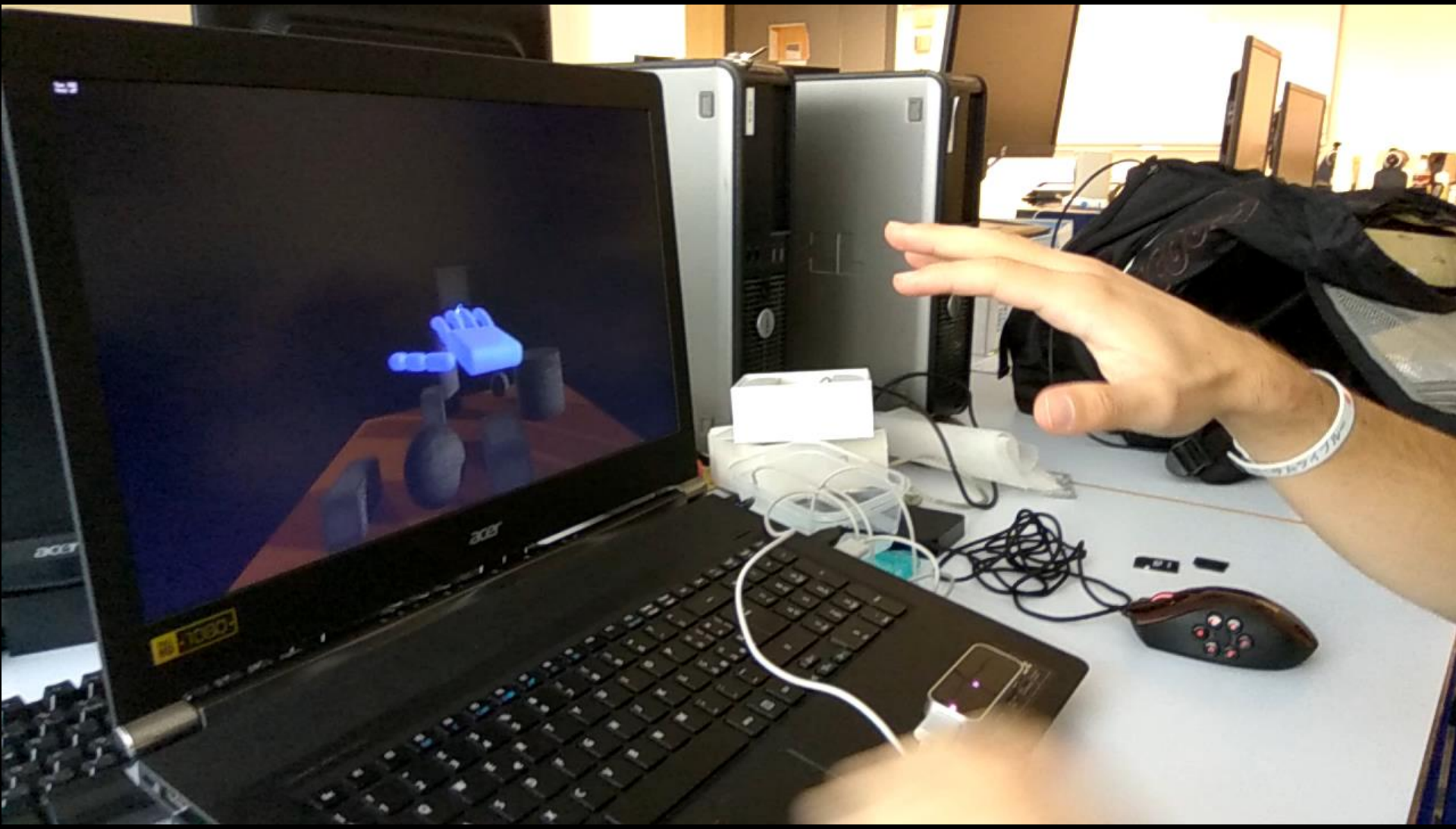
V-CAVEs





VR@ISIN – interaction

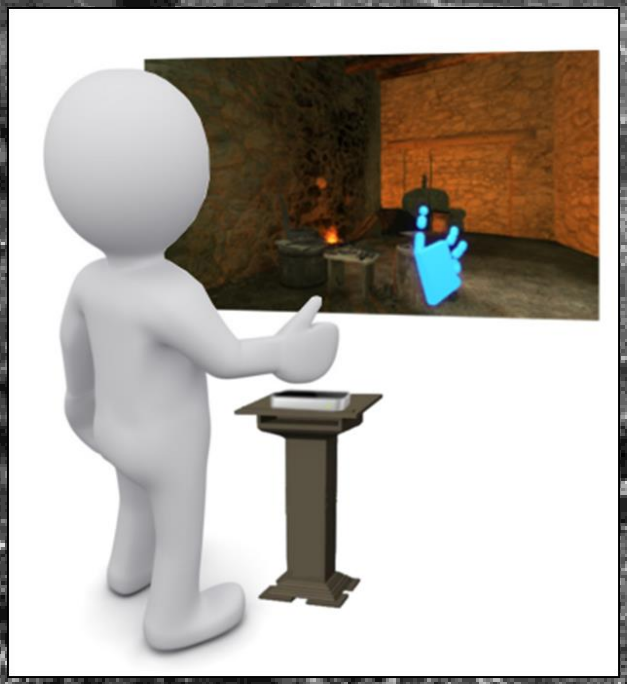




M. Paoliello, A. Peternier, Holodeck, ongoing

VR@ISIN – Virtual Antiquarium

In collaboration with:
ARAM
Ente Turistico Mendrisiotto e Basso Ceresio



M. Paoliello, A. Peternier, Virtual Antiquarium, 2015

CG and VR software engineering @SUPSI

- We are building the next generation of CG and VR software engineers:
  - For bachelor students:
    - Computer Graphics (1 semester, 6h per week, mandatory)
    - Virtual Reality (1 semester, 4h per week, optional)
    - Gaming (1 semester, 4h per week, optional)
    - Diploma projects (3 months, mandatory)
  - For master students:
    - Personalized and topic-driven programs
  - For professionals:
    - 3D Media and Gaming (CAS, 2 semesters)

Thanks!

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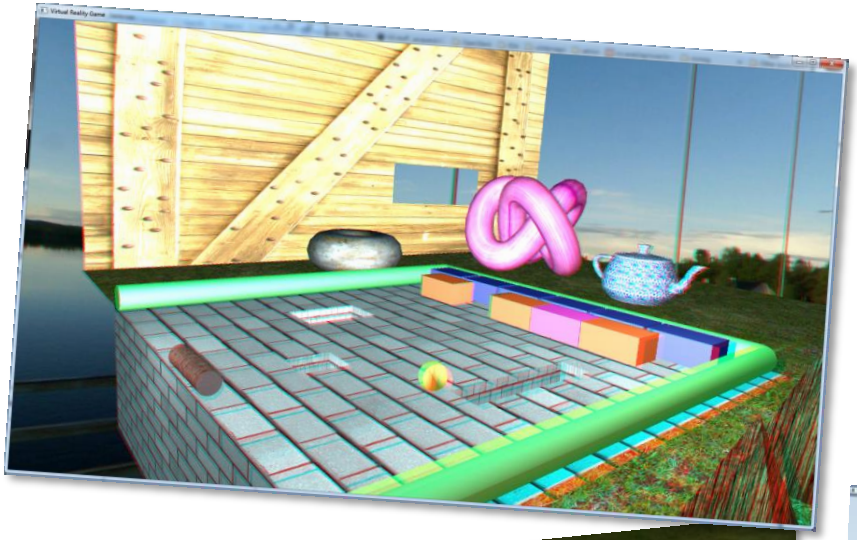
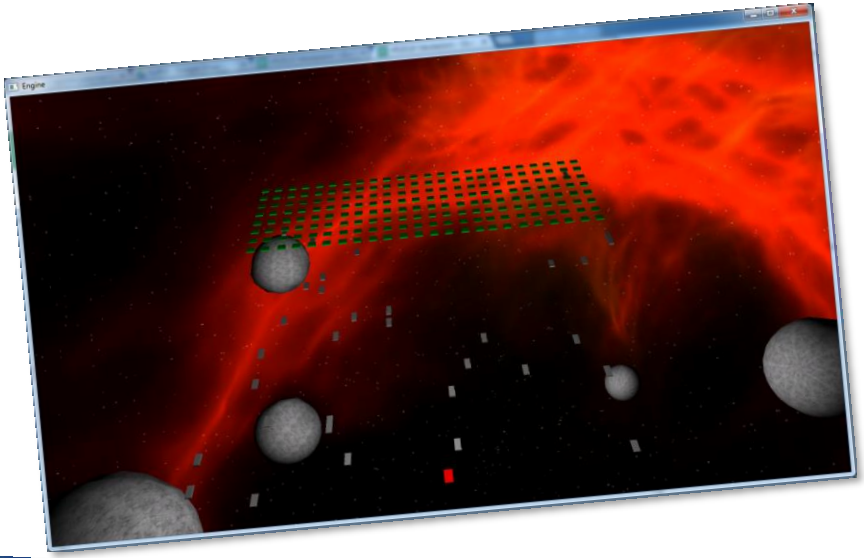
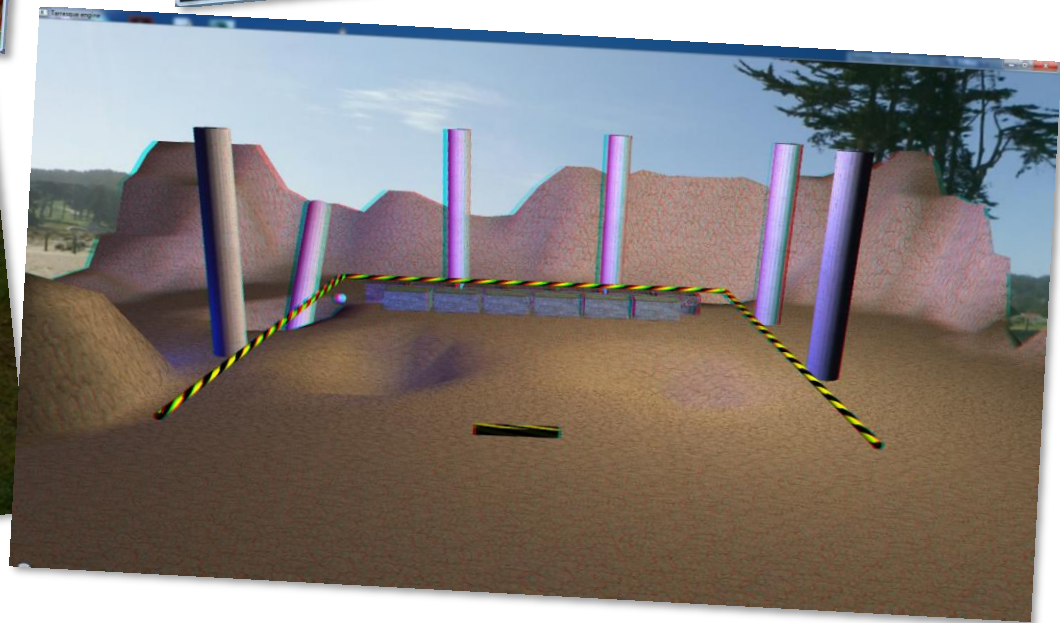
- www.peternier.com

M. Paoliello, A. Peternier, Kbowl, 2016

VR revival

then…

…now

CG and VR student projects