



Leibniz Supercomputing Centre
of the Bavarian Academy of Sciences and Humanities



V2C – The Virtual Reality and Visualisation Centre
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- What is virtual reality?
 - Technology
 - User-centred
 - Real-time interactive
 - Typically stereoscopic display
 - Immersion
 - Covers all senses, not restricted to visual perception

- Application areas
 - Psychology, training, ergonomic studies, industrial design, product presentation, vehicle simulations, architecture, archaeology, art and design ...

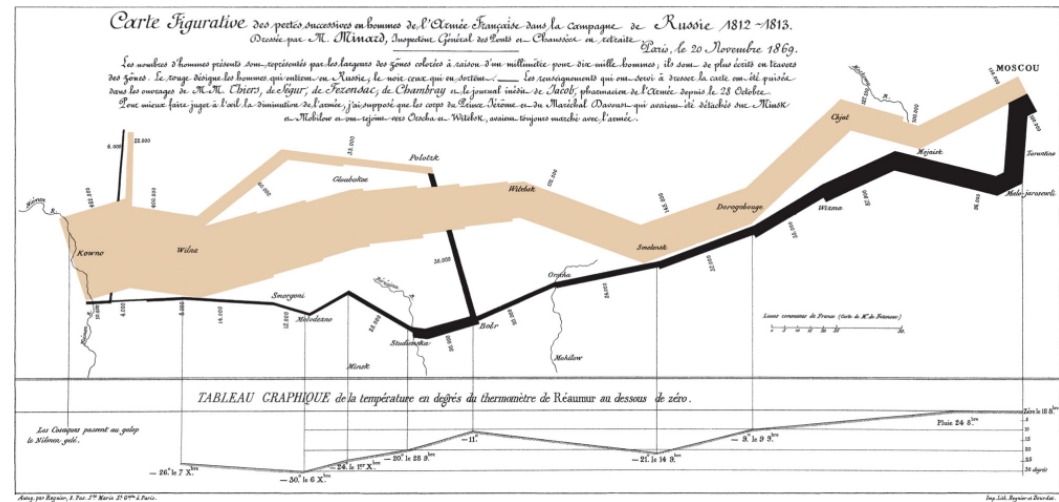
- What is visualisation?
 - Display and emphasise of significant features
 - Understanding (big) datasets and their attributes / relations
 - Separated into 2 big areas
 - Scientific visualisation
 - Information visualisation

- Application areas
 - Medicine, astrophysics, chemistry, mechanical design, computational fluid dynamics, geo sciences, bio sciences, financial data ...

- Measured or simulated data with spatial dimension
- Navigation is typically object centred
- Segmentation and quantitative measurements inside of datasets possible
- Typically volume or iso-surface rendering
- High amount of polygons or voxels
- In combination with stereoscopic display good recognition and understanding of spatial structures



- Abstract data which should be made understandable for the user in an intuitive way
- No spatial dimensions
- Challenging because content and relations (at least partially) have to be understood
- Transfer of data attributes on visual attributes
- Often explorative examination of data sets desired to recognise patterns





Virtual Reality and Visualisation Centre (V2C)



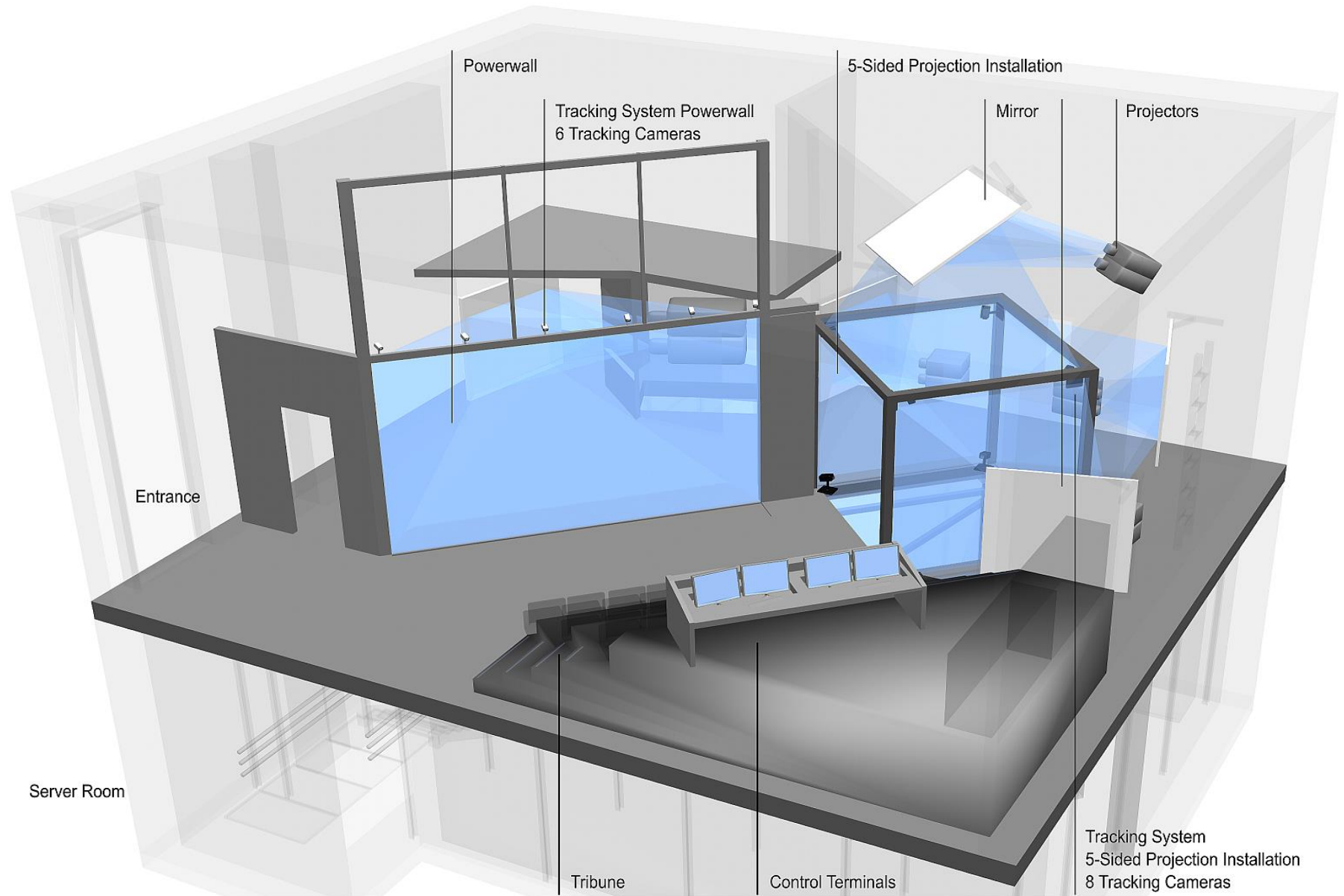


Virtual Reality and Visualisation Centre (V2C)

- Installations at V2C
 - 5-sided projection installation (CAVE-like)
 - Powerwall
- V2C dimensions
 - 12x12x11 meters
- 21 seats
- Established 2012
- Further installations
 - Holobench
 - Mobile stereo projection system



Virtual Reality and Visualisation Centre (V2C)



- Projection
 - 2x 4k Sony projectors
 - 4096 x 2160 resolution
 - 21.000 ANSI Lumen brightness per projector
 - 6 x 3,15 m screen area
 - Passive circular stereo projection
- Position tracking
 - ART ARTtrack2 (6 cameras)
- Compute system
 - SGI Altix UV10
 - 2x Nvidia QuadroPlex 7000



V2C – Powerwall

■ Use cases

- Presentations
- Data discussions
- Data analysis (limited due to averaged viewpoint)

■ Caveats

- Multi-display system synchronised via the OS
- Ideally the application is capable of running on cluster
- Tearing



V2C – 5-sided Projection Installation – Specs

■ Projection

- 10x CHRISTIE DLP 3-chip Simulation Mirage WU-3
- 1920 x 1200 resolution
- 3.000 ANSI Lumen brightness per projector
- 5x 2,70 x 2,70 m screen area
- Active stereo projection

■ Position tracking

- ART TrackPack4 (8 cameras)

■ Compute system

- SGI Altix XE500 cluster with 12 nodes
- 12x Nvidia Quadro 6000



V2C – 5-sided Projection Installation

■ Use cases

- Virtual environments
- Data analysis
- Presentations (limited amount of users due to perspective)

■ Caveats

- Real-time constraint is crucial (60 f/s)
- Development on a cluster
- Dynamics in dataset can lead to problems

■ Displays

- Oculus Rift DK1
- Oculus Rift DK2
- Mobile system (passive circular projection)
- Acer 3D desktop display
- Novint Falcon

■ Input

- Razer Hydras
- Kinects
- Wii Balance Boards
- Wiimotes



Services

- Research
 - Teaching
 - European projects
 - Project acquisition
 - Application development
 - Workshops and events
 - Data presentations
 - Tours
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- European Projects
 - Currently involved in IAPP
 - Application in two other projects
- Variety of projects with universities
 - TUM/LMU/UniBW
- International cooperations
 - UC Berkeley, US
 - University of Tokyo, JP
 - University of Salford, UK
 - Johannes Kepler University, AT
 - UfG, Linz, AT

- Libraries
 - OpenSG (Win/Linux)
 - Equalizer (Win/Linux)
 - VTK (Linux)
- Virtual Environments
 - RTT Deltagen (Win)
- Visualisation
 - Amira (Win/Linux)
 - Covise (Linux)
 - Dristhi (Win)
 - Paraview (Win)
 - Visit (Win)



Constraints

- Data sizes and data types
- Reservation in advance ideally a month ahead
- Do not underestimate effort of data polishing
- Importance of real-time display
- Content has to be adapted to the display and the technology
- Knowledge of real-time 3D modelling is helpful
- Knowledge of programming in domain of CG helpful
- Porting of visualisation can be cumbersome
- Perceptual aspects have to be considered

■ Courses

- Virtual Reality SS at LMU/TUM (6 ECTS)
- Mixed Reality SS at JKU, Linz, AT (3 ECTS)

■ Theses and practicals

- Practicals
- Bachelor Theses (2 p.a.)
- Master Theses (1 p.a.)

- Could be also oriented to an application area to support users

- In the past 2 years
 - 1 Journal article
 - 6 InProceedings (including poster, demo descriptions)
 - Many contributions in general science communications

- Participation in renowned conferences like
 - ACM ISMAR
 - ACM CHI
 - ACM VRST
 - IEEE InfoVis

“The purpose of computing is insight, not numbers.”

– Richard Hamming - Numerical Methods for Scientists and Engineers (1962)

“The purpose of visualization is insight, not pictures.”

– Ben Shneiderman - Readings in Information Visualization: Using Vision to Think (1999)