

Virtual Reality for Belle II

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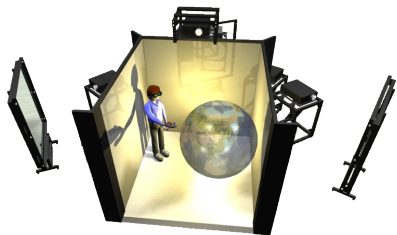
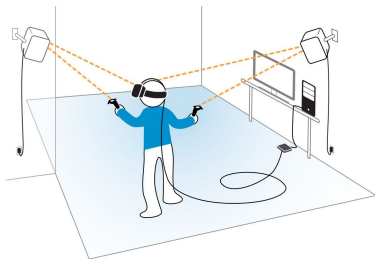


Federal Ministry
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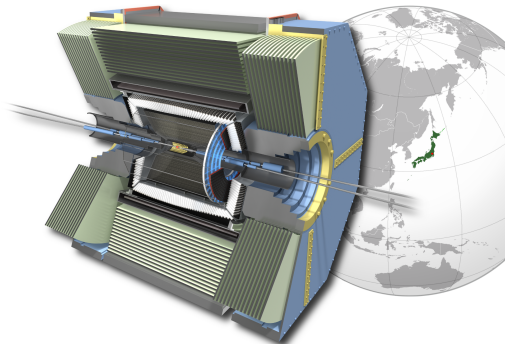
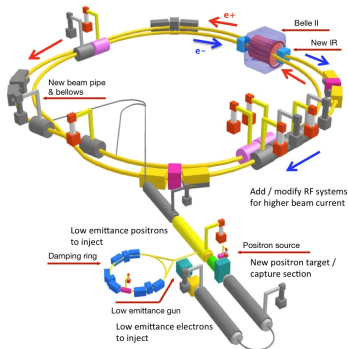


Virtual reality (VR) is a computer-generated scenario that simulates an immersive environment.



SuperKEKB

- $e^+ e^-$ collider at KEK, Japan
- (mainly) operates at $\Upsilon(4S)$ resonance
 \Rightarrow produces B meson pairs
- design luminosity of $8 \times 10^{35} \text{ cm}^{-2} \text{ s}^{-1}$
 (40x the current world record)
- first collisions (planned) this year



Belle II

- precise measurement of CP violation and indirect searches for new physics
- asymmetric detector design
- high particle identification efficiency
- precise momentum resolution

- Modified existing **Belle II VR software** (originally created by Virginia Tech)
 - ⇒ focused on outreach

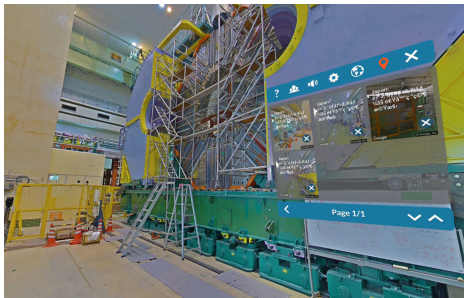
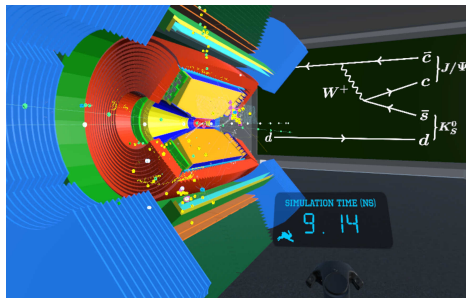
- Used VisoPlaces software
 - ⇒ provides Google Street View support

- Developed GRETCHEN
 - ⇒ VR application for Cave Environments



Belle II VR “Munich edition”

- adapted original Belle II VR
 - ⇒ put emphasis on outreach
 - ⇒ modified some mechanics
 - ⇒ added Feynman diagrams
 - ⇒ included HTC Vive support



VisoPlaces

- external software
- brings Google Street View to HMDs
- originally developed for the Rift
- however, no Rift support anymore (shifted to GearVR instead)
 - ⇒ minor modifications needed

⇔ Street View now part of **Google Earth VR**

- annual event on the Garching campus
- with $> 10,000$ visitors in 2017
- different research areas present their work
- also Belle II participates 🍀

Das Belle II Experiment

Das Belle II Detektor

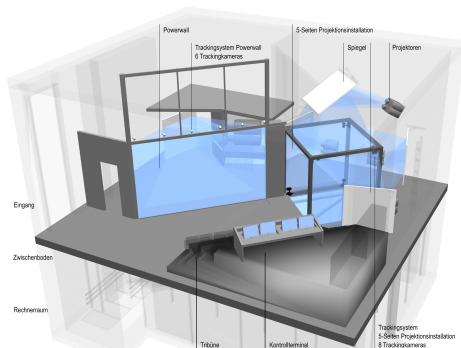
Das SuperKEKB Beschleuniger

Was werden wir damit untersuchen?



pictures taken from BYOPD

- Cave is the acronym for **Cave Automatic Virtual Environment**
- immersive VR environment where projectors are directed to up to six walls of a room-sized cube
- often made up of rear-projection screens
- 3D (shutter) glasses create impression of stereoscopic depth



Leibniz Supercomputing Centre
of the Bavarian Academy of Sciences and Humanities



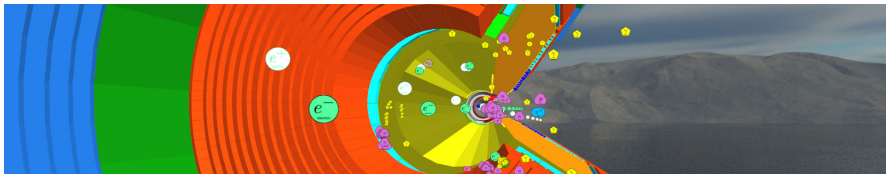
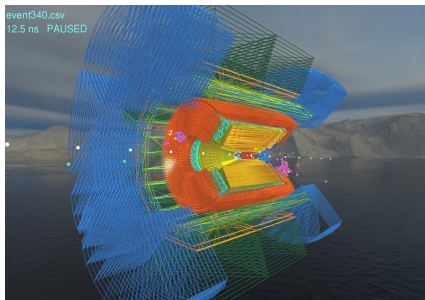
- The Cave at LRZ:
 - cluster of 12 nodes (10 render & and 2 server nodes)
 - five 2.7m x 2.7m walls with two 1080p active stereo projectors each
 - head & controller tracking

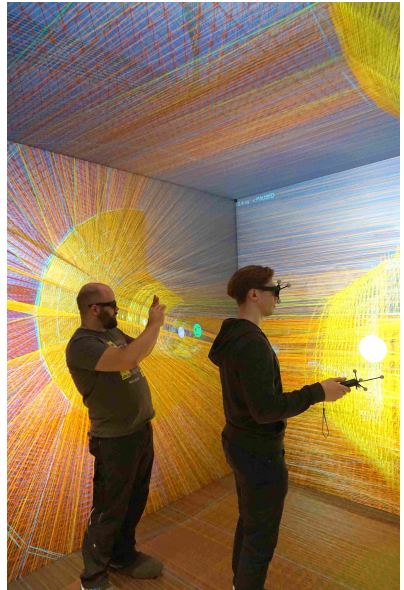
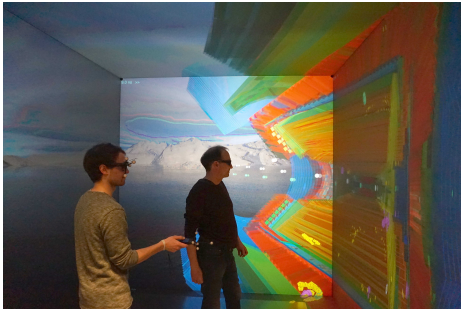
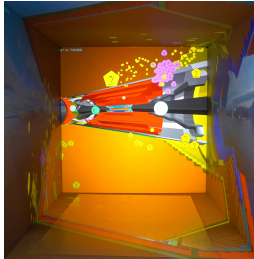


GRETCHEN

(Graphical Education Tool (for) Cave (h) Environments)

- simple event display for educational purposes in Cave environments
- written in OpenGL
- reuses some resources from Belle II VR (⇒ e.g. same event files)
- detector can be moved and rotated freely
- particles translate according to simulation





Conclusion & Outlook

- multiple VR activities at LMU's Belle II group
- focusing on developments for the Cave
- implementing some improvements for GRETCHEN

- GRETCHEN could also be used for other experiments

Thank you for your attention!



GRETCHEN