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Belle2VR –An Interactive Virtual Reality Visualization of GEANT4 Event Histories

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I describe a novel interactive virtual reality visualization of the Belle II detector at KEK and the animation therein of GEANT4-simulated event histories. Belle2VR runs on Oculus and Vive headsets (as well as in a web browser and on 2D computer screens, in the absence of a headset). A user with some particle-physics knowledge manipulates a gamepad or hand controller(s) to interact with and interrogate the detailed GEANT4 event history over time, to adjust the visibility and transparency of the detector subsystems, to translate freely in 3D, to zoom in or out, and to control the event-history timeline (scrub forward or backward, speed up or slow down). A non-expert uses the app - during public outreach events, for example - to explore the world of subatomic physics via electron-positron collision events in the Belle II experiment at the SuperKEKB colliding-beam facility at KEK in Japan. Multiple simultaneous users, wearing untethered locomotive VR backpacks and headsets, walk about a room containing the virtual model of the Belle II detector and each others' avatars as they observe and control the simulated event history. Developed at Virginia Tech by an interdisciplinary team of researchers in physics, education, and virtual environments, the simulation is intended to be integrated into the undergraduate physics curriculum. I describe the app, including visualization features and design decisions, and illustrate how a user interacts with its features to expose the underlying physics in each electron-positron collision event.

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