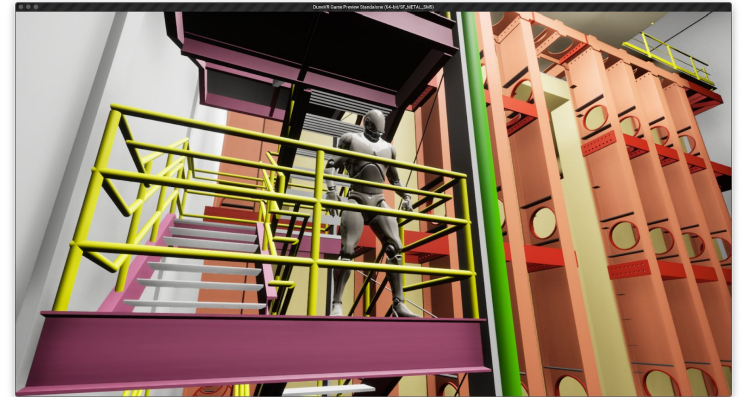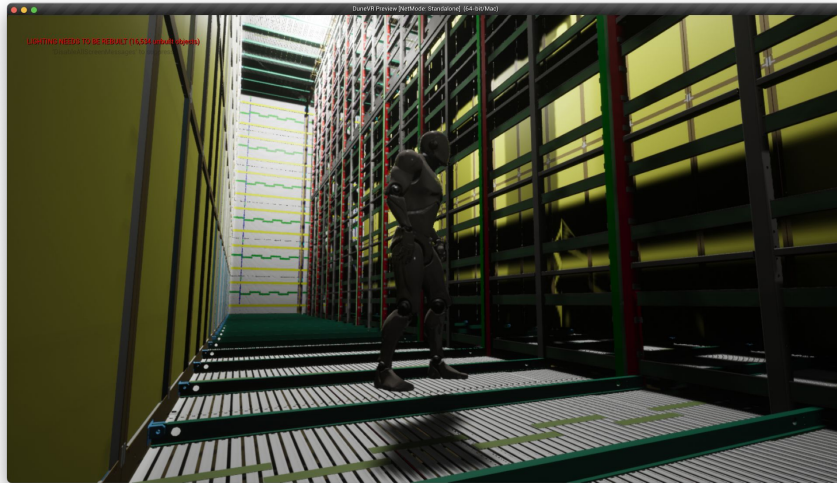# vDUNE

Virtualizing the DUNE Far Detector Cavern

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Project Update for May 5, 2022

- vDUNE Server - show ability for single avatar to navigate to the front of the DUNE detector
- Detector Bounding Box - discuss the need to reduce the number of proximal detector components
- Multi-avatars - show the ability for multiple avatars to be active in UnReal sandbox
- Game share - describe how customized UnReal instances are distributed to players
- Masterclass integration - set first goal date to showcase vDUNE

Project Summary

We envision providing Masterclass students a real-time virtual tour of SURF which includes the impression of the mammoth size of the detector complex, and an overview of the detector operation with interactive pop-up descriptors of the active components of the DUNE detector.

vDUNE Server

A dedicated Windows server has been built at the Valley City State University campus that hosts the UnReal engine where highly precise CAD files (Autodesk NavisWorks) accessed from the CERN EDMS site have been rendered. In addition to UnReal, Blender is regularly utilized for model building.

The VCSU server is accessed via VPN using the Cisco Anytime application which requires credentialing for individual users, and the Microsoft Remote Desktop application which both developers access on Mac Osx.

A feature of the networked UnReal server is allow multiple players to join simultaneously in the game, just as would be the case for multiplayer games such as Call of Duty, Halo, or Fortnite.

Demonstration
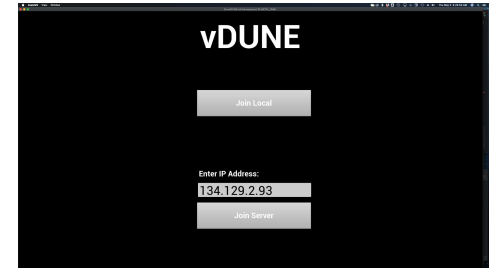
Detector Bounding Box

A complicating factor is in the immense size of the files that are used to render the detector hall and detectors, the geometry files can exceed billions of polygons.

While navigating a "full" detector, for example, CPU requirements are restrictive, and game play becomes intermittent.

UnReal has built in systems to render proximally, but software engineers are needed to work through the softened views, particularly while navigating within the DUNE detectors.

Research is underway that investigates the construction of shell scripts (python) that can streamline the effort to texturize elements of the detector so as to allow for a more fluid interaction with high geometry environments.
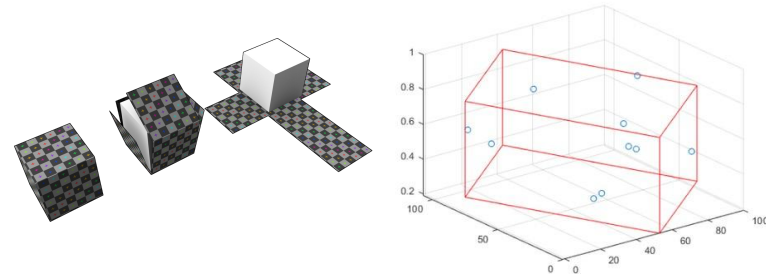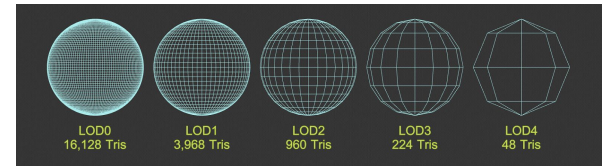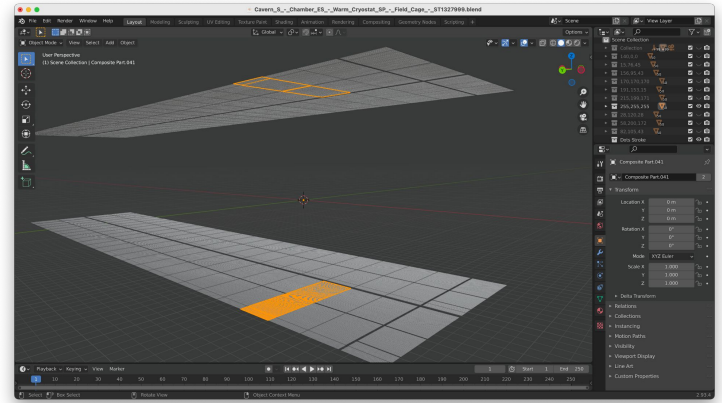
Multi-avatars

The vDUNE server provides a mechanism for multiple players which we suggest is ideal for enhancing the education and outreach efforts for DUNE.

In one of several use cases, during a Masterclass presentation, an organizer would project the screen of a client machine for viewing by a group of teachers. Multiple players would join the game, where for example, each has a specific expertise: CPA, APA, Cryogenics. These experts would provide a detector operations tour, highlighting their respective components.

In another use case, students within a classroom could simultaneous join the game, and navigate freely, asking questions to a roving expert or experts.

Demonstration

In this snapshot, two avatars roam the interior of a basic DUNE detector mockup. We are exploring skinning the avatars with unique colors, so as each can be recognizable.

Game Share

An aim is to provide individualized realtime tours of the SURF and DUNE detectors which will have us developing custom instances of the game for certain audiences.

For multiplayers, a file (200 Mb) is distributed via a Google share.

User access to the vDUNE server requires management.

A Github repository has been established for this project, which allows for tracking and resolving reported issues.

Slack is used for project management.

A document system is being developed, possibly as a dockerized Wordpress site.

Masterclass Integration

We are preparing for a first demonstration at an upcoming Quarknet masterclass training.

South Dakota School of Mines & Technology and Antananarivo U. has demonstrated admirable event display work.

Valley City State University and the University of North Dakota have been developing an SN neutrino focused training for high school teachers in North Dakota.

Is there a schedule that we can work towards?