Big VR Environments and Personal VR Devices for At-Risk Cultural Heritage in the Eastern Mediterranean - from Conservation to Hackathon

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Introduction

The goal of this project is to spread awareness for at-risk cultural heritage sites using Virtual Reality as a medium for visualization. This mission, funded by a University of California (UC) Office of the President's Research Catalyst grant, involves establishing a network of CAVEs (Cave Automated Virtual Environments) at four UC campuses to display various forms of archaeological data such as point clouds, 3D models, and pictures from at-risk cultural heritage sites. At the same time, personal VR devices such as the Oculus Rift and HTC Vive teaches the importance of preserving such sites to the general public.

Tools

- **Content Creation**
  - Unity3D Game Engine
- **Virtual Reality Devices**
  - Virtual Reality CAVE System
  - HTC Vive
  - Oculus Rift
- **Data Processing Tools**
  - Mesh Lab (Open Source)
  - Cloud Compare (Open Source)

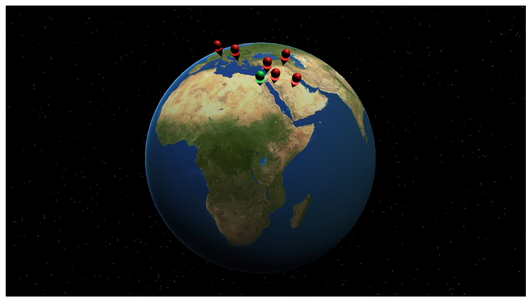
Cyber-Archaeology VR Hackathon

- Archaeologists and engineers collaborated to create VR content
- Each team had at least one archaeology student and one engineer
- Event took place over 36 hours during a single weekend
- Teams were given access to a wealth of archaeological data
- Students worked with HTC Vive and Oculus Rift VR headsets
- Six teams completed VR projects and were awarded prizes

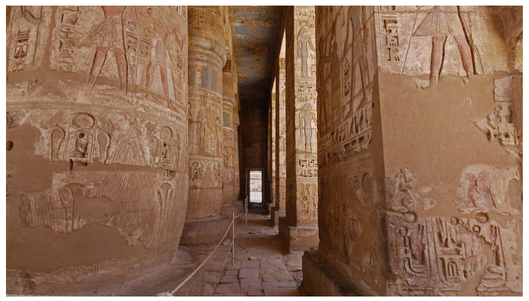
CYBER-ARCHAEOLOGY VR HACKATHON

Data Visualization Application

1. Archaeologists upload site data to an online database. Supported data types include 3D models, 360 panoramas, point clouds, pictures, audio, and videos
2. Data is downloaded to CAVEkiosk or personal VR computer. Downloaded information includes data sets, site names, site locations, and descriptions
3. VR user can browse archaeological sites on a 3D Earth. Available sites appear as red "Points of Interest" markers that can be selected
4. Once a location is selected, available data for that site appears, along with a description and name of the site. User can choose what data type to view
5. Data loads into Unity application and appears after a loading period. User can look around and navigate the data. When done, users return to the Earth



User viewing available sites on a 3D Earth

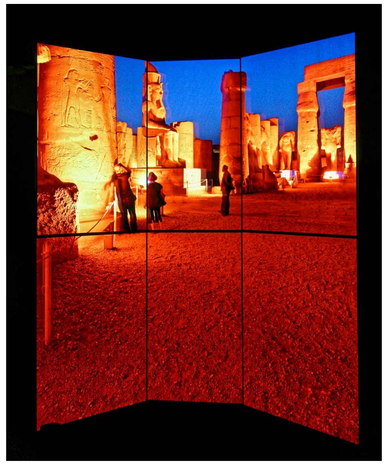


User viewing a 360 panorama from Luxor, Egypt

User viewing a point cloud of the Mar Saba Monastery

CAVEkiosk

- A 6 panel 3D CAVE (CAVE Automatic Virtual Environment) system
- Established at UC San Diego, UC Merced, UC Berkeley, and UCLA
- UCSD CAVE located in UCSD's Geisel Library as a public display
- CAVE platform ideal for group viewing as an interactive exhibit
- Users wear 3D glasses and view image on multiple screens in 3D
- Primary interaction method is a wired Xbox controller



Challenges and Future Goals

- **Future Goals**
  - Improve loading and caching times for displaying data
  - Make application interesting and intuitive for users
  - Combine research and narrative elements to tell a story
  - Increase traffic to exhibit and get more users using the system
- **Challenges**
  - Many data sets are too large to easily run in Virtual Reality
  - Xbox controller is not naturally intuitive for many users
  - Unity Game Engine is not ideal for loading external data
  - Collecting meaningful user data from the application is difficult

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