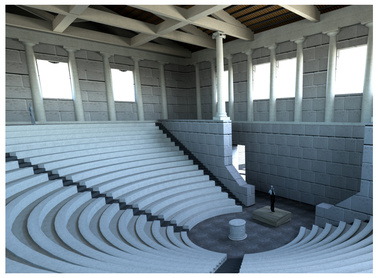
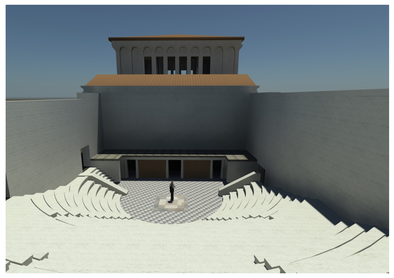

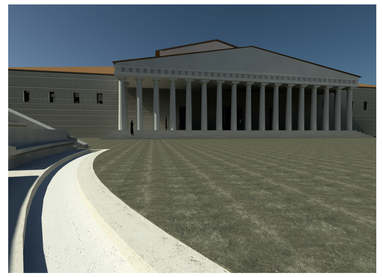
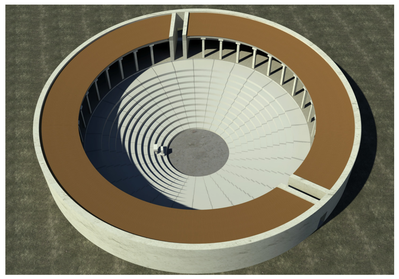

VISUALIZING ANCIENT GREEK RHETORIC IN IMMERSIVE VIRTUAL REALITY

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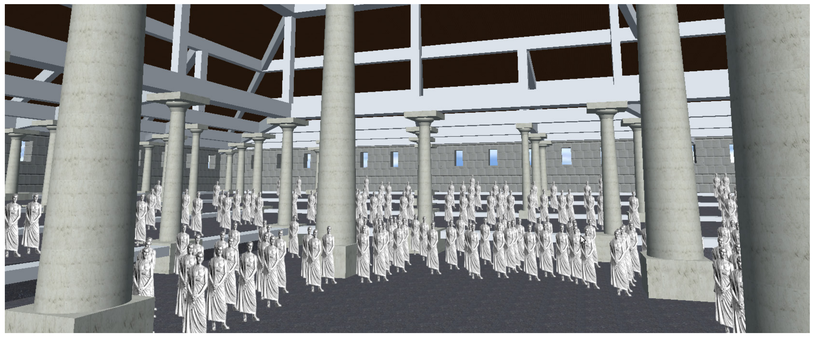
Abstract

We present a discussion of the insights gained through the development of an immersive virtual reality (IVR) application for visualizing the physical settings of ancient Greek oratorical performance. Through this discussion, we identify technological advancements in IVR over the past decade that enable improved visualizations of ancient performance spaces, and we highlight three areas that remain major research challenges, limiting widespread adoption of IVR in digital humanities applications.

Introduction

This is a long-term project to catalog and classify structures from the late Archaic, Classical, and Hellenistic periods (ca. 500-100 BCE) that staged performances of political and legal oratory in ancient Greece. Co-PI's Richard Graff, Writing Studies, and Daniel Keefe, Computer Science, along with collaborators at Pennsylvania State University endeavor to visualize ancient rhetoric as situated verbal performances, to better understand how the physical settings structured and constrained the interactions that took place in them. After modeling reconstructions of each site, we provide an immersive virtual reality experience of physically walking around in them by using MSI's 9.2m x 2.7m, three-panel, rear-projected stereoscopic display. The application is head-tracked, so as the user moves around the room, the perspective projection of the scene is updated accordingly.



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Goals

This project has three main goals for the use of immersive virtual reality:

1. Make an accurate evaluation of the reconstruction in life-size form of ancient Greek rhetorical sites
2. Provide an account of how the physical structures influenced the behaviors of speakers and listeners who gathered in them
3. Assess the suitability of the structures as venues of oral performance and group deliberation

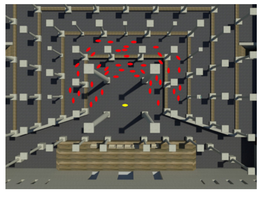
Crowd Simulation and Capacity Visualization

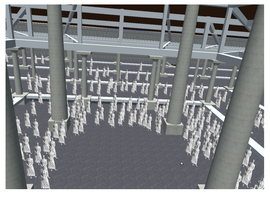
The custom visualization application we have developed depicts one of the most important sites of study, with four other sites partially modeled. The first structure called "The Thersilion" at the city of Megalopolis in the Peloponnese (southern Greek mainland) was evidently constructed shortly after the founding of the city in 369 BCE, expressly to house meetings of a confederation of independent city-states in the region; historical record indicates that representatives sent to such meetings would number 10,000.

In order to evaluate the accuracy of this capacity estimation, as well as to assess the suitability of the Thersilion as a venue for a crowd of this size, we are using two different perspective visualizations:

- A top-down perspective, showing the floor plan overlaid with outlines showing the amount of area each person would occupy.
- An immersive virtual reality experience showing a first-person perspective of what the Thersilion would feel like filled at different capacities.

For both visualizations, we implemented an algorithm that automatically distributes people inside the Thersilion according to different space-filling metrics, taking into account the estimated area each human occupies and the structure of the building.

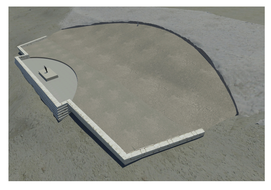
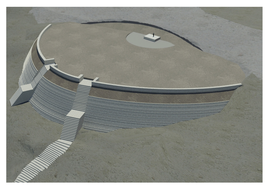
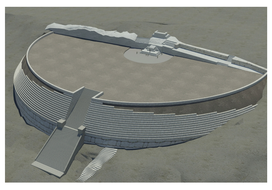




Visualizing Uncertainty and Change

The reconstruction models in our project are based on informed inferences because large parts of the structures no longer exist. Uncertainty needs to be shown in immersive VR so that viewers do not automatically interpret the models as fact. For instance, the height of the roof structure, the presence and dimensions of a clerestory, and the size and placement windows in the Thersilion model shown above are estimated based on the size of extant column bases and the requirements for illuminating an interior space of nearly an acre. New ways of representing uncertainty in immersive VR are needed in order to appropriately convey this meta information about the model together with the model itself.

Similar to uncertainty, we need the ability to represent change and to compare two or more similar models, which is difficult in VR. One of the sites considered in our study, the Pynx in Athens, went through three major design changes over the course of its use. The ability to compare different phases is instrumental for determining how and why it changed.

Immersive Multi-Method Data

In addition to the physical models, each structure has large numbers of pictures, maps, and text associated with it. New ways of visualizing this multi-method data within the virtual environment are needed so that researchers can deeply engage with their many forms of data, generating new hypotheses and evaluating them as they work within the virtual environment.