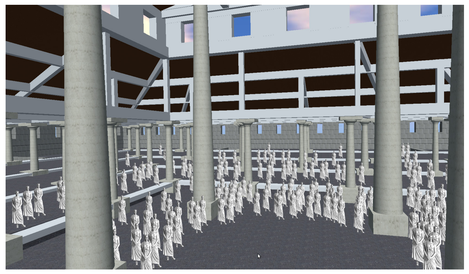

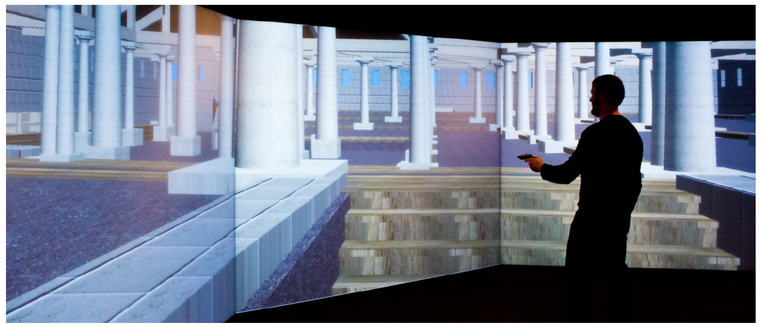
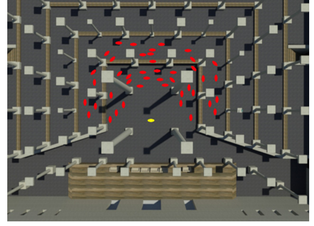

VISUALIZING ANCIENT GREEK RHETORIC IN IMMERSIVE VIRTUAL REALITY

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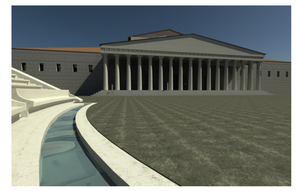


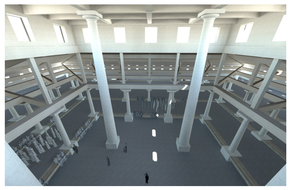
ABSTRACT

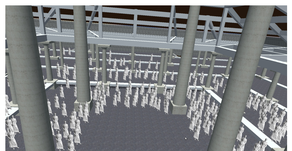
The goal of this project is to reconstruct ancient Greek rhetorical sites in virtual environments, including simulating architecture, sound, and crowds, to better understand how the physical settings structured and constrained the interactions that took place in them. Our work makes use of the large-format, head-tracked stereoscopic display at MSI, and our preliminary results include an immersive visualization of the Thersilion at Megalopolis, a site where speeches were once given to 10,000 people.

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. MSI-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. Use of the Minnesota Supercomputing Institute's visualization resources and computational hardware has proven instrumental in achieving this goal.

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.





GOALS

This project has three main goals for the use of immersive virtual reality and MSI's computational resources:

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:

- The first is a top-down perspective of the model, showing the floor plan overlaid with outlines showing the amount of area each person would occupy.
- The second is 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.

CONCLUSION AND FUTURE WORK

We have created a virtual reality application allowing for the exploration of ancient Greek structures of political and legal oratory. Our collaborators are excited by the potential immersive virtual reality has as a tool for understanding historical antiquity and the growing field of digital humanities.

In the future, we have identified several interesting areas in need of further work:

Real-Time Crowd Simulation and Acoustical Modeling
We are very interested in developing methods for real-time, physically accurate acoustical computation and crowd simulation using computation resources at MSI. Although sound has always been considered a valuable aspect of immersive VR, in our work it rises to an importance equal to that of the visuals for understanding and evaluating the reconstructions.

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 from our case study 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.

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.

University of Minnesota Supercomputing Institute
Minnesota iV Lab
Writing Studies