ARCHAVE: A Virtual Reality Interface for Archaeological 3D GIS

Master’s Thesis Proposal
by
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Brown University February 4, 2000
Presentation Outline

1.- Motivation and definitions.
2.- Problem to be solved.
3.- Hypothesis.
4.- System description.
5.- Testing.
6.- Timeline.
7.- Contributions.

ARCHAVE: A Virtual Reality Interface for Archaeological 3D GIS
Motivation

Brown University excavations at the Great Temple of Petra (Jordan) since 1993.

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--- Collaborators:

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David Laidlaw (CS Assistant Professor)

Eileen Vote (PhD candidate Dept. Old World Archaeology and Art)

Talal Akasheh (Dean of Research and Graduate Studies, Hashmite University (Jordan))

--- Committee:

John Hughes (CS Professor)

Nancy Pollard (CS Assistant Professor)

David Laidlaw (CS Assistant Professor)

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GIS: Geographical Information System

"A set of tools for collecting, storing, retrieving and displaying spatial data for a particular set of purposes." (Burrough P.A., 1986)
Why 3D GIS?

VR Interface:

- Desktop
- Cave
- HMD
- Workbench

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Archaeologists must make important judgments about the object to record, characteristics of those objects and their relationship to the site and the culture they came from.

A dig system is established to record the information needed for analysis.

After information is recorded, it is analyzed using various databases, statistical analyses, laboratory procedures.
The Problem ...

- Large 3D dataset.
- Difficulty of a direct analysis of tabular data.
- Researchers need to be able to extract conclusions and relations.
- Limited type of queries because of visualization issues.
The Problem ...

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A Proposed Solution ...

- **Use VR.**
- VR+GIS ....... obvious combination.
- Helps in understanding the context of the data.
- Freedom of movement through the dataset.
- Immersion in the "3D dataset virtual world".
- Eventually...
  - More complex queries.
  - From "data-viewer" to advanced GIS functionality.
  - Alternative to more complex data-mining strategies.

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Background

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A Virtual Reality interface to a GIS application will allow archaeologists to easily identify and successfully analyze more complex interrelationships from the field-data.

+ Classical approach.
+ Workstation.
+ Workbench.
+ Cave.

The use of different working environments will allow us to compare the different user interfaces and evaluate the success of the project.

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System components

- GIS end.
- Connection VR-GIS.
- VR end.

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GIS application

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- ESRI’s ArcView.
- EarthLab.

"GROSSO MODO"

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VR-GIS Connection

- ArcView’s Internet Map Server.
- Web client.
- ArcView’s Avenue™.

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User’s Scenario (1/2)

- Become familiar with the site.
- See the trenches.
User’s Scenario (2/2)

- See the loci.
- See artifact information.
Evaluation

- Tests and user study.

- Tests for:
  - Environment navigation
  - GIS operations

- Pilot studies and User study:
  - Experienced archaeologists.
  - Three different interfaces.
  - General impressions and specific timed tasks.
Schedule

- February .......... Web client, model of the Temple, topographical data.
- March ............... Walking interface using the Wand.
- April ................. Avenue scripts and first VR-GIS interface.
- May .................. Data visualization models.
- June .................. Intra-theme visualization models. Pilot study I.
- July ................... LOD implementation. Flight interface.
- August ............... Advanced GIS queries. Pilot study II.
- September .......... User study and final presentation.

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Contributions

- The first VRGIS application for archaeology research.
- User study across 3 different working environments.
- New interfaces for GIS applications.
- Navigation and LOD techniques.

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"Impact"

- Complete system to investigate new GIS interfaces.
- Integration of this system with artifact and architecture reconstruction software.
- Intra and inter-site collaboration.