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Virtual Tabletop for Fresco Fragment Analysis

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I. Overview

In the interest of preservation, various 3D scans and high resolution images of ancient fresco fragments have been collected into an existing database. This data is grouped into "tabletops" based on the locations where the fragments were discovered, which often but not always corresponds to fragments that fit next to each other in a completed reconstruction of the fresco. An existing program is able to provide a "virtual tabletop" view of the fragments and allow the user to virtually manipulate and reorganize these models, which are grouped by confirmed matches. The program can also analyze the models to propose matches based on the edges of the fragments. These digital tools allow the user to study the fragments closely without concern for damaging the materials, and the algorithms used provide extra confidence when considering matches. However, the existing program depends on outdated frameworks that are not portable on every OS or device.

The goal of this proposed senior project is to build the framework for a web application that will ultimately have many of the features of the existing program, but be especially tailored for portability and efficiency. Specifically, it should provide a pleasant user experience when used on a tablet, which can be carried on-site. The end goal for this semester will be to build a web app that can serve images and models from the existing database to display a virtual tabletop, and allow users to manipulate these images to study the fragments and their broader context.

II. Project Description

Basic Functionality

- Log in to web app to view database of images/models, perhaps via CAS
- Select a tabletop to load from the database, display a top-down view of the fresco fragments in that tabletop (perhaps loaded as images at this point), as well as groupings of fragments, and each fragment's info (such as ID number)
- Select/drag/rotate controls on each fragment or grouping

Goal Functionality

- Provide 3D view of fragment or grouping

- Toggle on/off the fragment info
- On tablet, take a picture to set as the background for the tabletop

III. Primary Considerations

- Efficiency: There is a lot of information to load from the database, especially considering that a tablet is less powerful than a PC. Think about when to get away with loading simply images, lower resolution models, etc.
- User experience: Clear and simple controls for manipulating the fragments, as well as a smooth touch screen experience on a tablet.
- Portability: Should function relatively well on any OS and many types of devices

IV. Framework/Tools

- Node.js server for backend
- Vue.js for frontend
- Possibly Quasar for portability
- Some vue plugin like Leaflet for image display and movement controls
- Three.js for 3D model display

V. Deliverables

- Full code for the backend and frontend of a web app that provides functionality described above, hosted on Github

VI. Timeline

Before Spring Break (BSB)

Have basic functionality using 2D images (load the tabletop and display the fragments, allow user to manipulate them)
- Week of 2/3
    - Decide which tools to use
    - Design basic user experience
    - Understand how to access database
    - See code of existing program?
- Week of 2/10
    - Set up basic server/ framework (anticipate getting back up to speed with using Node and Vue)
    - Understand organization of data set
- Week of 2/17
    - Query database, necessary endpoints, be able to select a tabletop to view

- Week of 2/24
    - Display of each fragment and grouping once tabletop is selected
    - Controls for manipulating fragments and groupings
- Week of 3/2
    - Continue work on display of tabletop and manipulating fragments
    - Definitely check responsiveness of view and efficiency of loading data

After Spring Break (ASB)

Ability to view 3D models of fragments or groupings by incorporating Three.js