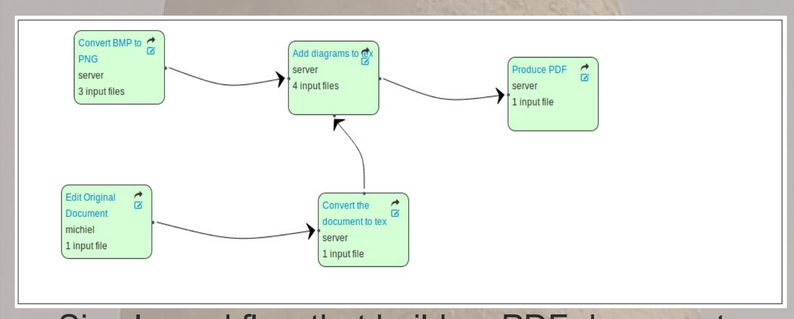
Spatial Management of African Sites and Heritage

The project is divided into two major components. The first is a work flow management system and the second is an indexing and streaming system for large point clouds. These components aim to solve two challenges faced by the members of the Zamani Project: management of data processing in general and management of large data sets in particular.

Workflow Management System

Aim:

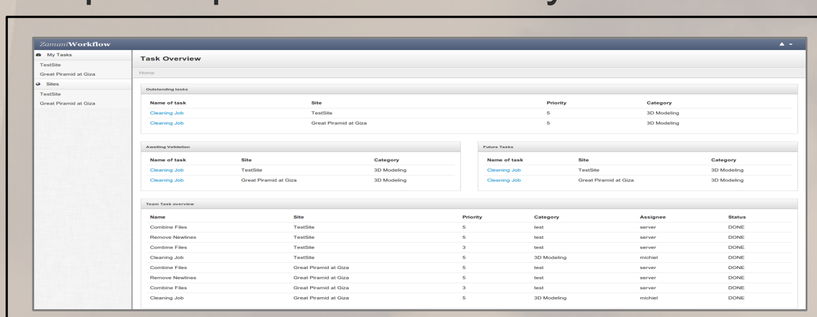
- Manage the tasks of the Zamani Project
- Support both *user tasks* and automated server tasks
- Manage the file transfer to and from workstations



Simple workflow that builds a PDF document

Design:

To manage the process, tasks are topologically ordered. This enables the system to dynamically execute tasks. All user tasks within the system requires verification from a senior member. The system supports a Web interface to manage the tasks. Failure and verification controls were added to improve process accuracy.



Task interface of Zamani Workflow

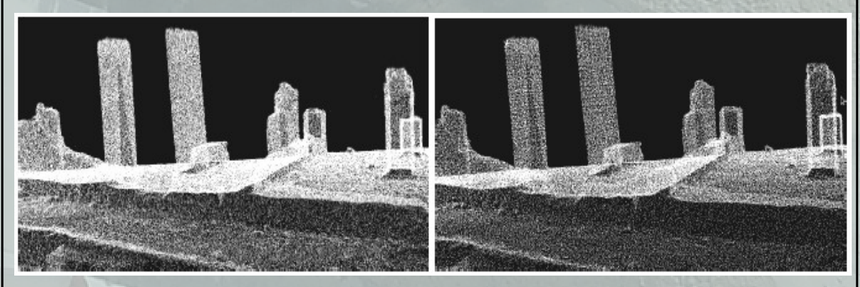
Results:

A *User Experience* evaluation, performed on 24 users, showed that 18 users found the system easy to use, 19 found it easy to learn. The system was shown to be efficient and usable. It was shown that the system was able to successfully execute a portion of the tasks present within the Zamani Project.

Point Cloud Management

Aim:

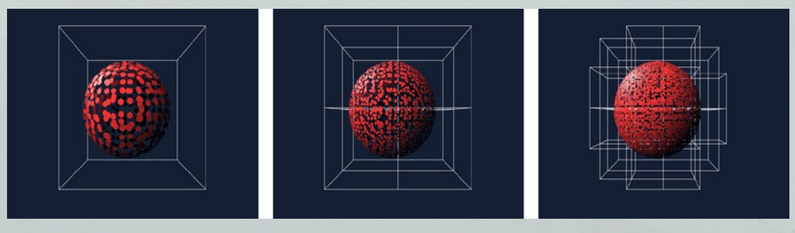
- Enable region extractions from large point clouds
- Extractions should be performed quickly (a few seconds)
- Extractions can be performed at a varying resolution
- Enable streaming of points from server to clients



The same region extracted at varying resolutions

Design:

To enable the multiresolution extractions, an index for the point cloud is built. The index subdivides the point cloud and performs a reordering on the points such that a multiresolution representation can be efficiently extracted. The points are then efficiently streamed to clients from the server.



Octrees were used to create the multiresolution index and for spatial partitioning

Results:

Evaluation showed that the system was reasonably fast, performing extractions in a few seconds, even when the point cloud contained billions of points. It was also shown that as one increases the resolution of the extraction, the time taken scales linearly.

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