3D Remote Collaboration Framework for Virtual Cultural Heritage using Windows Azure Environment

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Background
Background

• Digital Archiving Project for Cultural Objects
Background

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Data Resolution: 1mm ~ 10cm
Vertex #: 1M~
Data Size: 100MB~100GB
Proposed Sharing Style
Similar Style

Second life
Previous Project

- Cyber-Archaeology on Tele-Immersion
Proposed System
Core functions

• Display for Huge Cultural 3D Models
  – Real-Time
  – Large Datasets

• Collaborative Framework
  – Sharing User’s Avatar
  – Manipulation by Remote Users
Display for Huge Cultural 3D Models
Display system
Model and Image based Display

Final Image
Overview

- Server on Cloud
  - 3D model in LOD structure
  - Pre-rendered image repository

- Network
  - Rough 3D model
  - Pre-rendered images

- Client
  - Model
  - Image
Data Structure – Model-based Data – (Offline Process)
Data Structure – Image-based Data – (Offline Process)

grid space split regularly
Data Structure – Image-based Data – (Offline Process)
Selective Data transfer

Viewpoint ID (3,5,5)

Empty
On Windows Azure

Windows Azure

3D Data

Image DB

Management Role

Instance 1

Instance 2

Instance 3

Communication Role

Viewing parameter

Storage

Viewpoint ID: (3, 5, 5)

Empty
Results
Comparison of Data Transfer

- pure MBR
- Grid-Lumigraph
Collaborative Framework
3D Collaborative Sharing

- Sharing user’s avatar in 3D space
- Manipulation of 3D model by human motion
User’s Avatar captured by Kinect
User’s Avatar captured by Kinect
Interactive Browsing by Hand Motion

palm  grasp
Setup

Kinect
Interactive Browsing
on Windows Azure

3D Model Server

User Server

User Management Role

User Image Role
User Management Role

- Connecting State
- View Point
- User Motion, Command
- Moving parameters
User Image Role (1)

User 1

Color Data

Depth Data

User 2

Color Data

Depth Data
User Image Role (2)

User Image Role

User 1
- Color Data
- Depth Data

User 2
- Color Data
- Depth Data

User 3
- Color Data
- Depth Data
Collaborative Browsing
Summary

• 3D collaboration system for cultural models on Windows Azure
  – Real-time display for large models
    • Model and Image based method
  – Collaborative browsing framework
    • Sharing 3D space and real avatar
    • Interactive manipulation
Future work

• Collaborative application
  – Attach and share information on the 3D model
  – Navigation in 3D buildings

• Image quality of User’s avatar

• Fast communication
Thank you for your attention.