

# Digital Cultural Heritage

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## Cultural Technology

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- Cultural technology is one of 6 key technologies for the new economy of Korea
  - Biological Technology
  - Culture Technology
  - Environment Technology
  - Information Technology
  - Nano-Technology
  - Space Technology
- Cultural technology application areas are:
  - Entertainment (game, theme park, electronic theater, character, etc)
  - Art/science/heritage museum
  - Culture and art performance and exhibition
  - Digital restoration and preservation

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## Cultural Heritage meets Technology

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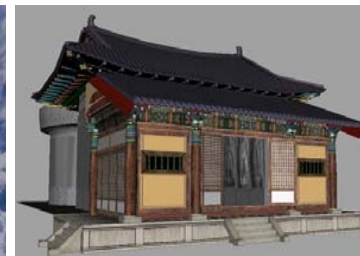
- Conventional cultural heritage + Digital media technology
- Intersectional innovation by interdisciplinary designers – archaeologist, historian, artist, computer scientists, engineers, etc
- Cultural heritage technology is mainly developed for
  - Preservation of cultural heritage with 3D computer graphics
  - Digital restoration and interpretation of cultural heritage
  - Experience cultural contents

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## Why Digital Restoration?

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- Cultural heritage which doesn't exist anymore
  - e.g. Hwangyongsa temple
- Cultural heritage which faulty exist
  - e.g. Miruk pagoda, Sokkuram



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## Digital Restoration -Gyeongju World Culture Expo



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## A Journey into the Breath of Sorabol

- ❑ Organizer: Culture EXPO Foundation,
- ❑ Production: Imaging Media Research Center, KIST
- ❑ Duration: September 1st ~ November 26th, 2000
- ❑ Visitors: 1.2 million people
- ❑ Theme: A Journey Into the Breadth of Sorabol
- ❑ Concept: Encounter/harmony between high technology and culture

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## A Journey into the Breath of Sorabol

- ❑ VR Scenario
  - Multi-Path scenario (Ktong-ju South Mout, Royal palace, Sokkuram Grotto)
  - Variable special effects (illumination water effect, time of day effect)
  - Interactive Scenario (Group interaction of butterfly..)
- ❑ VR Contents DB
  - Cultural Heritage 3D DB of Shilla: Architectural, pagoda, monument
  - Special Effects DB: Under Sea Royal tomn, Sokkuram Buddhist Grotto
  - Animation DB: cyber Character, cultural game
- ❑ Texture Image and Post-Production
  - Heritage texture images

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## A Journey into the Breath of Sorabol

1300 years ago, Shilla Kingdom created a unified nation in the Korea Peninsula for the first time. Sorabol, capital of Shilla Kingdom, was the 4th largest city in the ancient world with a population of one million. By taking visitors back in time to the era of the Shilla Kingdom, it encourages Koreans to draw on the strength of their cultural heritage to promote reconciliation and peace the the Korean peninsula.



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## A Journey into the Breath of Sorabol



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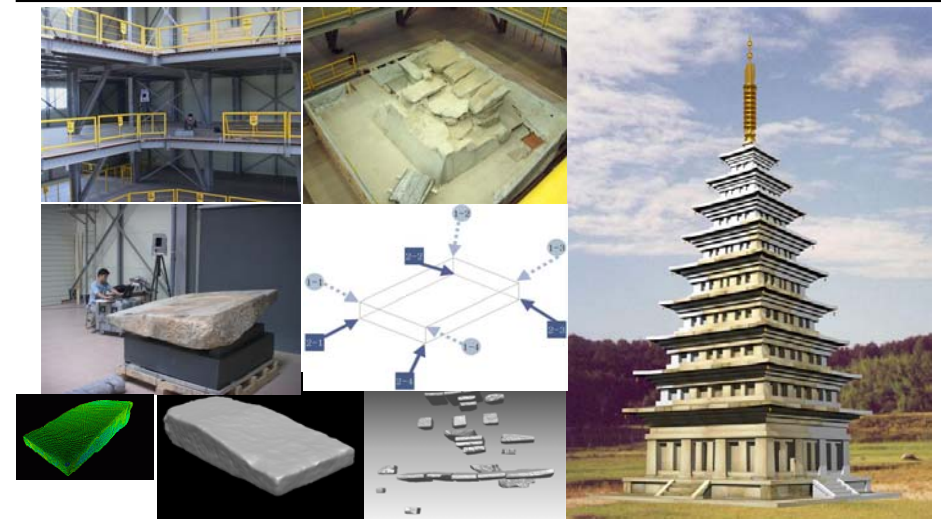
## A Journey into the Breath of Sorabol



## Hwangyongsa



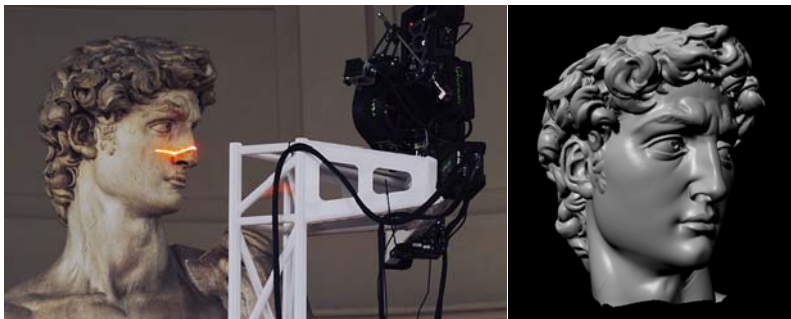
## Miruksa Pagoda



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## Michaelangelo

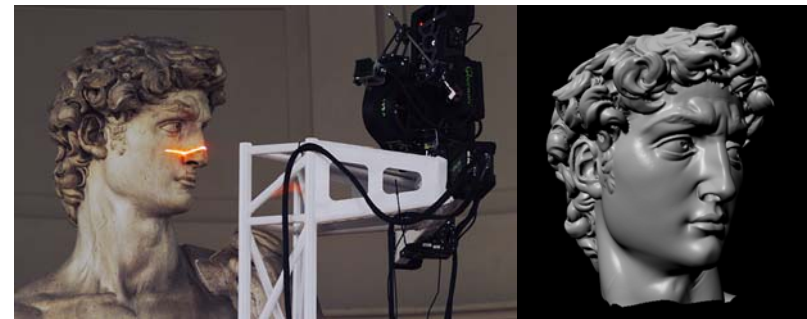
- Use of 3D scan on real cultural heritage



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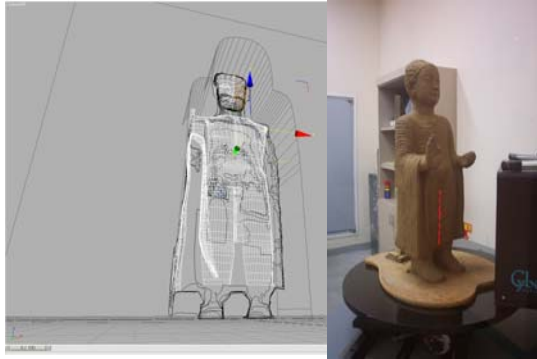
## Michaelangelo

- Use of 3D scan on real cultural heritage



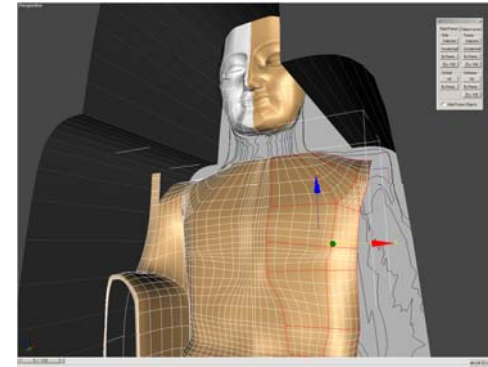
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## The Great Buddha of Bamiyan



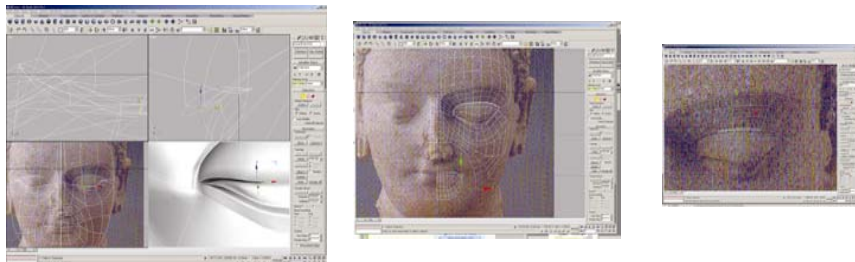
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## The Great Buddha of Bamiyan



## The Great Buddha of Bamiyan

- Use of Gandhara style in the reconstruction of Bamiyan Buddha



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## Cheonggyecheon (Stream)

100 years ago

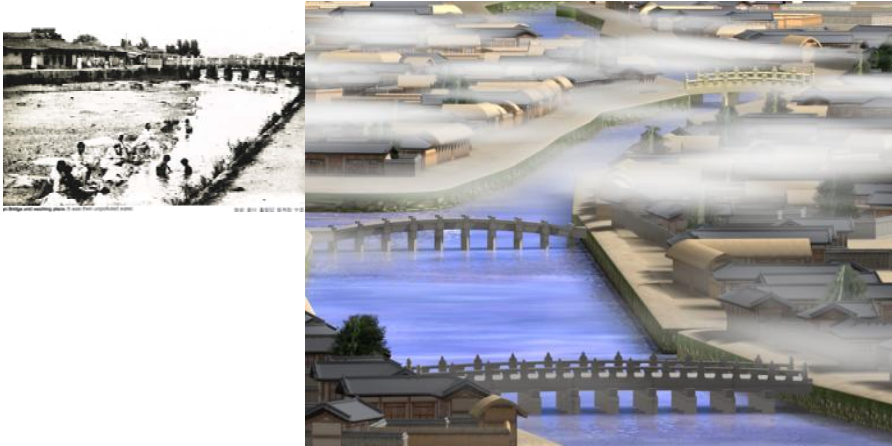
The original name of the Cheonggyecheon (Stream) is 'Gaecheon' meaning "Open Stream" and its sources are Inwangsan (Mt.) located in the northwest of Seoul, the south foot of Bugaksan (Mt.) and the north foot of Namsan (Mt.). It is an urban stream flowing from west to east converging the center of Seoul. Its total length spans 10.92 km.



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## Cheonggyecheon (Stream)

100 years ago

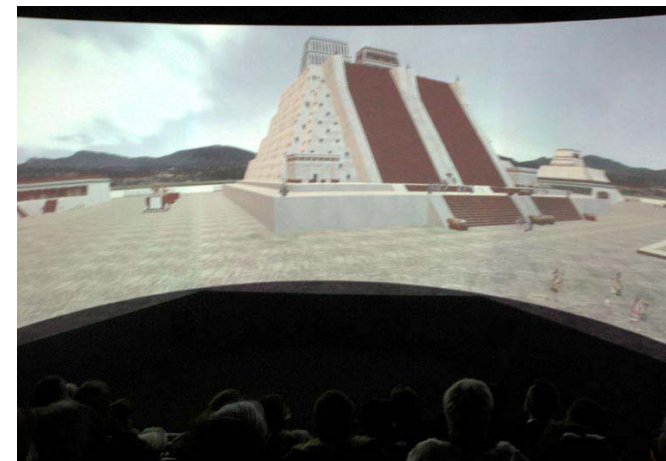


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## The Reality Center - Toppan



## Hanover Expo 2000 - Aztec



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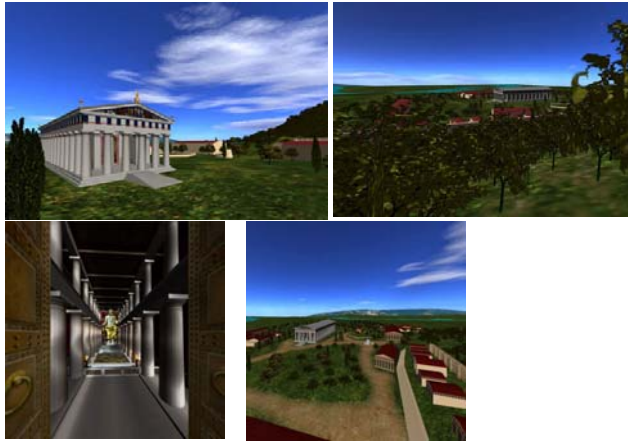
## Shared Miletus

- Experience new virtual world without a time or space limit
- Combines the virtual museum & the real museum -Spans the information and physical space in an organic manner.
- "Shared Miletus" is a cultural heritage demonstration which takes visitors on a shared virtual voyage through the ancient Greek city of Miletus as it existed 2000 years ago.



## Temple of Zeus at Olympia

- Foundation of the Hellenic World <http://www.fhw.gr/>



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## Silk Road Shrine

- A virtual cultural and artistic exhibit of the Mogao Grottoes of Dunhuang. Dunhuang, one of western China's ancient cultural sites, is considered the gateway to the well-known Silk Road- the East-West trade route between Asia & Europe.



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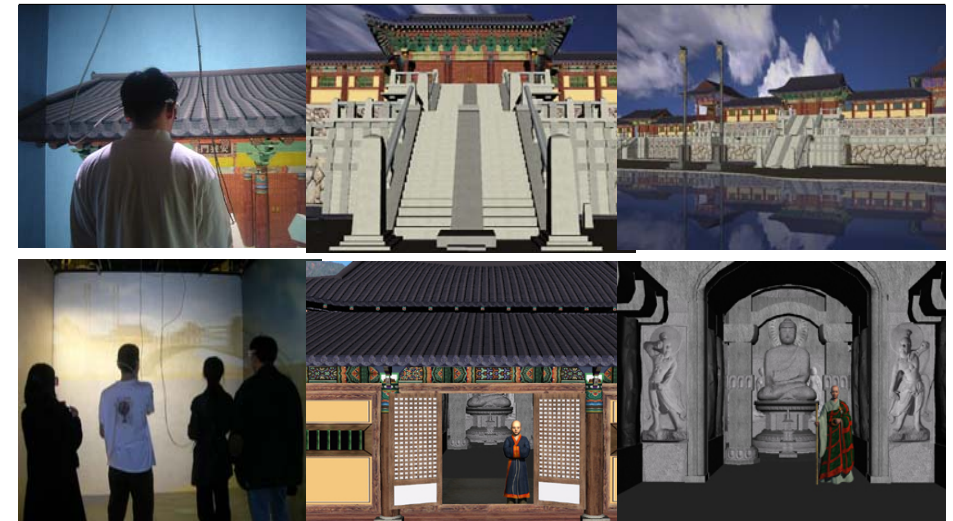
## Virtual Harlem

- VR reconstruction of Harlem, NY during the 1920-30's.
- Allows students at remotely located CAVes to tour Harlem, and listen to African American artists, writers and intellectuals of that time - notably Langston Hughes, Marcus Garvey and others.



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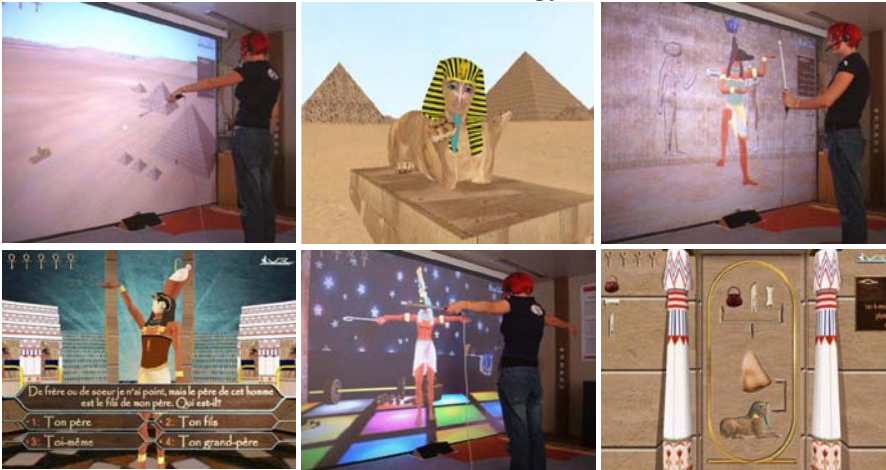
## Virtual Shilla



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## Enigma of the Sphinx

- Swiss Federal Institute of Technology in Lausanne (EPFL)



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## Digital Koguryo

- Digital reconstruction of Anak No. 3 Tumulus in Virtual Reality



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## Tangible Moyangsung

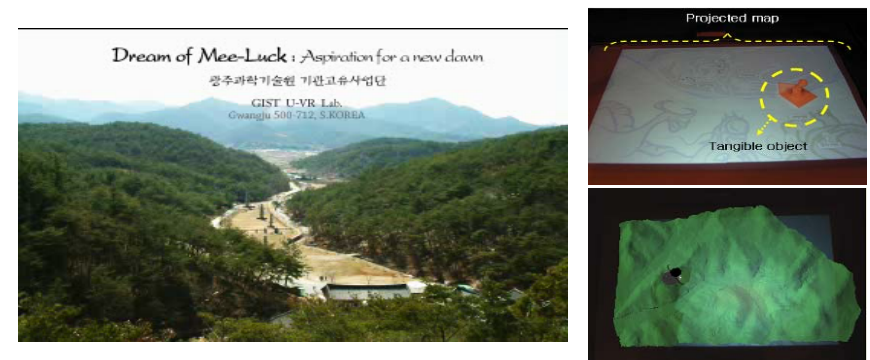
- Use of tangible blocks to interact with the virtual environment



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## Dream of Mee-luck

- VR-based immersive cultural heritage system
- Context-aware, personalized human-computer interaction



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## Dream of Mee-luck

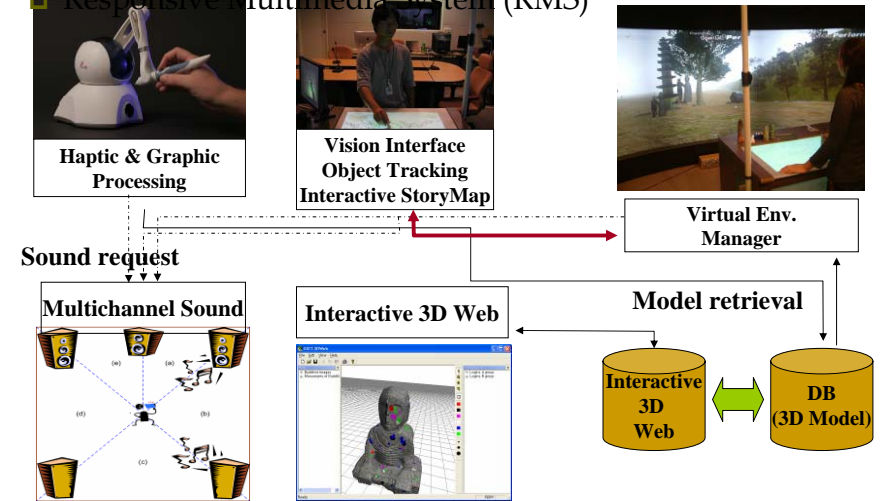
- Context-aware i-System
  - Multi-modal tangible UI
  - vr-UCAM
  - Context-aware dynamic VE



Y. Lee, S.J. Oh, W. Woo, "A Context-based Storytelling with Responsive Multimedia System (RMS)," *LNCS(ICVS)*, 3805, pp. 12-21, 2005.

## Dream of Mee-luck

### Responsive Multimedia System (RMS)



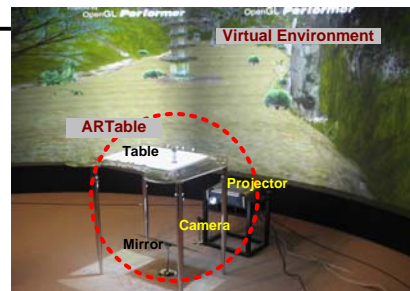
Y. Lee, et. al., "Responsive multimedia system for context-based storytelling," *LNCS(PCM)*, vol. 3767, pp. 361-372, Nov. 2005.

## Dream of Mee-luck

### Interface on ARTable



System setup



Navigation using tangible objects on ARTable



Menu selection

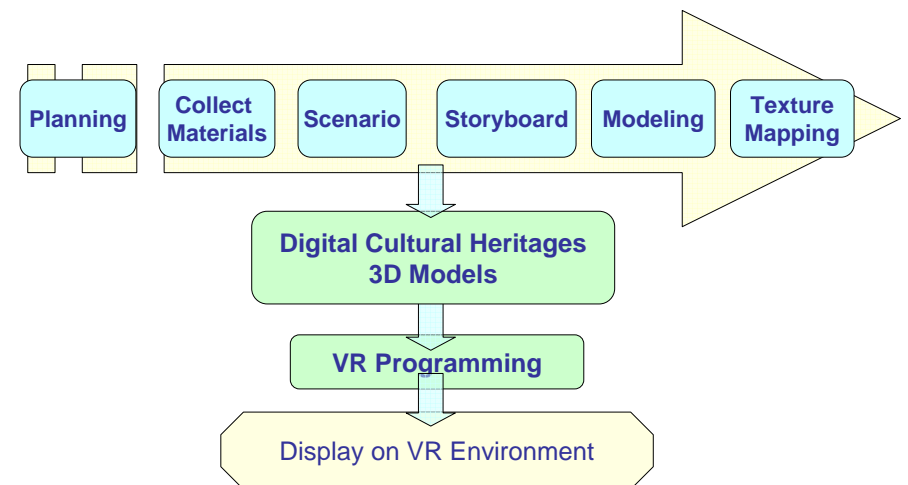


VE Navigation



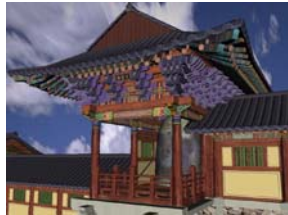
Augmented snow man on top-view

## Design Process of Digital Cultural Heritage



## Digital Restoration

- ❑ 2D-based restoration – e.g. wall painting
- ❑ 3D-based restoration – e.g. building, sculpture, bequest



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## Work Flow

- ❑ Modeling
  - Miniature or Map Scan -> NURBS Modeling -> Polygonal Modeling
- ❑ Scan -> Texture
- ❑ Light Analysis - Search Good Lights position
- ❑ Reduce Polygon
- ❑ Convert the models to VR scene

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## Planning

- ❑ What kind of Cultural properties?
- ❑ Navigation time?
- ❑ What kind of sound effect?
- ❑ Historical Background of Cultural properties
- ❑ What kind of H/W & S/W?

### Hardware

O2 R12000  
Compaq  
AP550  
Onyx rack  
with:  
(EVLCAVE)

### Software

Maya 3.0  
Softimage  
Polytrans  
IRIS Performer graphics library  
CAVELib VR library  
Yggdrasil VR Authoring Toolkit

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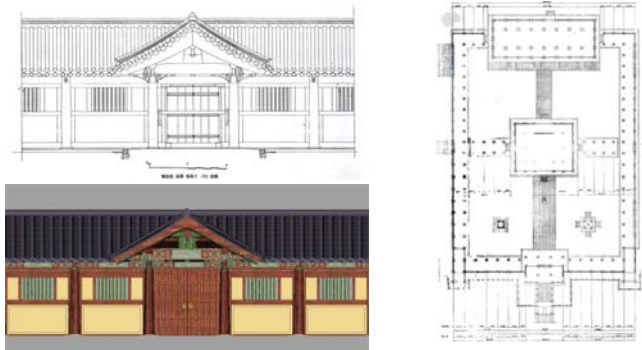
## Tools

- ❑ Modeling
  - Softimage, Maya, 3DStudio Max, Lightscape
- ❑ Lighting
  - Lightscape
- ❑ Data Conversion
  - PolyTrans, Multigen
- ❑ Animation
  - YG Programming
- ❑ Texture Mapping
  - Photoshop, Painter etc

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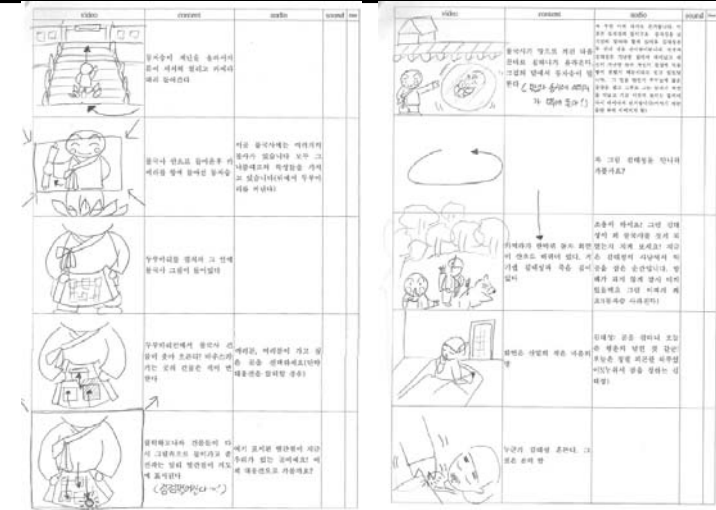
## Collect Materials

- Maps , Paper, Books, documents
- Field investigation
- Scan miniature



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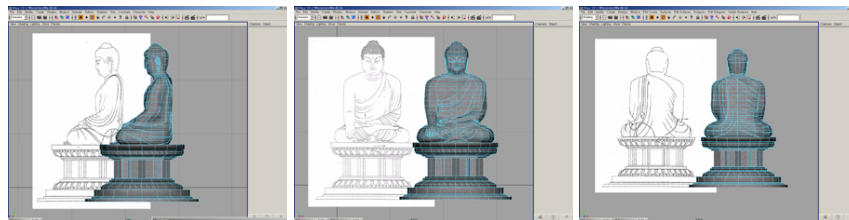
## Scenario & Storyboarding



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## Modeling

- Scan images -> Polygon modeling

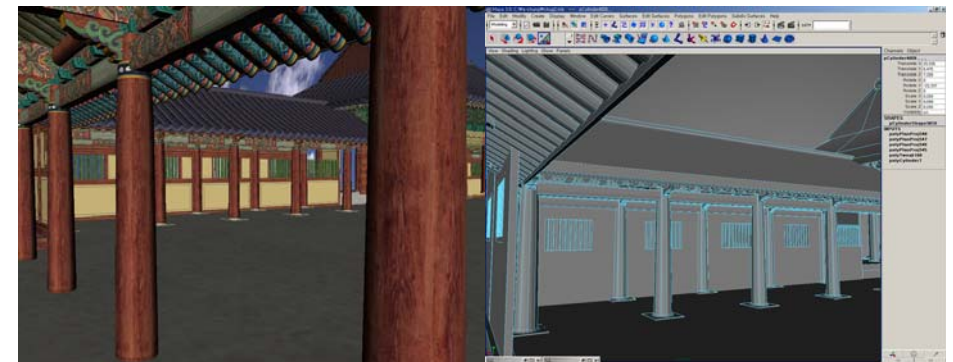


NURBS Modeling, Polygon Modeling

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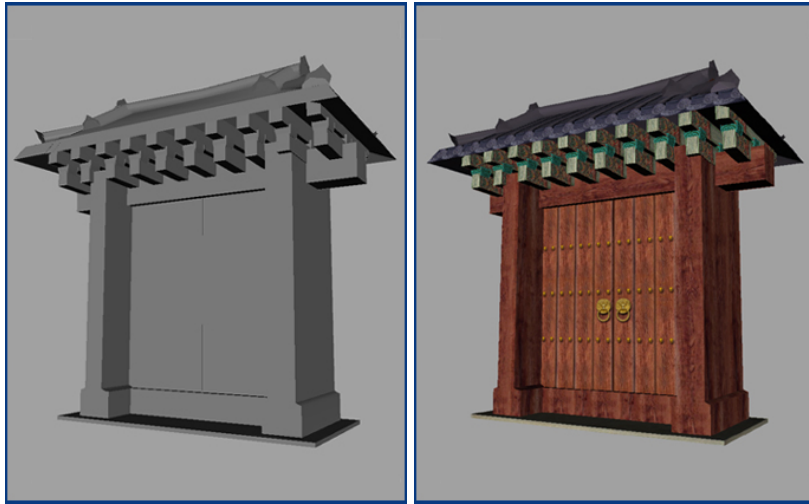
## Modeling

- Polygon modeling



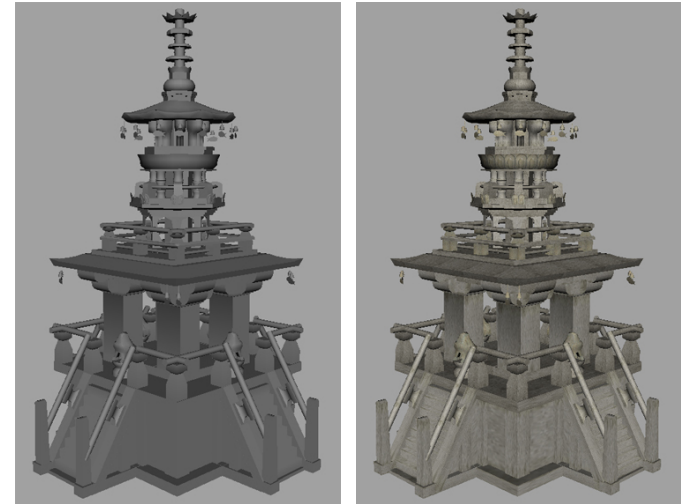
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## Texture Mapping



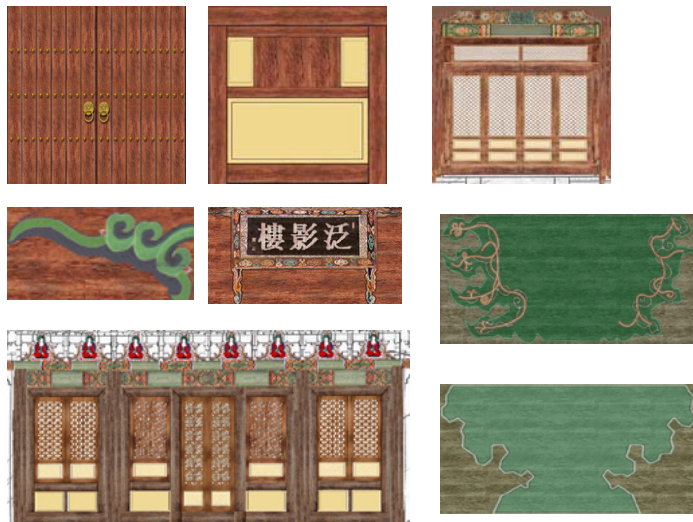
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## Texture Mapping



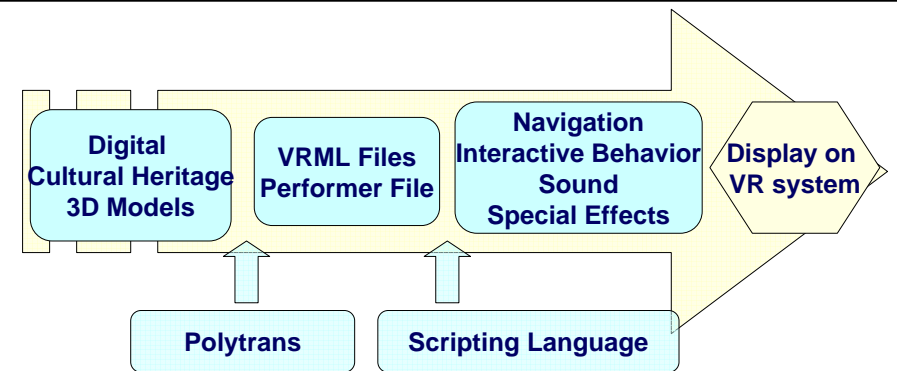
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## Texture Mapping Source Samples



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## VR Programming



VRML(Virtual Reality Modeling Language) for the Internet

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