

# ARCO

# **3D Model Creation**

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## 3D Model Creation – Overview







#### Build a 3D digital representation of the object

- > 3D geometry (accuracy, resolution ...)  $\rightarrow$  3D mesh
- > Texture (resolution, light, colour ...)  $\rightarrow$  images

#### Develop tools which fit to the context:

- ≻Museum collection (objects, time for modelling...)
- Museum staff competences
- ≻System cost



## ARCO: Two levels in 3D model creation

≻Object Modeller (OM)

≻Interactive Model Refinement and Rendering (IMRR) Tool



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## **Object Modeller**

State of the art of 3D modelling:

- ≻Laser scanning
- Mechanical system (probe contact)

≻Image based system:

- Low-cost solution
- Without contact technology
- Convenient accuracy
- Texture acquisition

#### ARCO : 2 systems are studying

≻Industrial software

≻Development of a custom system

•Design of specific hardware (stereo rig)

•Design of the User Interface/Computation Software



**Object Modeller: Industrial Software** 

Principle: 3D modelling from photographs:

Available products (Image Modeler, Photo Modeler)

≻Low-cost software (less than 2000€)

≻Easy acquisition

≻Process images from archive

### Step 1: Camera Calibration and View Registration





#### Step 2: 3D Reconstruction / Texture extraction



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Workshop on 3D digital acquisition at first Museum User Trials

- + 3D modelling of artefacts (simple shape, texture...)
- + Simple image acquisition process
- + Low-cost solution
- Difficult as soon as the artefact complexity increases
- Human driven : heavy and numerous interactions
- Time required for modelling a simple artefacts (several days)

Decrease and simplify the user interactions Increase the resolution of the 3D model



## Object Modeller The custom stereo system

- Image acquisition tools
- ➢ 3D model generation
- ▹ basic 3D model enhancement
- ➢ Export





#### **3D Stereo Reconstruction**







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## 3D Model Enhancement

Saving / Opening the mesh

➤3D Navigation

≻Face/vertex management

≻Smoothing, decimation



Merge of stereo reconstructions Under development...





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## Interactive Model Refinement and Rendering (IMRR) Tool Overview

- Customised 3ds max interfaces, scripts and plug-ins
  - Interface for the refinement of digitised models created with any variant of the Object Modelling tool
  - Interface for the creation of simple models directly within the IMRR
  - Database plug-in import VRML,MAX, textures and original images
- Future Work and Handling input from other sources
  - Other plug-ins, e.g. freehand trace, edge detection, ...
  - Import XDE
  - Export XDE
  - Laser input
  - Mechanical input



## IMRR – Customised 3ds max Interfaces

• The 2nd prototype IMRR offers two customized interfaces

Augmented Representation of Cultural Objects



## IMRR – Model Refinement Prototype 1

RC

- Refinement of digitized models created with variants of the Object Modeling tool
- IMRR 2nd prototype provides a customised user interface exposing only the functionality required to refine a typical model, such as that produced by Image Modeller



## IMRR – Future Refinement Prototypes

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- The IMRR Refinement Interface for the 3rd prototype and final system will provide the functionality required to refine models produced by OM
- The nature and scope of refinements will be determined by the quality of models provided by the OM



## **IMRR** – Model Creation

- Creation of Simple models directly within the IMRR tool
- From the 2nd prototype system onwards the IMRR provides a customised ۲ user interface exposing only the functionality required to create a simple model – i.e. models which exhibit some form of symmetry or have standard geometries



## IMRR – Database plug-in

- Current functionality
  - Browse ARCO database
  - Preview images
  - Import 3ds max projects
  - Import VRML
  - Search on XM metadata

Browse Database		C Search Database
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E-O Cup refined		In CO_Description
B-M CupOrig		
M measureVAM		Results from the search
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E- 4 cup_Final.WRL		
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		Desc: Media Object

### IMRR – Future Work

- Future Extensions
  - Other plug-ins, e.g. freehand trace, edge detection
  - Import XDE
  - Export XDE
  - Laser input
  - Mechanical input



RCC

## 3D Model Creation Conclusion

**Object Modeller** 

≻Image based system

Design a custom system to simplify user interactions

Interactive Model Refinement and Rendering Tool

► Based on 3D Studio Max

>Depending on outputs of the Object Modeller

≻Creation of simple artefacts

Access to ARCO database

