The ARCO Project

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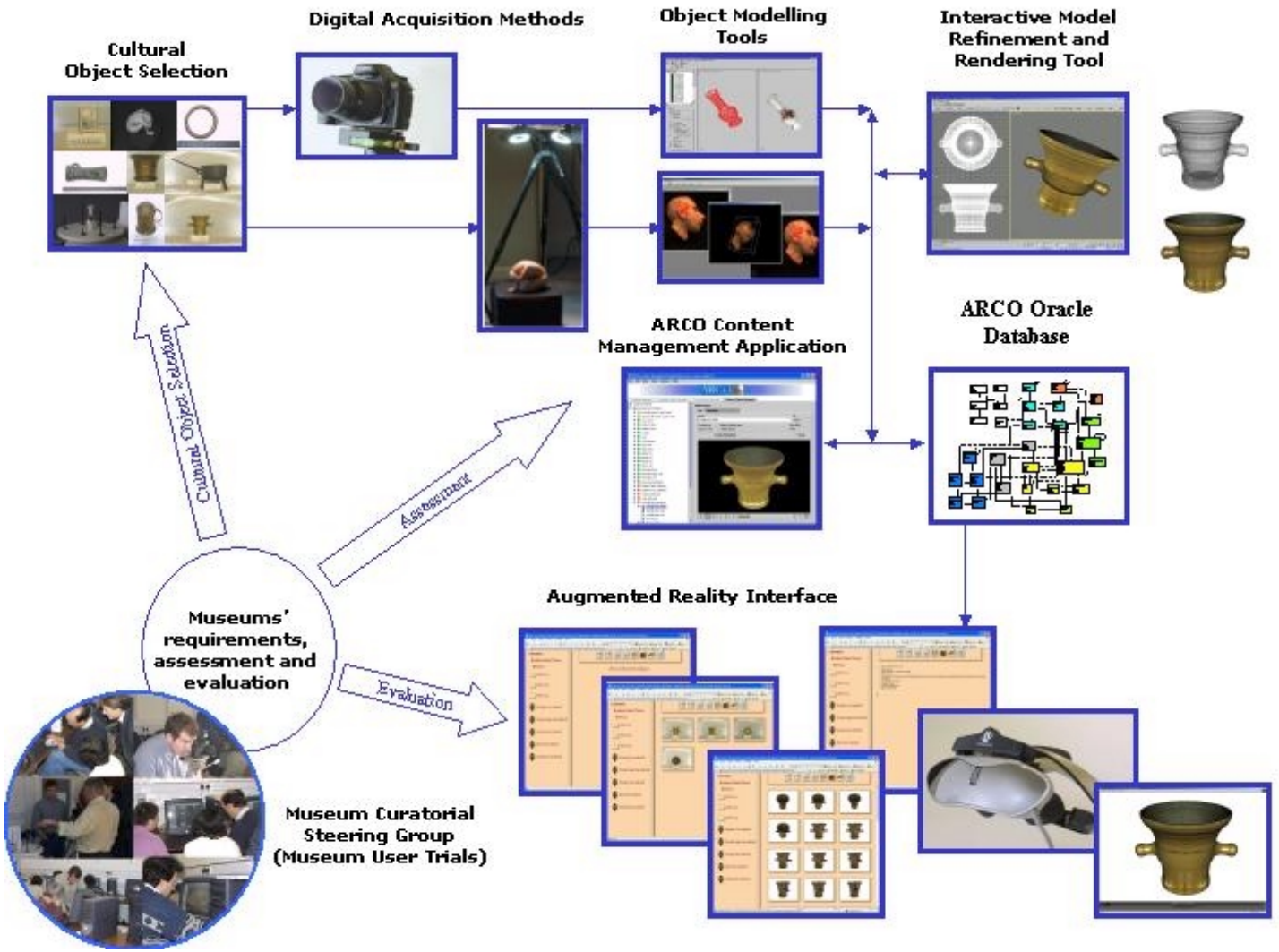
The ARCO RTD Project

- ARCO started in October 2001 as a three year RTD project
- Co-funded by the EC under the 5FP (IST)
  - Total investment is 2.8M Euro. 2.05M Euro from the EC
- Seven partners including two museum pilot sites from 4 European countries
  - United Kingdom: *University of Sussex, Victoria and Albert Museum, Sussex Archaeological Society, UKOLN at the University of Bath*
  - France: *Commissariat à l'Energie Atomique*
  - Poland: *Poznan University of Economics*
  - Italy: *GIUNTI Publishing Group*

Goals of the ARCO Project

- The ARCO aim is to develop innovative technology and expertise to help museums **Create**, **Manipulate**, **Manage** and **Present** cultural objects in virtual exhibitions both inside and outside museums
- How? By building a set of tools and processes from digitisation to visualisation:
  - **Digitise Artefacts using Photogrammetry**, **3D Modelling and Refinement**, **Database and Content management**, **Visualisation in a Virtual or Augmented Reality Environment**
  - **Interoperability**, i.e. an Open Architecture
    - XML Data Exchange between tools and other systems
    - Metadata Element Set based on Standards
- Why?
  - To allow museums to create virtual museums and galleries
  - Visitors can virtually interact with archived multimedia collections

ARCO Prototype Systems and Components

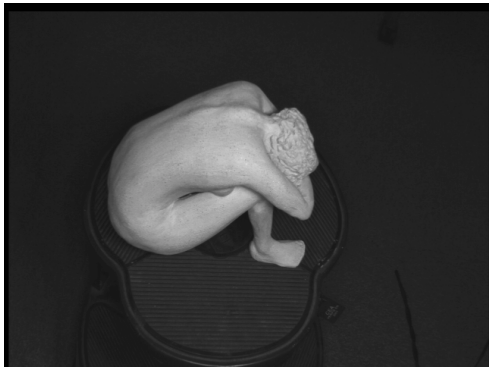


Create: Digitise Artefacts using Photogrammetry

- But first we need to select Museum Objects for 3D Modelling
- Objects selected by museum curator for model creation
- Method of modelling depends on features of the objects
  - Objects with *simple geometry* modelled with modified 3ds max or Maya
  - Objects with *complex geometry* modelled with:
    - Photogrammetry
    - Mechanical digitisers
    - Lasers

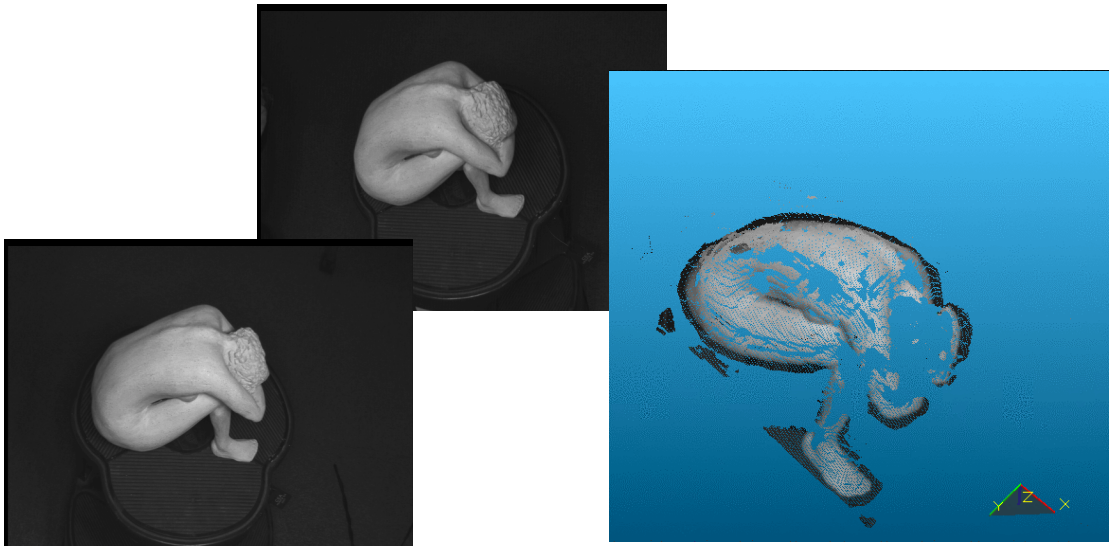
Simple Objects

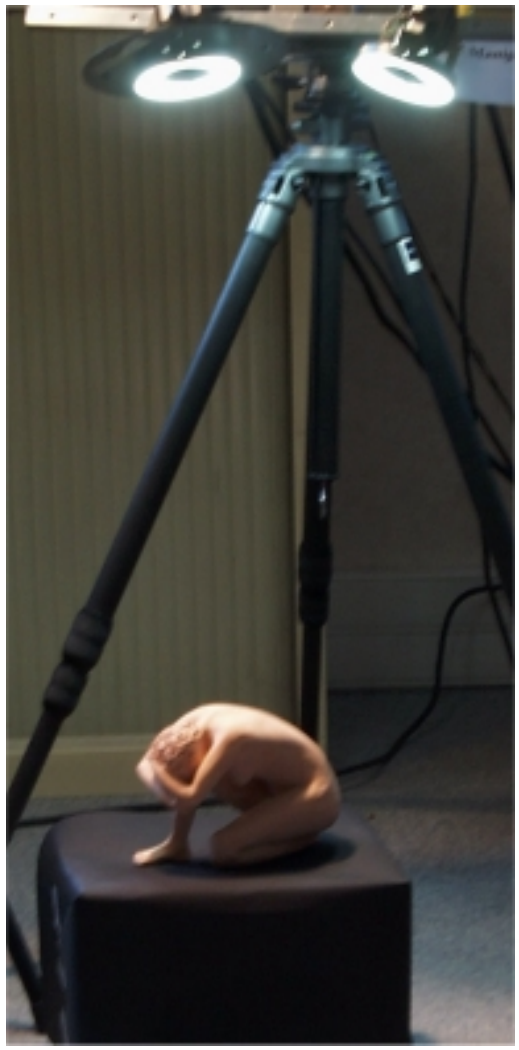
Complex Object



Create: Digitise Artefacts with the Object Modeller

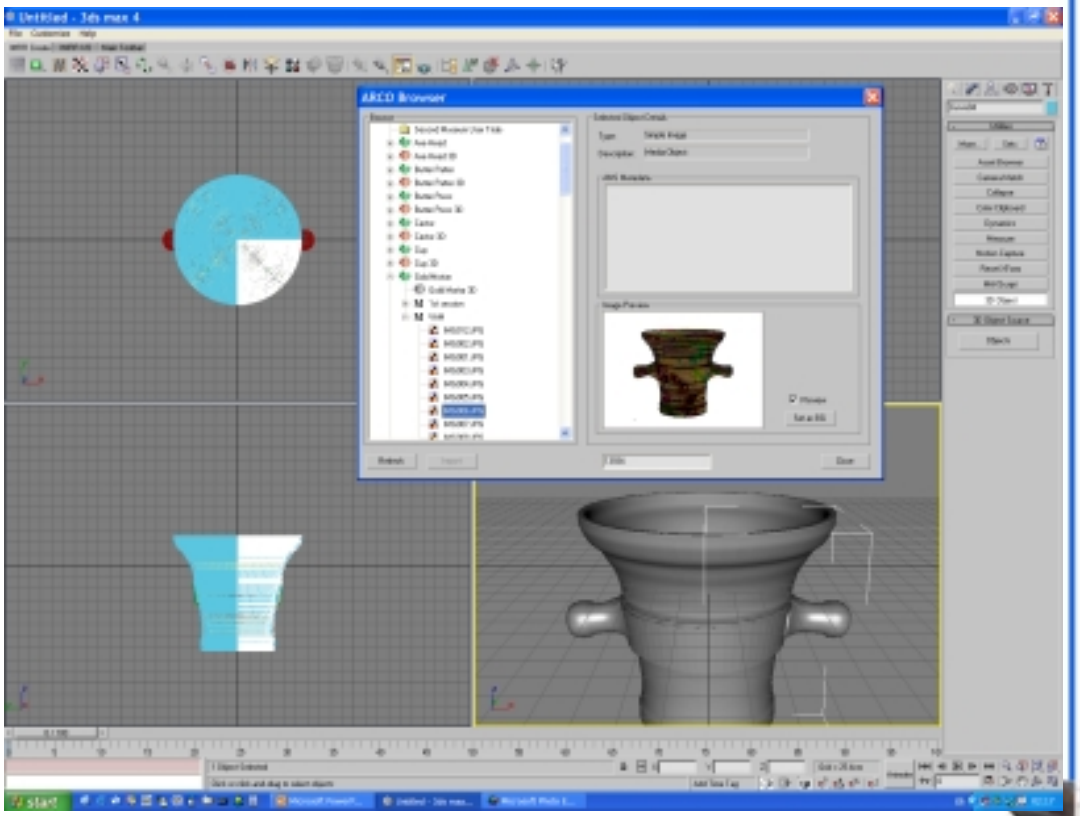
- For complex models ARCO is developing a stereo digital camera system:
  - Easy to use and portable in order to model artefacts with accuracy, completeness, texture
  - How? Several sequences of digital stereo pictures from which museum object geometry and textures are extracted and merged to produce a 3D textured model





Manipulate: 3D Modelling and Refinement

- Interactive Model Refinement and Rendering Tool
- A tool for refining digitised models and for creating simple models
- Key Features
  - Simple Interfaces
  - Refinement
  - Creation
  - Database Browser Plug-in
- Future Plug-in Extensions
  - XML Data Exchange
  - Roland Picza Laser Scanner (£7.5K)
  - MicroScribe GX2 (£2.5K)

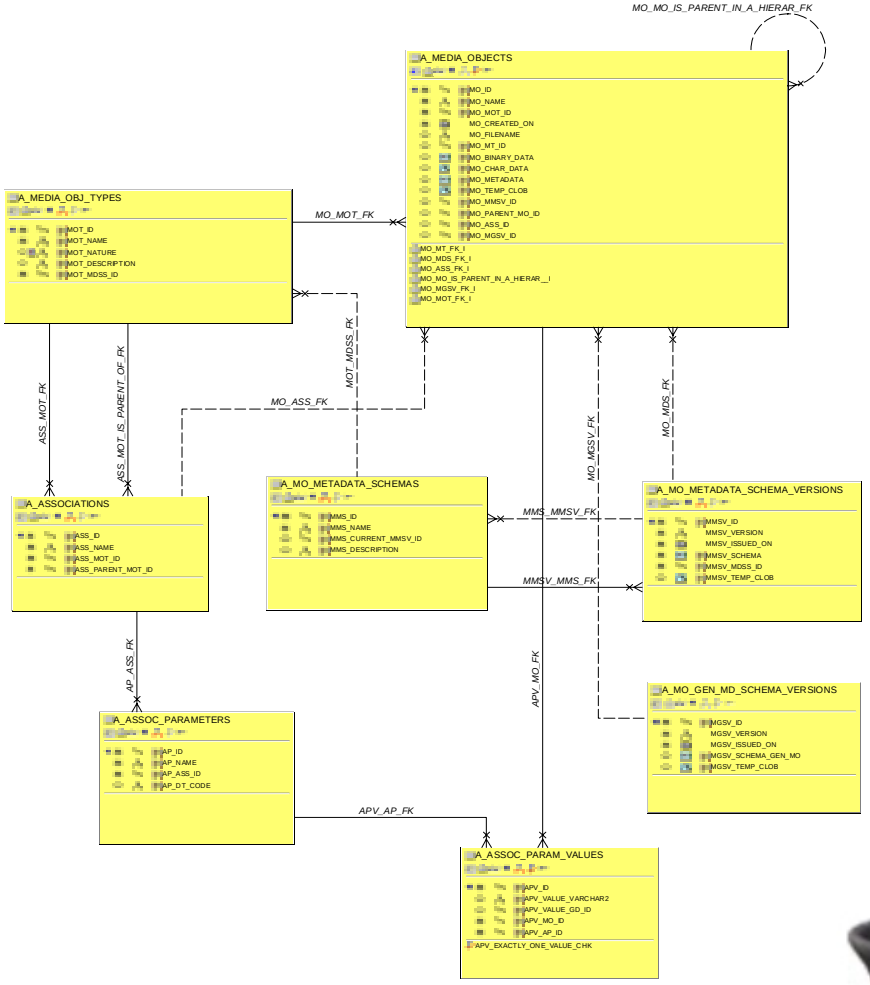


Media Objects from the Creation and Manipulation

- Sample media objects representing cultural objects in the database:
  - Images from the photogrammetry (OM)
  - VRML models exported from model refinement (IMRR)

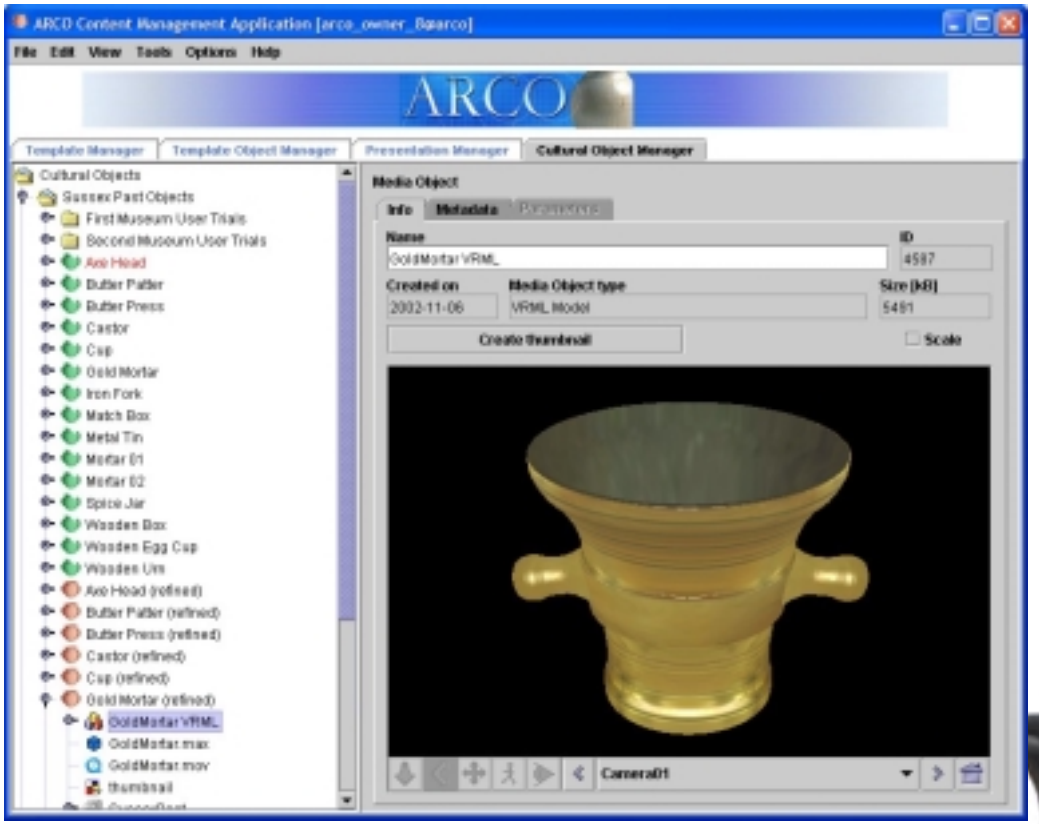
Manage: Object Relational Database

- All ARCO data is stored in a database for consistency
- Currently implemented in Oracle 9i ORDBMS
- Meta-schema approach allows to add new types of media objects without changing database structure, content management application, or visualization interface
- XML data stored in native XML format



Manage: Content Management Application

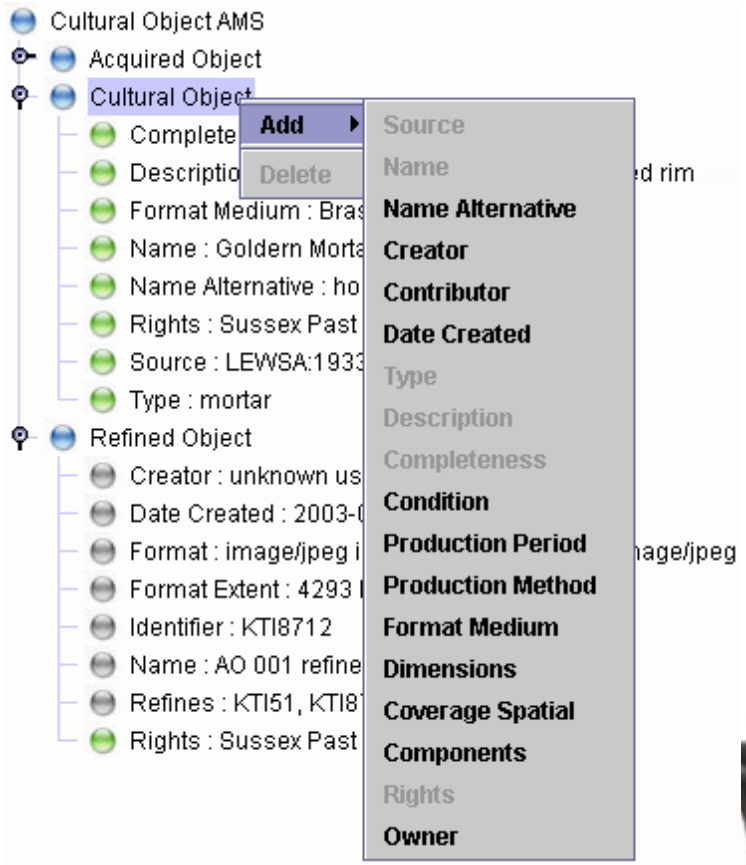
- Museums will not manage the database directly
- Specific application created for management of the ARCO database
- Provides several managers for ease data manipulation, e.g.
  - Loading and saving data
  - Creating, deleting, moving objects
  - Edit metadata
  - Manage X-VRML templates for the creation of virtual museums



Interoperability: AMS – ARCO Metadata Schema

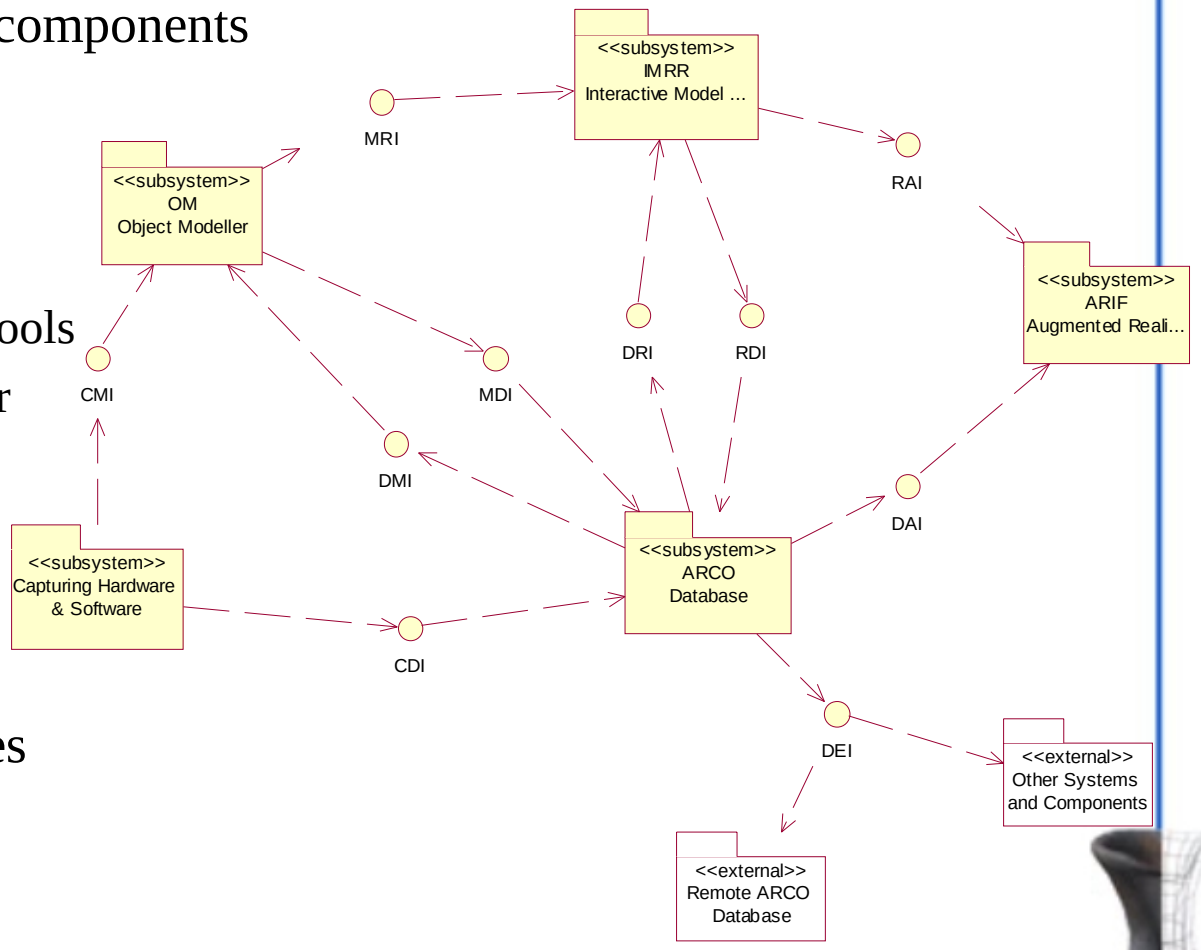
- AMS is a metadata schema for describing the ARCO process from digitisation to visualisation:
  - Resource discovery metadata
  - Curatorial and descriptive metadata
  - Technical metadata associated with ARCO components
- AMS elements:
  - Adopted from standards (DC, AMICO, SPECTRUM, etc.)
  - ARCO specific elements
- Implemented with XML Schemas
- Interoperability

AMS Metadata Editor



XDE – XML Data Exchange

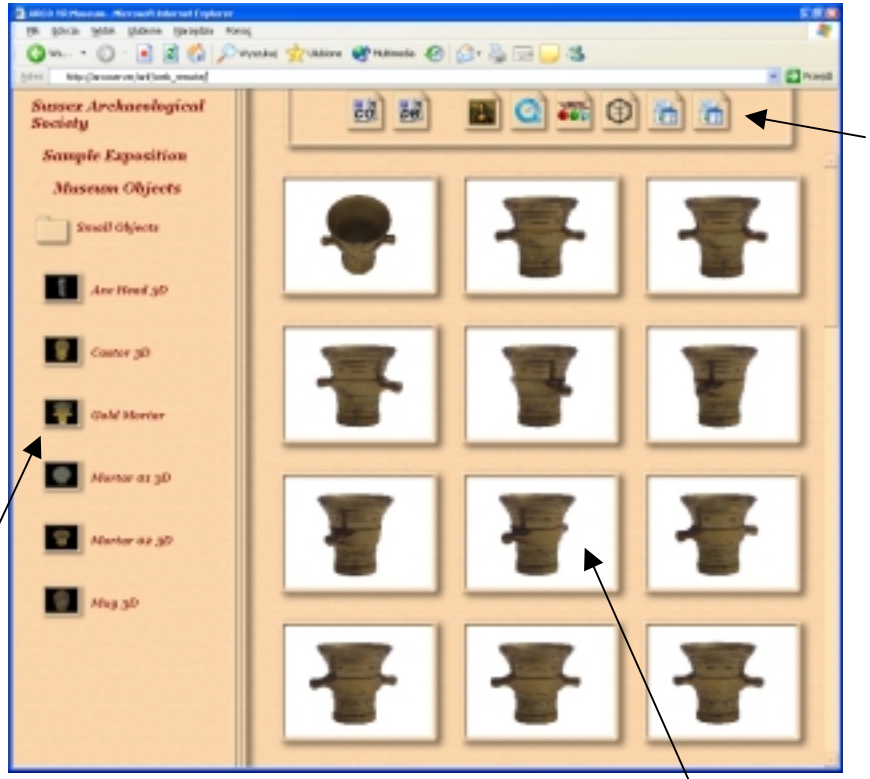
- XML interfaces of ARCO components
- Open architecture
  - Extensible set of ARCO tools
  - Interoperability with other systems
- Data exchange between distributed ARCO databases



Presentation: Augmented Reality Interface

- Visualisation on the database delivering ARCO media objects (e.g. VRML, metadata, pictures … virtual exhibitions) to the user
- Three visualisation interfaces
  - Remote Web Interface
  - Local Web Interfaces
  - Local AR version based on ARToolKit

Remote Web Interface in a Browser



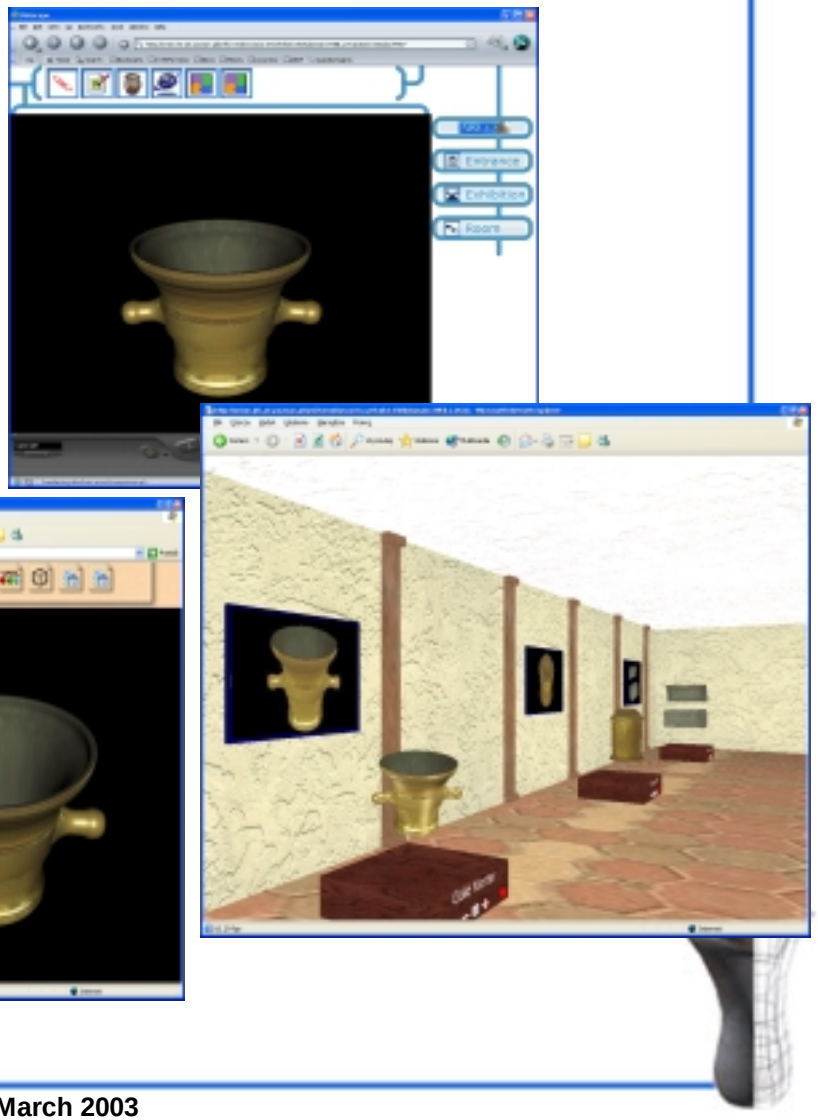
Media Object Selection

Database Navigation

Selected Media Objects

Presentation: Dynamic Modelling with X-VRML

- X-VRML – high-level XML-based language for creating dynamic VR models and parameterised presentation templates
- Dynamic creation of ARIF contents by combining data and X-VRML templates
- Same database content visualised three different ways by applying different X-VRML templates



Conclusions

- ARCO is developing an open architecture that integrates state-of-the-art with ARCO specific technologies to allow museums to build virtual exhibitions
  - Digitisation and modelling of 3D museum artefacts (OM)
  - Refinement and creation of the 3D virtual museum artefacts (IMRR)
  - Object relational database and content management application (ACMA)
  - Visualisation of museum exhibitions in a virtual environment (ARIF)
  - Integrated through XML technologies (X-VRML, AMS, XDE)

- Other information at ARCO website:
  - http://www.arco-web.org/