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ARCO



Augmented Representation of Cultural Objects

Building Virtual Museum Exhibitions



ARCO Project Partners

The University of Sussex (UK)

The Sussex Archaeological Society (UK)

The Poznan University of Economics (Poland)

Commissariat a l'Energie Atomique (France)

Giunti Gruppo Editoriale (Italy)

University of Bath (UK)

Victoria and Albert Museum (UK)



ARCO-Team @ Museum Association Conference, Brighton

- ARCO team on Stand 70
 - o Martin White (UoS)—ARCO Project Manager
 - o Krzysztof Walczak (PUE)—Database and Content Management
 - o Manjula Patel (UKOLN)—Heritage Metadata
 - o Patrick Sayd (CEA-LIST)—Digitisation
 - o Rafal Wojciechowski (PUE, UoS)—Virtual and Augmented Reality
 - o Mirosław Stawniak (PUE)—Database and Content Management
 - o John Manley (Sussex Past)—Small Museum Perspective
 - o James Stevenson (VAM)—Large Museum Perspective
 - o Fabrizio Giorgini (GIUNTI)—Business Models
 - o Nicholaos Mourkoussis (UoS)—Metadata and XML Schemas
 - o Joe Darcy (UoS)—3D Modelling of Museum Artefacts



Presentation Outline

- ARCO Project Introduction – Martin White (UoS)
 - **Tools for building virtual museum exhibitions**
- ARCO Technology Overview – Manjula Patel (UKOLN)
 - **Creating and Manipulating** 3D Models
 - **Managing** Cultural Object Database
 - **Presentation** of Cultural Objects using Virtual and Augmented Reality
- Benefits for Small Museums – John Manley (SussexPast)
- Benefits for Large Museums – James Stevenson (VAM)



ARCO Background

- ARCO started in October 2001 as a three year RTD project
 - 1 year left to run, on schedule to finish September 2004
- Seven partners including two museum pilot sites from 4 European countries
 - United Kingdom, France, Poland, Italy
- Co-funded by the EC under the 5FP (IST)
 - Total investment is 2.8M Euro. 2.0M Euro from the EC



ARCO Status

- Progress so far:
 - o 4 prototype systems and components completed, various configurations demonstrated at:
 - COMDEX Fall 2002, Las Vegas
 - EVA 2003 Florence and London
 - Example 4th prototype components are exhibiting on stand 70
 - Two Museum User Trials, third in October at Sussex Past
 - o Large dissemination activity:
 - Vision, Video and Graphics, UK
 - Visualisation, Imaging and Image Processing, Spain
 - Dublin Core, USA
- Immediate Future Developments:
 - o Final 12 months of project for more detailed system integration, assessment and evaluation, dissemination activities
 - o Technology Implementation Plan



ARCO Technology Overview



ARCO Project goals

Prototype systems and components

Digitisation of artefacts

3D modelling and refinement

Storing and managing digitised objects

ARCO data model

Metadata in ARCO

Visualisation of digitised artefacts

Manjula Patel (UKOLN, University of Bath)

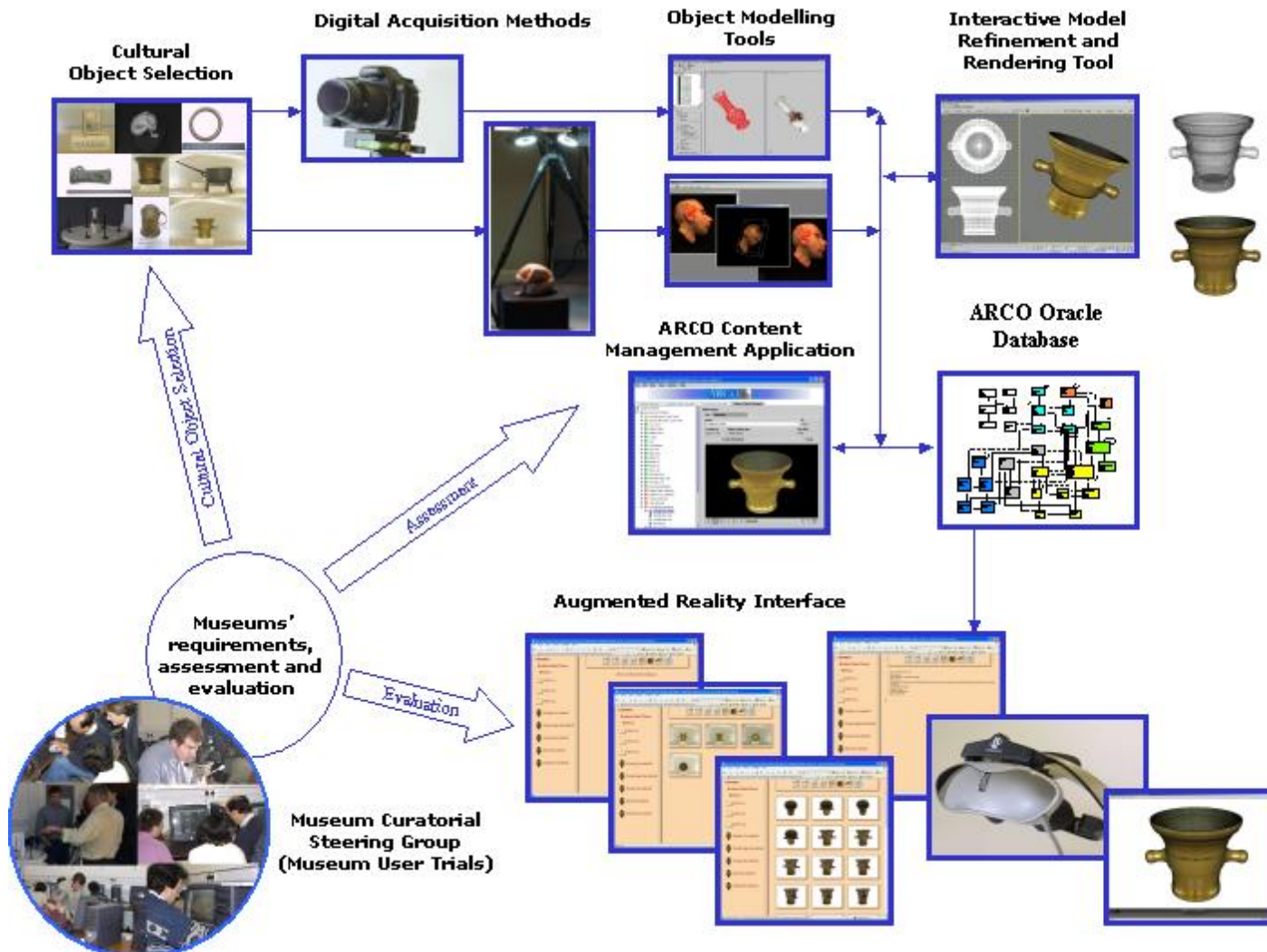


Goals of the ARCO Project

- Develop innovative technology and expertise to help museums **Create**, **Manipulate**, **Manage** and **Present** cultural objects in virtual exhibitions both within museums and over the Web
- Why?
 - To allow museums to have an online (3D) presence
 - To enable interaction with digital representations of collections
- How? By building a set of tools and processes from digitisation to visualisation:
 - **Digital capture of artefacts**, **3D modelling and refinement**, **Database and content management**, **Visualisation in virtual or augmented reality environments**
 - **Interoperability** i.e. an Open Architecture
 - XML Data Exchange between tools and other systems
 - Internet, Web, graphics and metadata standards



ARCO Prototype Systems and Components



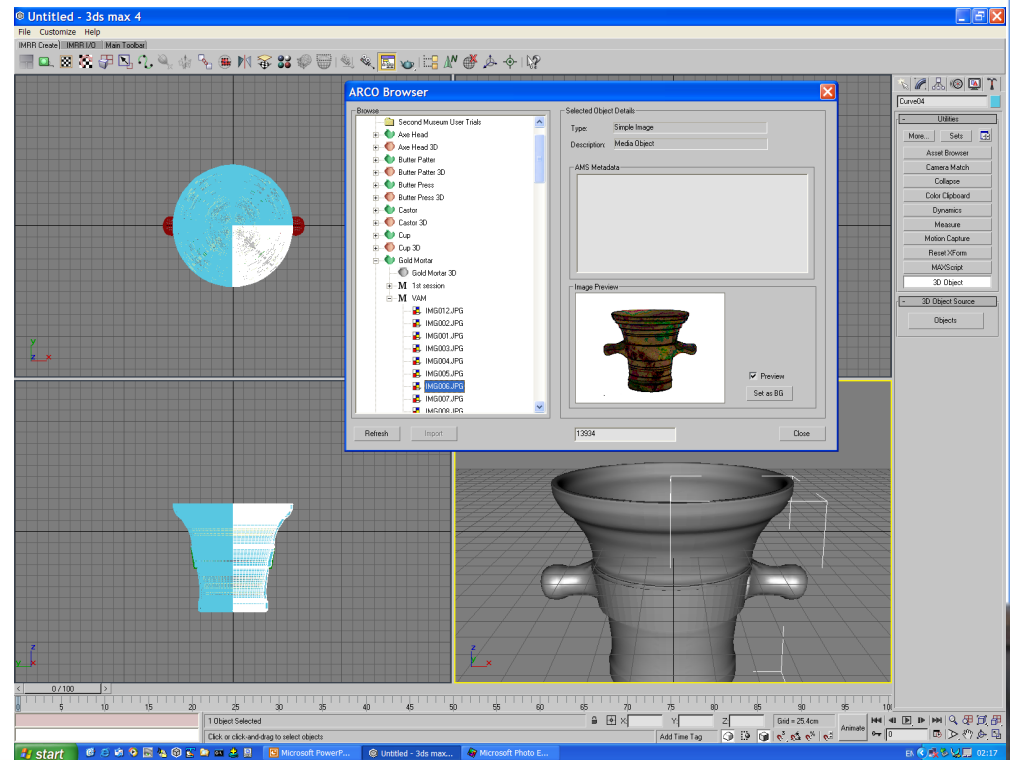
Create: Digitise Artefacts with the Object Modeller

- Method of modelling depends on features of the objects
 - Objects with simple geometry are modelled with modified 3ds max or Maya
- For complex models we use a custom built stereo digital camera system:
 - Object geometry and textures are extracted from sequences of stereo pictures and merged to produce a 3D textured model
 - Portable in order to gain access to fragile artefacts
 - Ease of use for museum staff who are not experts in 3D measurement
 - Result should be an accurate 3D model of the artefact in terms of shape, texture and resolution
 - Automated stereo reconstruction as far as possible



Manipulate: 3D Modelling and Refinement

- A tool for interactive model refinement and rendering
- Creation of simple models and refinement of digitised models
 - smoothing the object geometry
 - reducing polygon count for Internet based rendering
 - re-applying lighting
 - repairing missing parts
- Database connectivity
 - search and browse objects
 - import and export models (including models generated by other methods, e.g. Mechanical scanning, Laser scanning)



Media Objects from Creation & Manipulation Stages

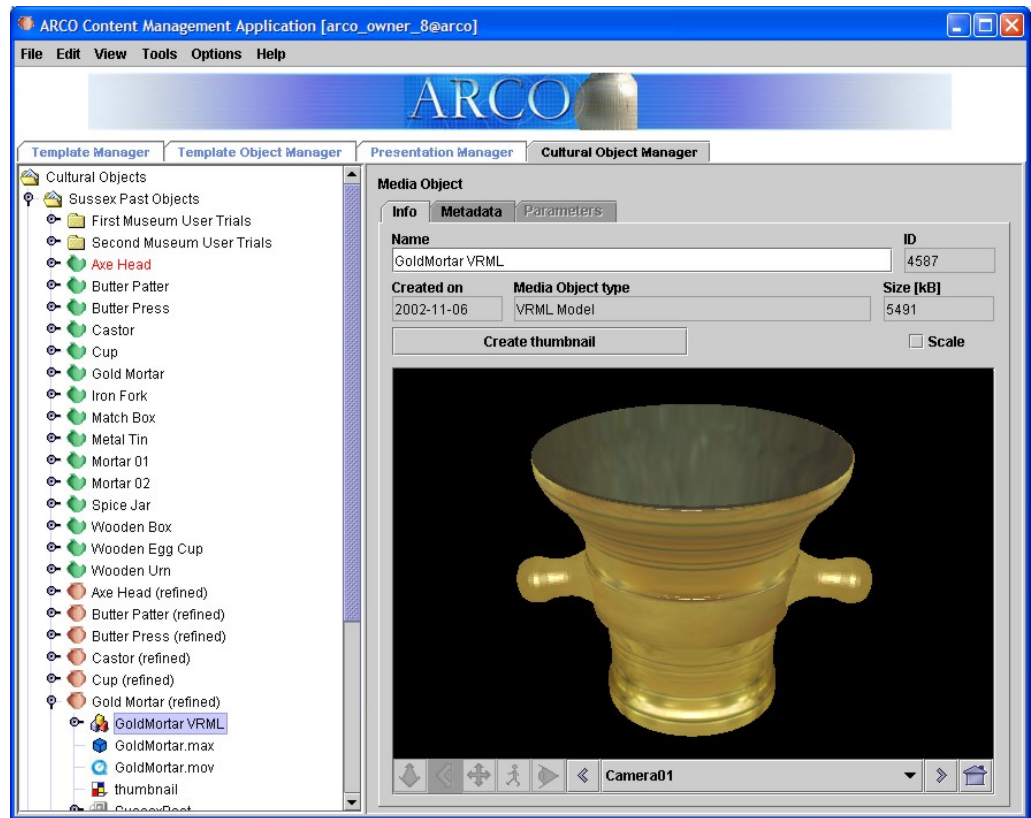
Sample media objects representing cultural objects in the database:

- Images from the photogrammetry process
- VRML models exported from model refinement



Manage: Content Management Application

- All ARCO data is stored in a database for consistency
- Museums do not manage the database directly, but through a Content Management Application (ACMA)
- ACMA provides several managers for ease of data manipulation, e.g.
 - o Cultural objects
 - o X-VRML templates
 - o Virtual exhibitions



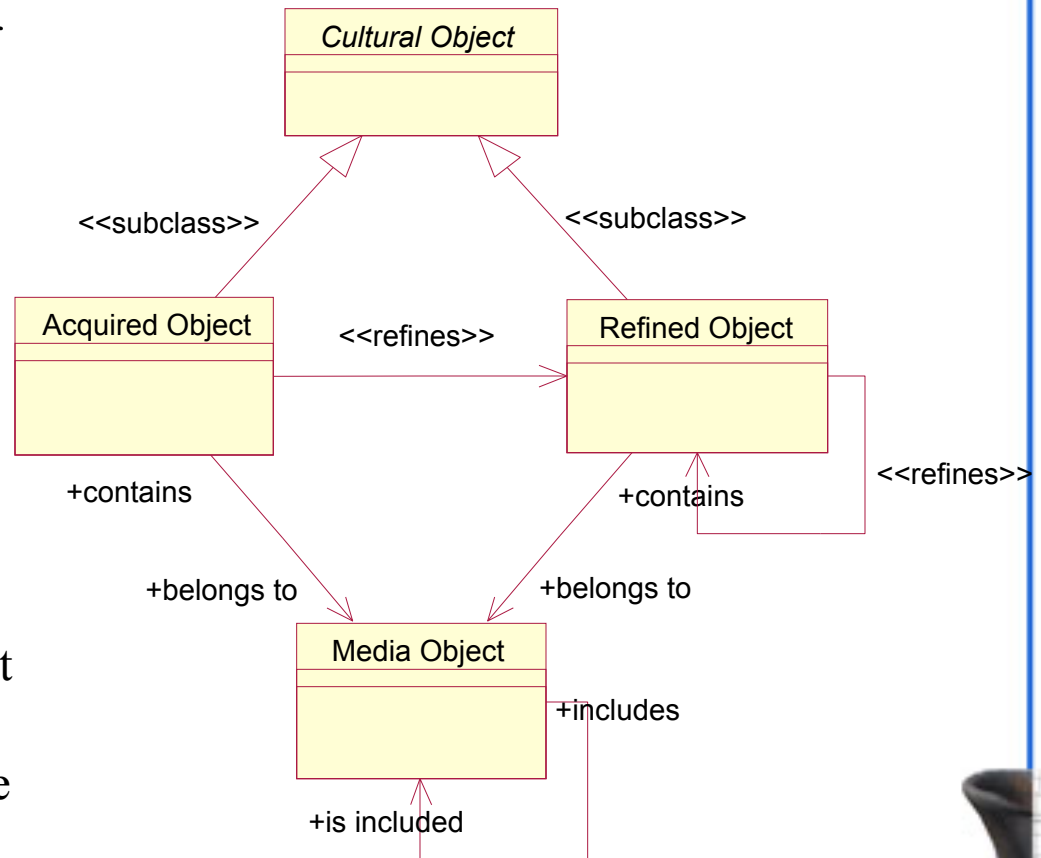
ARCO Data Model

Cultural Object: descriptive curatorial metadata, surrogate for the physical artefact

Acquired Object: digital representation of the physical artefact

Refined Object: acquired (or refined) object which has been modified

Media Object: individual object which makes up a digital representation (3D model, texture maps, description etc.)



Interoperability: Metadata for Digital Artefacts

- AMS –ARCO Metadata Schema, is a vocabulary for describing processes from digitisation to visualisation:
 - o Resource discovery metadata (DCMES)
 - o Descriptive curatorial metadata (mda SPECTRUM)
 - o Technical metadata (preservation)
 - o Themed metadata (intelligence, effort report)
 - o ARCO specific elements
- Interoperability
 - o Data exchange between ARCO components
 - o Cross domain and compatibility with museum best practice
- Implemented with XML Schemas

AMS Metadata Editor

The screenshot shows the AMS Metadata Editor interface. On the left, a tree view displays the following structure:

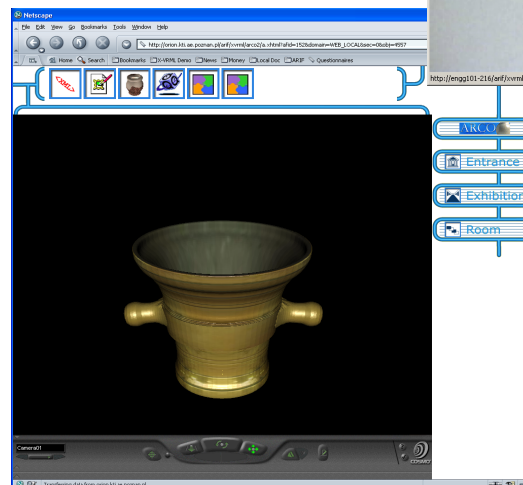
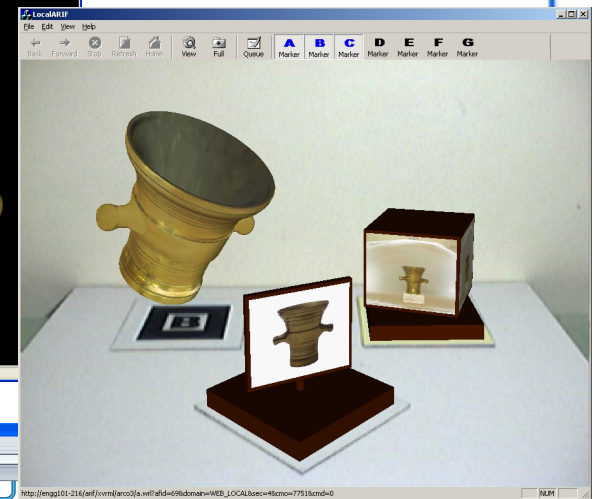
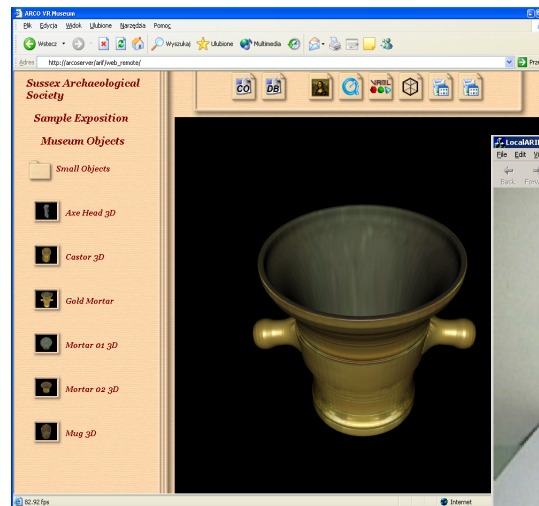
- Cultural Object AMS
 - Acquired Object
 - Cultural Object
 - Complete
 - Description
 - Format Medium : Brass
 - Name : Golden Mortar
 - Name Alternative : ho
 - Rights : Sussex Past
 - Source : LEWSA:1933
 - Type : mortar
 - Refined Object
 - Creator : unknown us
 - Date Created : 2003-0
 - Format : image/jpeg i
 - Format Extent : 4293 I
 - Identifier : KT18712
 - Name : AO 001 refine
 - Refines : KT151, KT18
 - Rights : Sussex Past

A context menu is open over the 'Cultural Object' node, showing the following options:

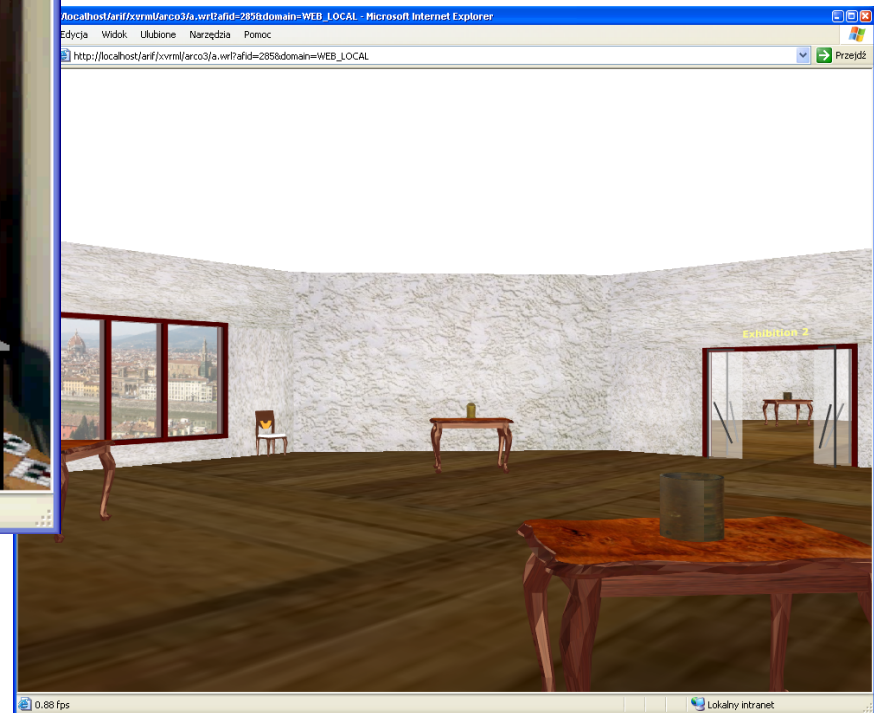
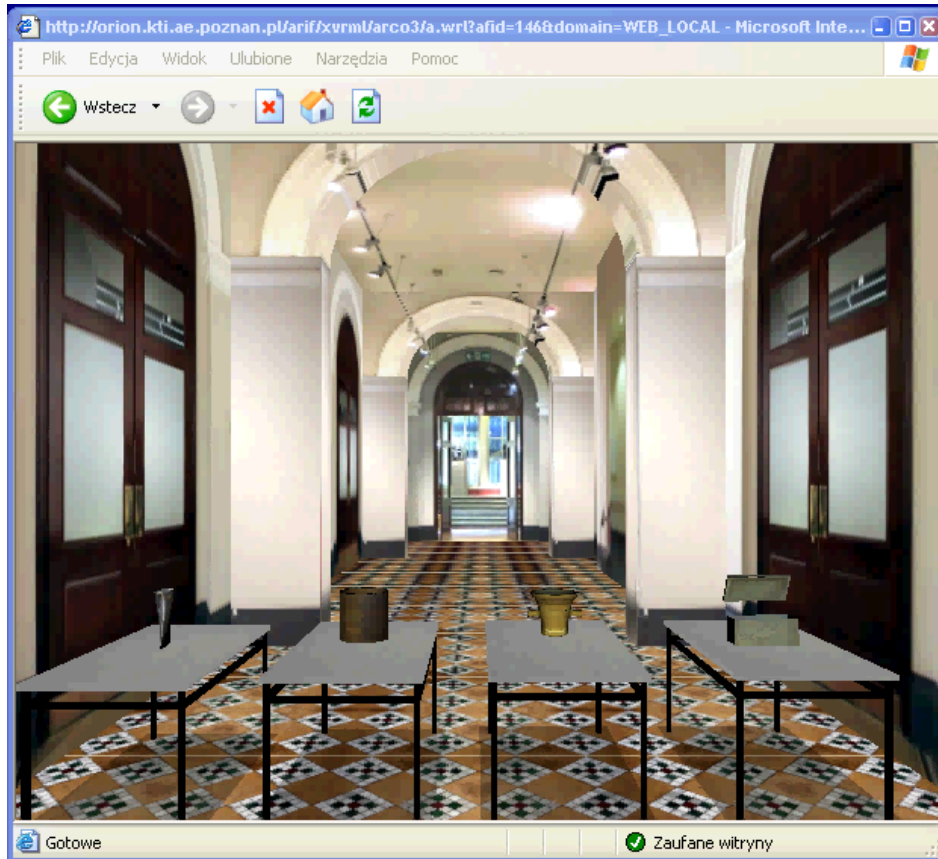
- Add
- Delete
- Source
- Name
- Name Alternative
- Creator
- Contributor
- Date Created
- Type
- Description
- Completeness
- Condition
- Production Period
- Production Method
- Format Medium
- Dimensions
- Coverage Spatial
- Components
- Rights
- Owner

Presentation: Augmented Reality Interfaces

- Visualisation of ARCO media objects from the database
 - VRML models, metadata, images, virtual exhibitions
- Three visualisation interfaces, same database contents
 - Remote Web Interface (search, browse)
 - Local Museum touch-screen (search, browse)
 - Local Augmented Reality environment (interact)



Virtual Museum Exhibitions and Galleries



Conclusions

- ARCO is developing an open architecture that integrates state-of-the-art with ARCO specific technologies to enable museums to build virtual exhibitions
 - Digitisation and modelling of 3D museum artefacts (OM)
 - Refinement and creation of the 3D virtual museum artefacts (MR)
 - Object relational database and content management (ACMA)
 - Visualisation of museum exhibits in virtual environments (ARIF)
 - Integrated through XML technologies (X-VRML, AMS, XDE)
- ARCO tools are end user driven through museum pilot sites being closely integrated into the design process
- Visit us at the ARCO website:
 - <http://www.arco-web.org/>
 - Stand 70

