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Preservation of Interactive Multimedia Systems with an Ontology based Approach

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Overview

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- Context – CASPAR EC IST Project
- Interactive Multimedia Performance Systems (IMP)
 - Music via Motion (MvM), www.leeds.ac.uk/icsrim/mvm
 - i-Maestro 3D Augmented Mirror (AMIR) System, www.i-maestro.org
 - ICSRiM Conducting Interface
- CASPAR Conceptual Model
- CIDOC-CRM and FRBR ontologies
- ICSRiM IMP Archival System
 - Interface and functionalities
 - Validation
- Conclusions




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Context

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- CASPAR EC IST Project
 - Build a framework to support end-to-end preservation lifecycle for scientific, artistic and cultural information
- Contemporary performing arts testbed
 - Interactive Multimedia Performance (IMP)
- Interactive Multimedia
 - Technology-enhanced
 - Performances
 - Learning
 - Preservation
 - Performance capture/recording and analysis beyond AV

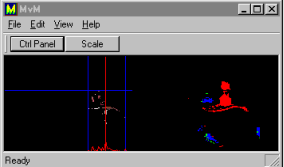
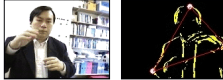



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Music via Motion (MvM)

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- MvM: A framework to integrate interactive multimedia, motion sensing, audio synthesis, VR and AR technologies
 - explore virtual and augmented instruments
 - provide users/performers with real-time control of multimedia events with their physical movements
- Application areas include stage performance and installation arts



Ready

IMP Elements and Processes

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Example of an IMP production process
(based on Music via Motion (MvM) system, www.kcng.org/mvm)

www.kcng.org.uk

i-Maestro 3D Augmented Mirror (AMIR)

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- Technology-enhanced learning
- More in-depth recording and understanding
 - playing gesture
 - Intangible heritage
 - Individual performance style
- Data stream include: Audio + Video + 3D motion data + Sensor data + Analysis
- Multimodal feedbacks with graphical visualisation and sonification
- Max/MSP jitter, c/c++, Lua, SDIF

Excerpt from Bach's Partita No. 3 in E major, BWV 1006 (Preludio)

www.kcng.org.uk

AMIR

i-Maestro: www.i-maestro.org

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www.kcng.org.uk

ICSRiM Conducting Interface

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- A system for tracking and analysing a conductor's hand movements
- Uses multiple wii-motes to capture a conductor's movements
- These movements are analysed
- This information is then fed back to the user in an entertaining yet educational manner

www.kcng.org.uk

GUI

- 3D environment
- Intuitive UI
- Multiple modes
 - Visualisation and sonification
- Multimodal data capture and analysis

Complexity of the IMP Preservation

- IMP rely heavily on digital media
- A recording (e.g. video) of a performance is not sufficient for re-performance
- Preserving individual components of a performance is clearly a challenge
- However, putting these components together in one place does not make a performance
- They need to be assembled in a logical and temporal order with their inter-relationships
- Preserving this knowledge through time is even more challenging
- Preservation for
 - Re-performance at a later time
 - Historical study/analysis in performing arts in the future
 - Better preparation for the future needs

Example IMP - from a Music via Motion (MvM) performance involving motion generated music with dance

Example IMP interface from the i-Maestro EC IST Project involving 3D motion data, sonification, and graphical feedbacks

CASPAR Conceptual Model

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Based on the OAIS Information Model

- OAIS: Open Archival Information System
- Originally a recommendation for space data system standards
- An ISO standard for archival information systems
- OAIS defines a standard set of terminologies, conceptual and functional models for an archival information system
- OAIS can be used to promote the interoperability amongst digital libraries and archives that maintain digital information over the long term

CIDOC-CRM


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- The CIDOC Conceptual Reference Model (CIDOC-CRM) has been proposed as a standard ontology for enabling interoperability among digital libraries
- International Committee for Documentation (CIDOC) of the International Council of Museums (ICOM)
- It defines a set concepts for physical and temporal entities

CIDOC-CRM FRBR Extension

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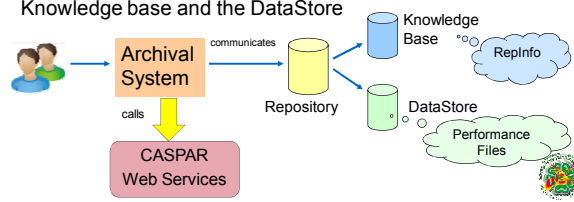
- Two main objectives in extending CIDOC-CRM for the preservation of IMPs:
 - To provide a domain specific vocabulary for describing an IMP. (e.g. details on how the archived performance was carried out and how it can be recreated)
 - To provide a vocabulary for describing digital objects, their interrelationships and operations performed on them in the digital preservation context.
- The FRBR (Functional Requirements for Bibliographic Records) describes a high level conceptual model of creative works and how they are represented in the real world
- It is used as extension ontology of the CIDOC-CRM for describing the conception process of the performance



ICSRiM IMP Archival System

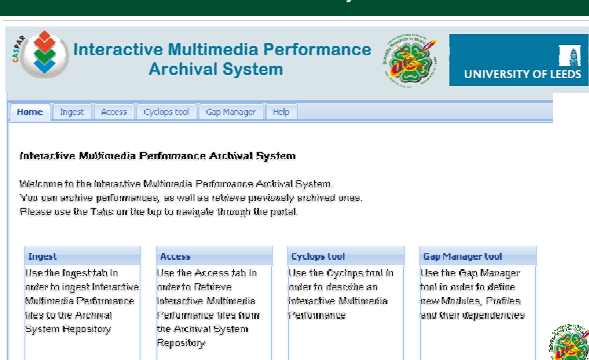
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- The ICSRiM Archival System is used for the implementation of the preservation scenarios
- Integration of the selected CASPAR components as web services
- Communication with the Repository containing the Knowledge base and the DataStore




Web Interface of the Archival System

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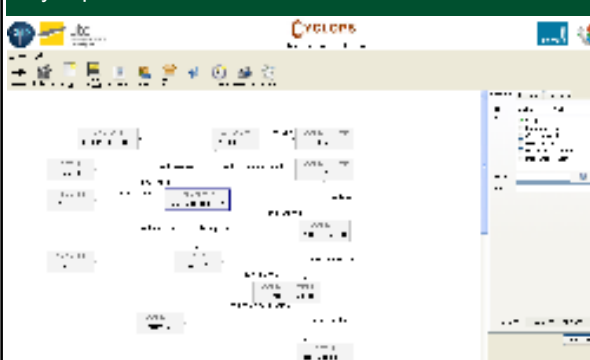




Ingest	Access	Cyclops tool	Gap Manager tool
Use the Ingest tab in order to ingest Interactive Multimedia Performance files to the Archival System Repository	Use the Access tab in order to retrieve Interactive Multimedia Performance files from the Archival System Repository	Use the Cyclops tool in order to describe an Interactive Multimedia Performance	Use the Gap Manager tool in order to define new Modules, Profiles and their dependencies




Cyclops Interface

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Validation  UNIVERSITY OF LEEDS


- **Participant**
 - experts who work with IMP
- **Validation**
 - Ingestion of an IMP work (their own work)
 - Retrieval and reconstruction of an IMP they have no information about it
 - Install and performance the components using the instructions
- **Results**
 - The system is useful to store efficiently IMPs
 - The system provided all the needed instructions for the reconstruction of an IMP
 - Some difficulty in using Cyclops (complexity of the graphs)
- **Responses to feedback received**
 - Demo videos and tutorials helped
 - Template graphs for Cyclops




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Conclusions  UNIVERSITY OF LEEDS

- Digital preservation of interactive multimedia performances is a challenging issue
- Preserving knowledge is vital for future reconstruction of interactive multimedia performances
- a preservation framework based on ontologies
 - Make use of standard ontology models
 - Used to define interrelationships between the components
- a web-based Archival System for the preservation of IMPs
- Integrated selected components of the CASPAR Framework
- Future work
 - Extend functionality of the system
 - Mechanisms providing notifications to users when a change occurs




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Thank you!

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