

Experiences in applying augmented reality techniques to adaptive, continuous guided tours.

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LIFEPLUS

- “Innovative revival of life in ancient frescos and creation of immersive narrative spaces, featuring real scenes with behaved virtual fauna and flora”.



LIFEPLUS Consortium

- **FORTH, 2D3 Ltd.**
 - (Video Tracking)
- **Bionatics S.A.**
 - (3D Plant Modelling and Animation)
- **IGD Fraunhofer Institute for Computer Graphics**
 - (AR Authoring Tools, Video Tracking)
- **INTRACOM S.A.**
 - (Mobile AR Platform, Databases, System Integration)
- **Swiss Federal Institute of Technology, University of Geneva**
 - (3D Life Modelling and Animation)
- **noDNA A.G.**
 - (3D Human Models)
- **A&C2000 S.R.L.**
 - (GPS and GIS Systems)
- **Archaeological Superintendence of Pompeii, University of Milan**
 - (Archaeological Data and Story Telling)

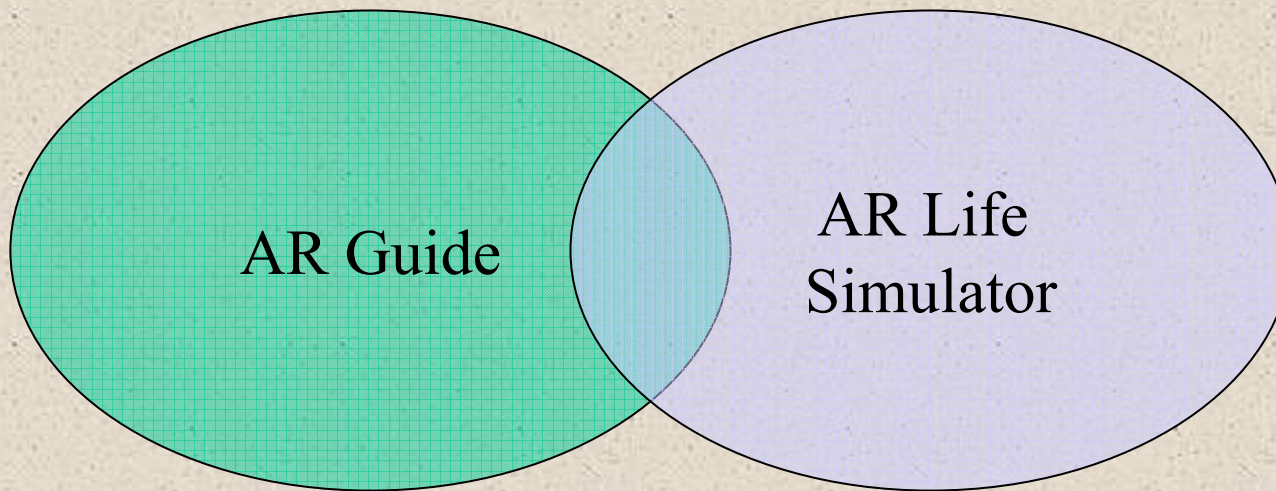
State-of-the-Art

- Audio Guides
- Web-Sites
- PDAs (SottoVoce, Chateau deVersailles)
- Pen-Tablets (MUSE)
- VR
- MR (ENAME)
- AR
 - MARS, ARCHEOGUIDE, GEIST, Tokyo Museum

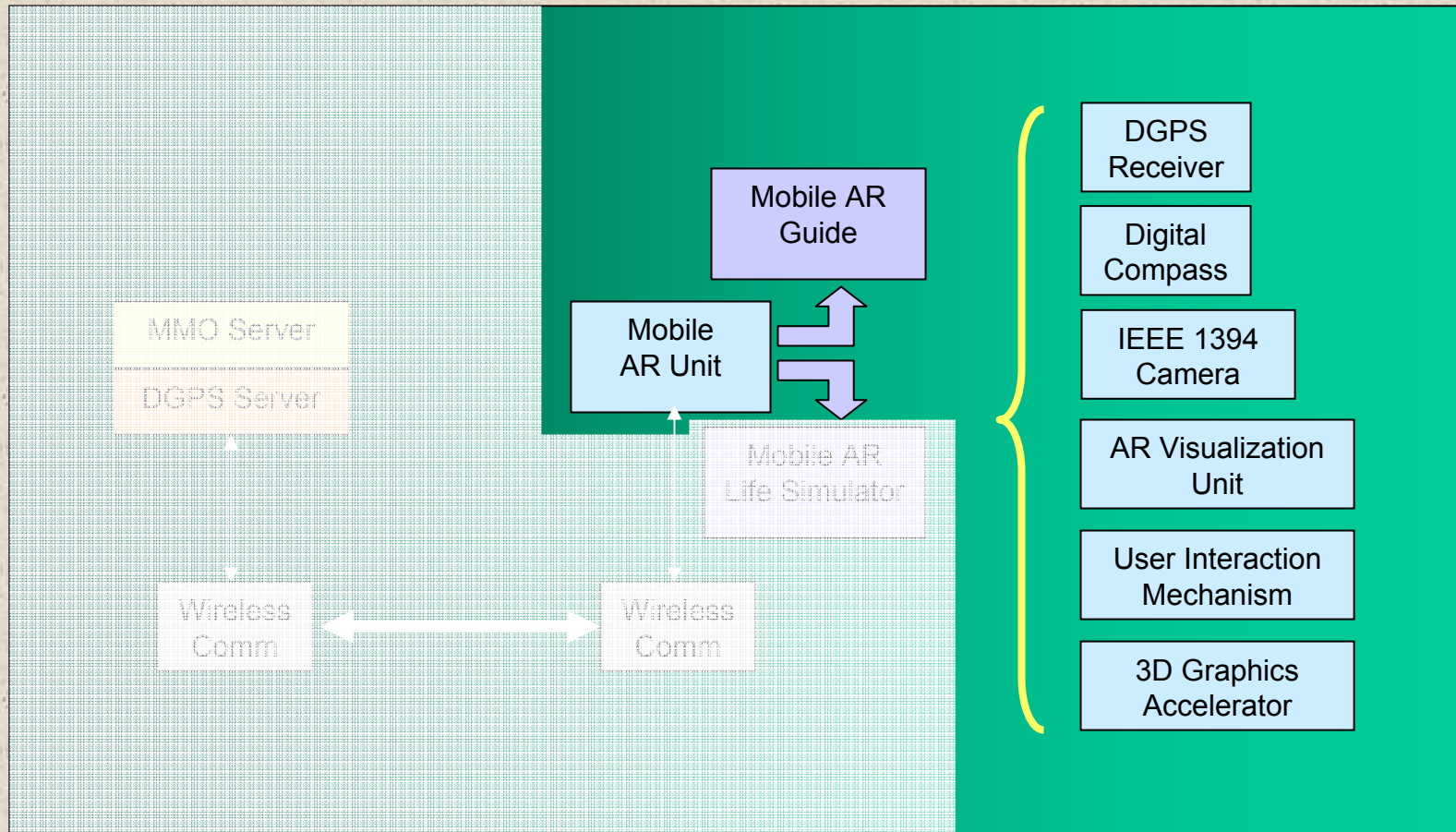
What is LIFEPLUS?

- E-guide
- Ubiquitous AR Tour Companion
- AR Life Simulator
- Mobile AR Platform
- Enhanced Cultural Metadata Scheme
- MMO Personalization Scheme
- 3D Camera Tracking

2-module System



Hardware Architecture (1)

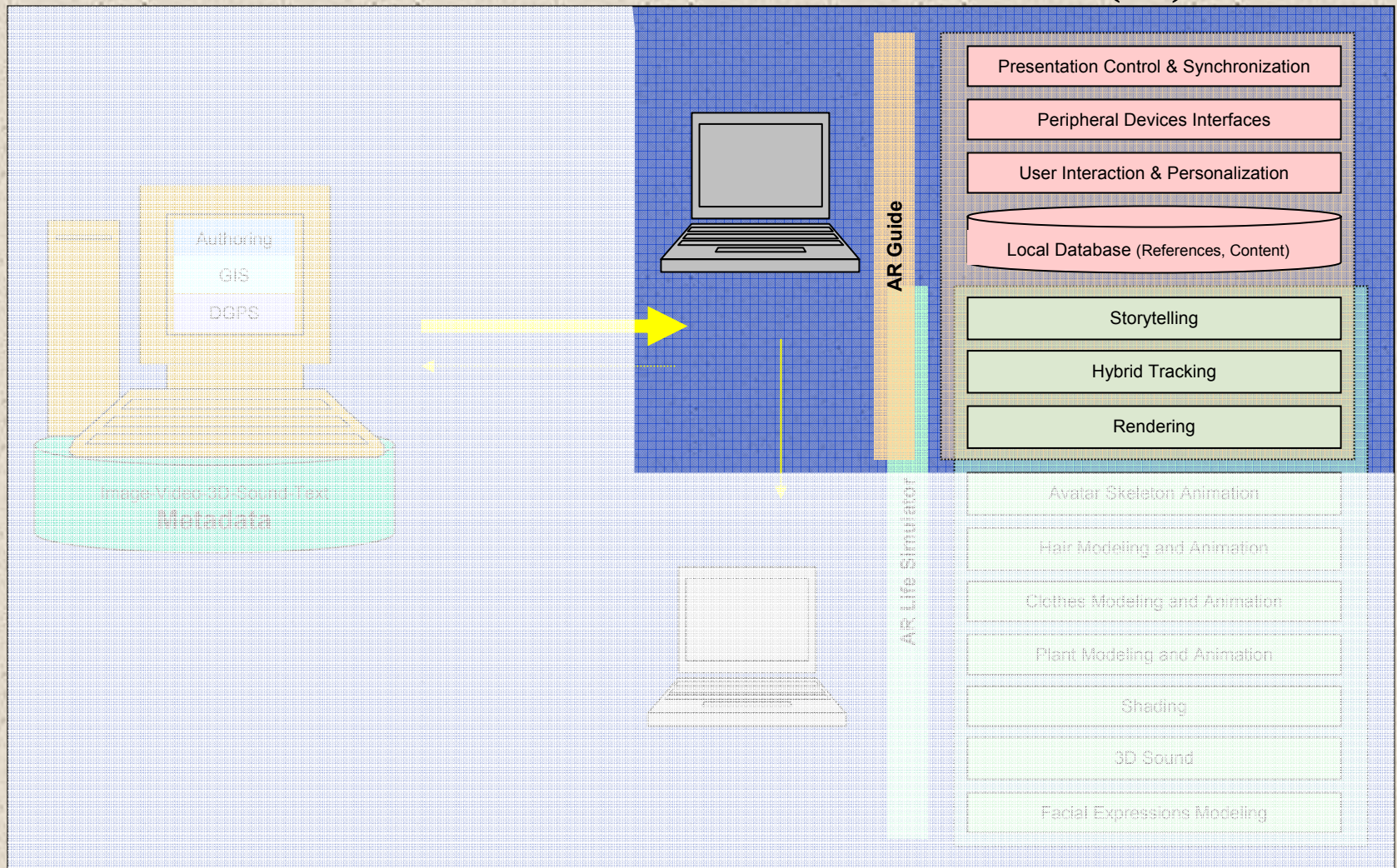


Hardware Architecture (2)

- N-Vision AR Binoculars
 - 600x800 pixels
 - Video see-through
- 3-button UI set
- Unibrain Fire-I IEEE 1394a Digital Camera
 - VGA (640x480 pixels)



Software Architecture (1)



Positioning System (1)

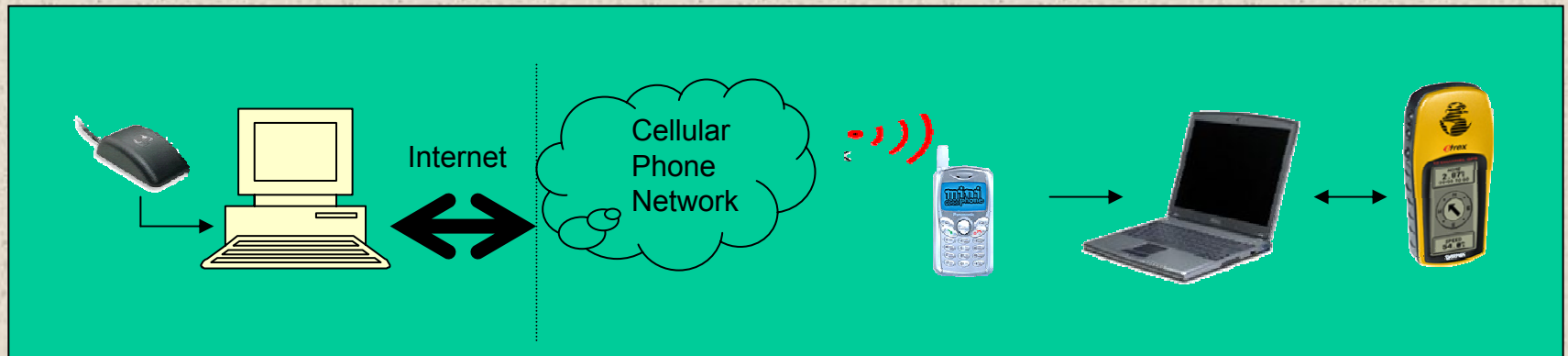
- 12-channel GPS receivers
- DGPS server (WGS84 system)
 1. Pair of Bidirectional Radio Modems @ 433MHz
 - 500m range for line-of-sight
 - Accuracy: 15m → cm
 - Acquisition Times: 15-45sec
 - Weight: 150gr



Positioning System (2)

2. GSM/GPRS Mobile Phone

- GSM corrections over the Internet & cellular network (Galileo Sistemi)
- DB9 connector to the mobile unit
- Bluetooth connection to the mobile phone



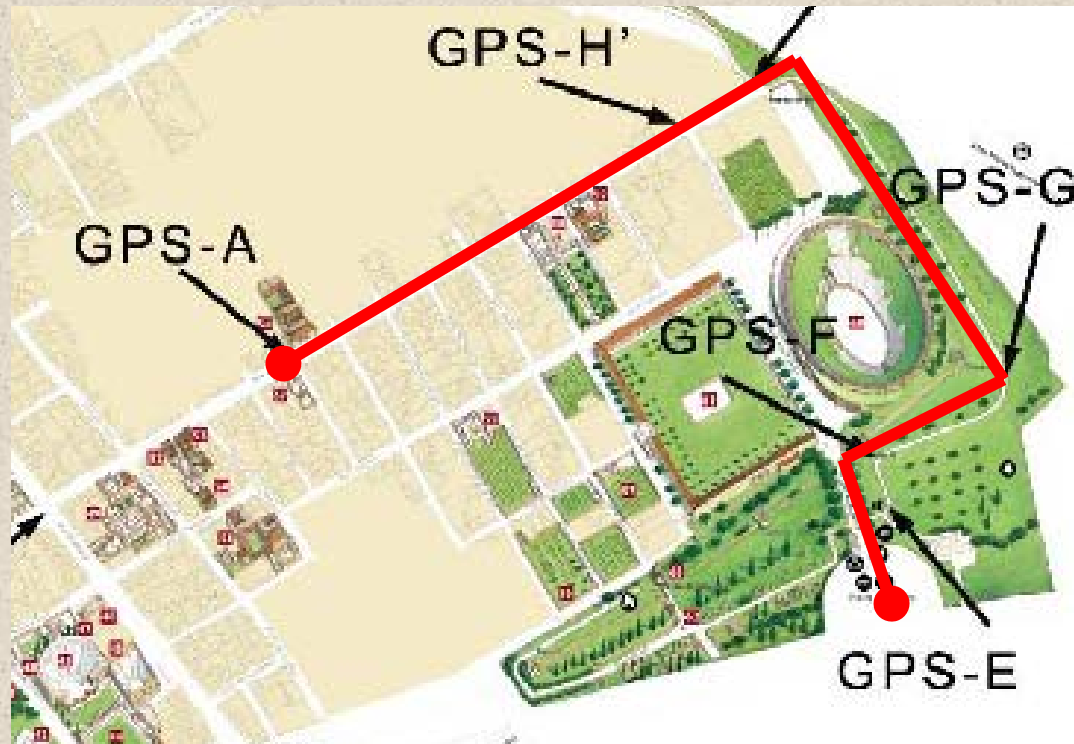
Tour Path

- Always Active AR Guide
- On Demand AR Life Simulator



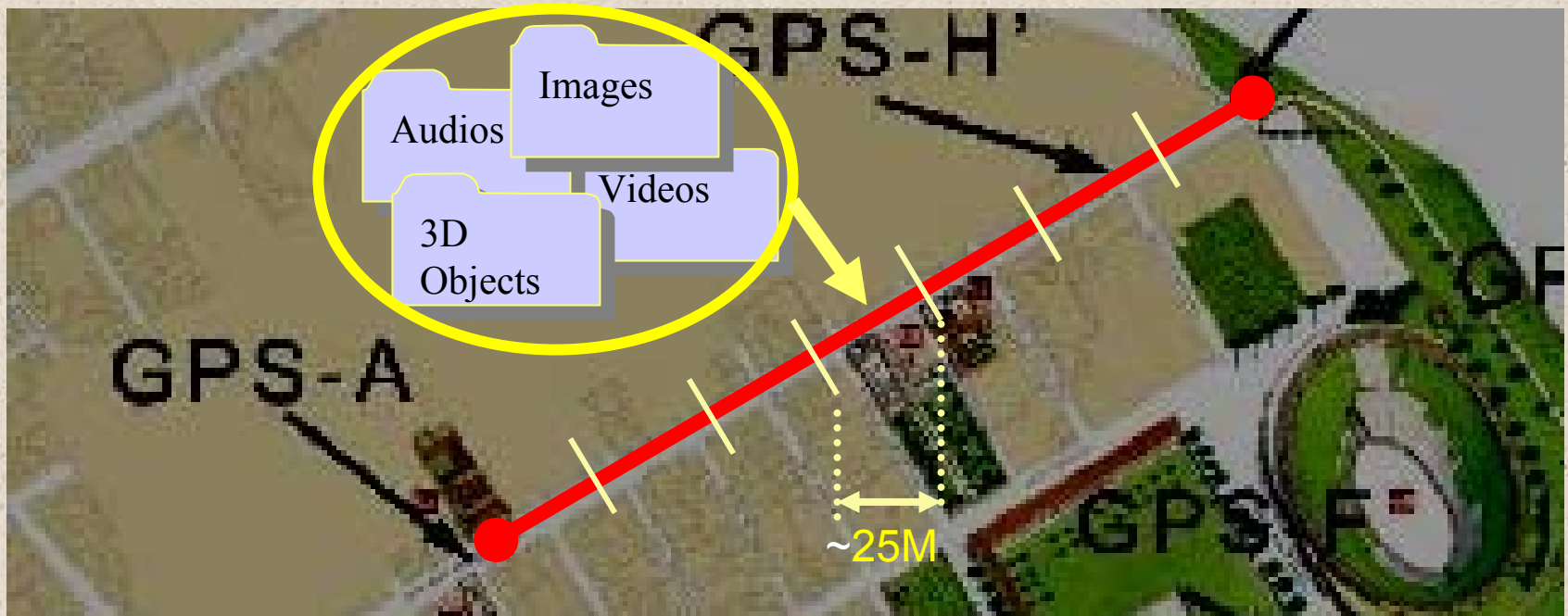
MMO Synchronization (1)

- Tour Segmentation



MMO Synchronization (2)

- Path Segmentation
 - 0.5m/step $\rightarrow$ 1.3sec/m
 - 60words/30sec
 - Split path into segments according to logical text units



MMO Synchronization (3)

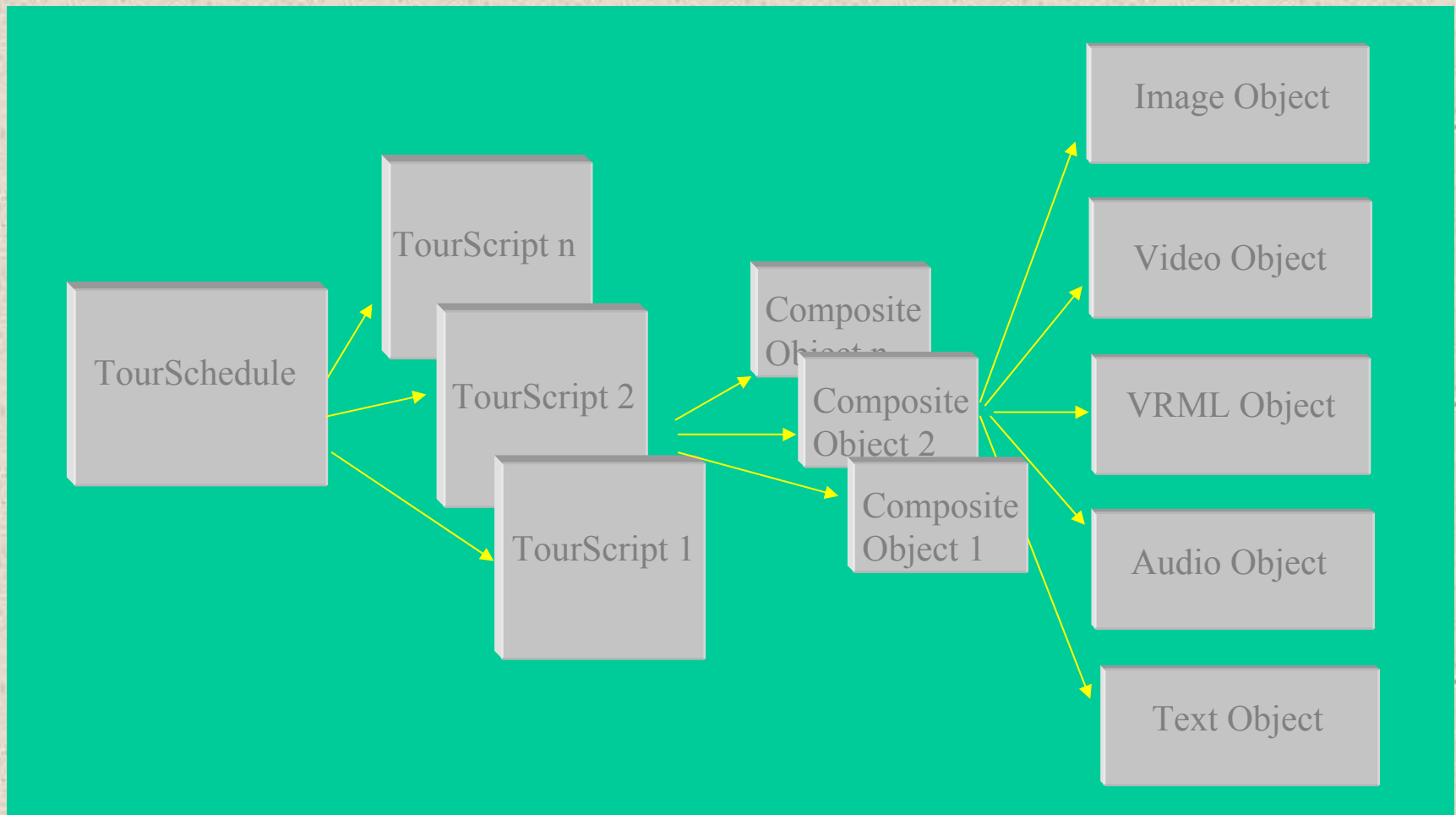
- MMO Content Presentation
 - Location & Orientation Sensitive
 - Walking Pace
 - fastest → brief + successive build up
 - User's profile
 - Age
 - Interests
 - Nationality

Tour Description (1)

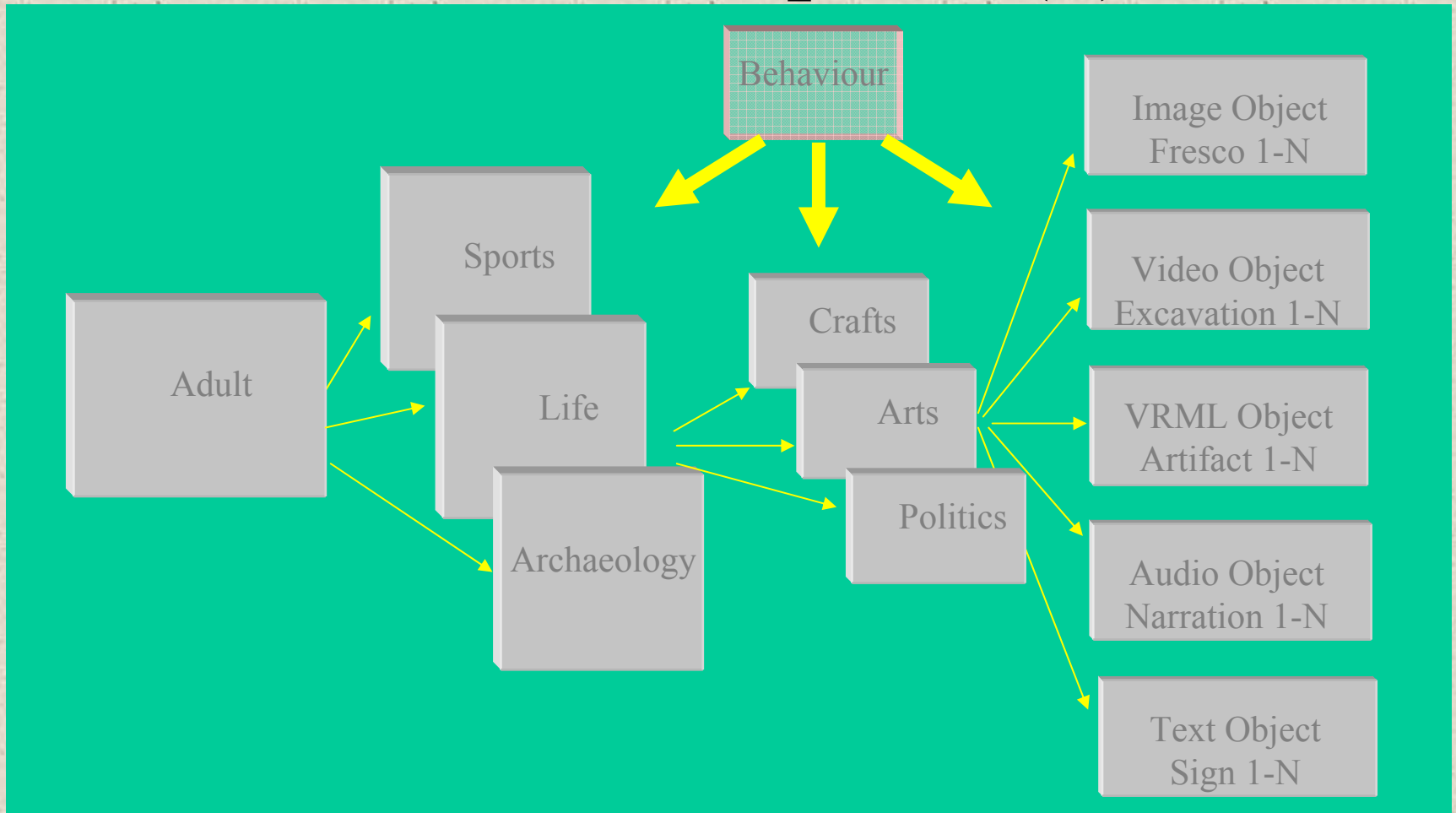
- Metadata Descriptions
 - Profile (Age, Interests, Nationality)
 - Available time
 - Geographic
 - x, y Coordinates
 - Heading
 - Proximity Range
 - Tour Segment Identifier
 - (Fuzzy Handover)
 - Cultural Metadata
 - Dublin Core

Dublin Core Metadata Elements	
Title	Format
Creator	Identifier
Subject	Source
Description	Language
Publisher	Relation
Contributor	Coverage
Date	Rights
Type	

Tour Description (3)

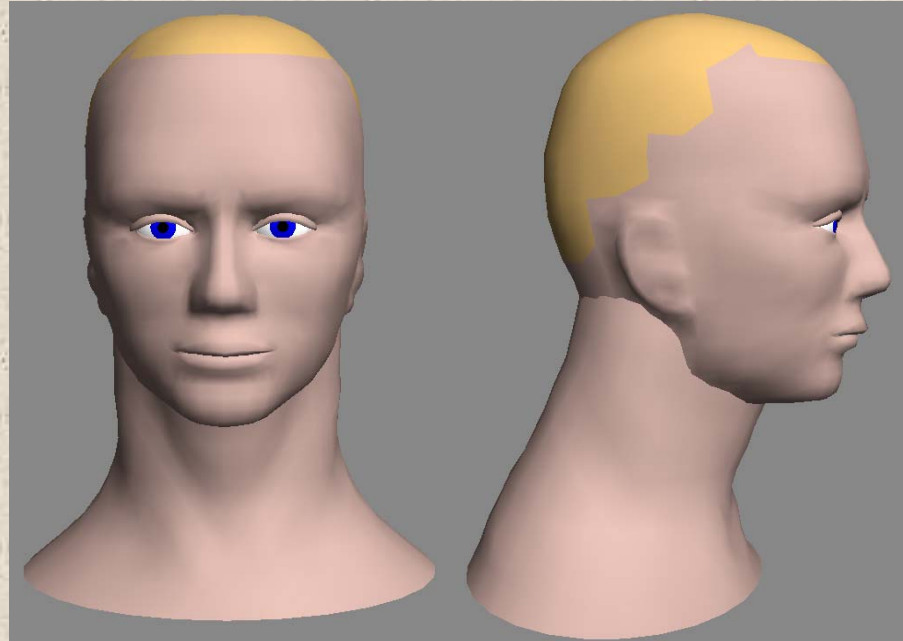


Tour Description (4)



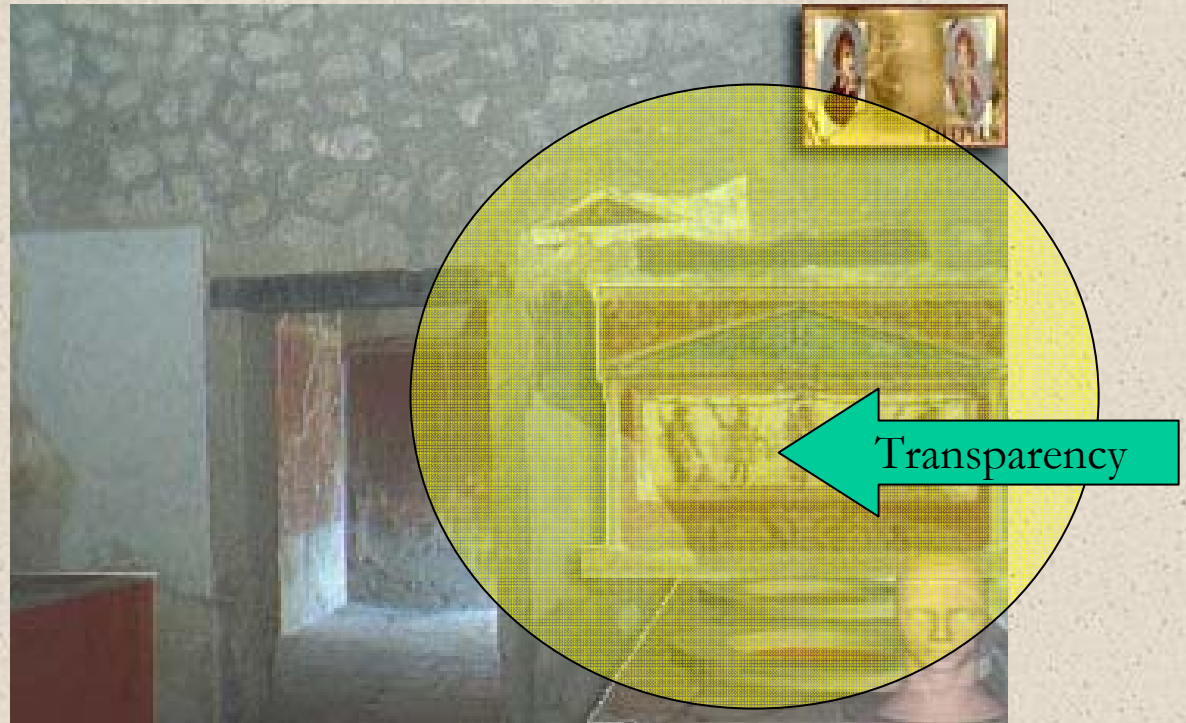
AR Guide (1)

- Text logo
- Map
- Slide Show
- VRML
- Avatar
- Menu 
- Sound



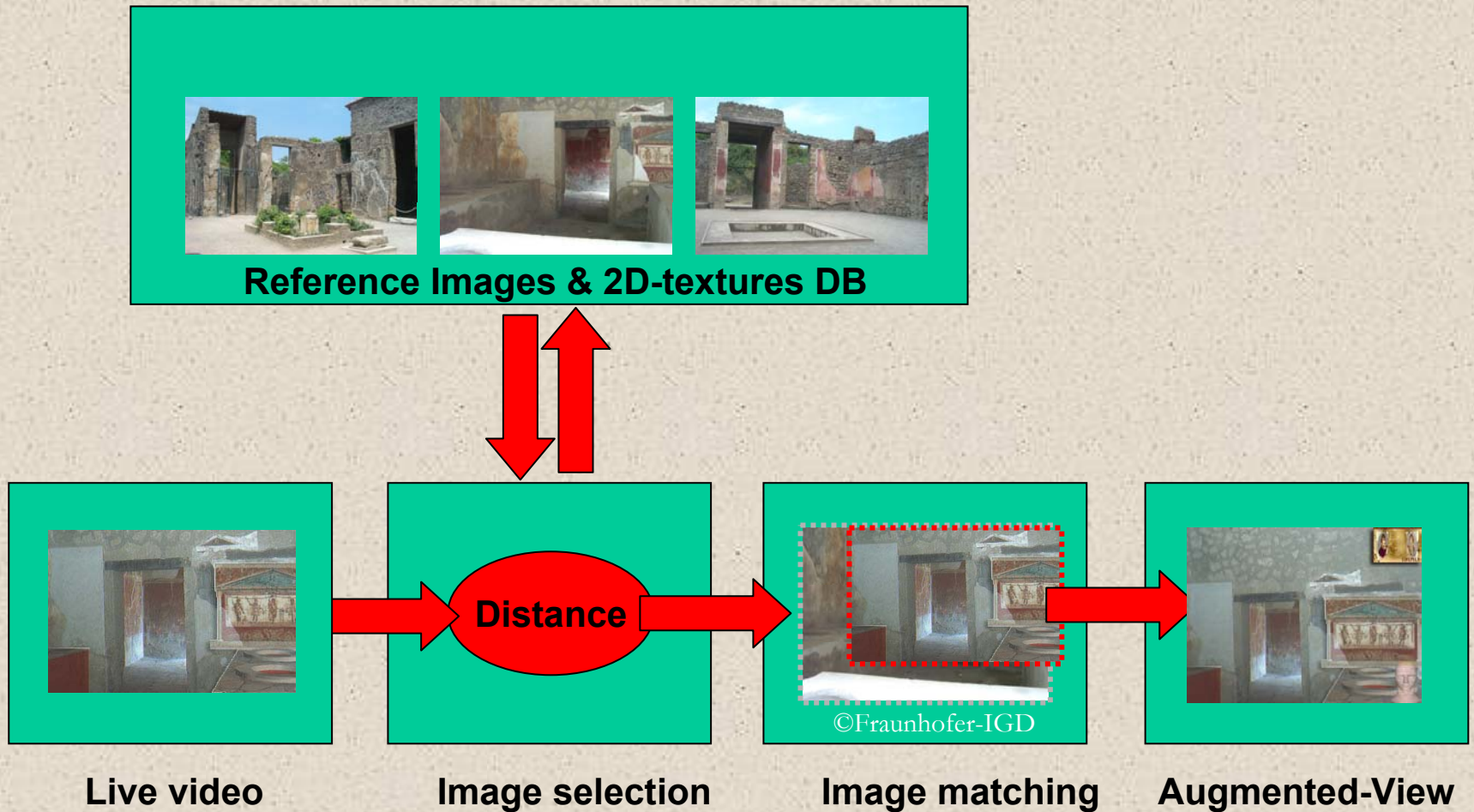
AR Guide (2)

- AR Reconstruction



AR Guide Video Example

2D Tracking with reference Images



AR Life

- 3D Human Modeling
 - Polygon-based modeling → simplification
 - Skeletal modeling
 - Clothes modeling
 - Hair modeling
 - Shading
 - Animation
- 3D Plant Modeling
 - Polygonal modeling
 - Skeletal modeling
 - Animation
- Collision Detection
- Storytelling

Experiences (1)

- Initial Application at Pompeii
 - Thermopolium of Vetutius Placidus
 - AR Guide
 - AR Life Simulator
- Physical Considerations
 - Size
 - Weight
- Indoor – Outdoor Use
 - Visualization Device
 - Image Quality + Contrast



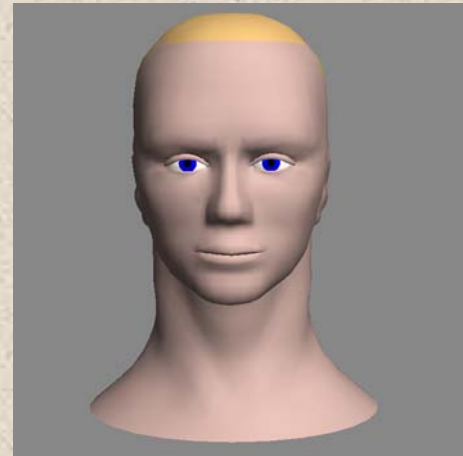
Experiences (2)

- Personalization
 - Profile
 - Behaviour
- Guidance
 - Site Plan + User Tracking
 - Path Indication
- Communications Infrastructure



Experiences (3)

- Avatar Guidance
 - Lip Synchronization
 - Informative
 - Directions
 - Other Messages
- Interaction
- 3D Tracking
- AR Life



Conclusions

- Successful Application
- Integration on a lighter unit
- Feedback to 2nd Prototype
- On-site trials
- Choice of additional tours
 - AR scenarios for Amphitheatre and Aromatic Garden

Thank you