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Initial Training Network for Digital Cultural Heritage

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Interactive and Mixed reality environments in Digital Cultural Heritage

Foundation of Research and Technology (FORTH)

Institute of Computer Science

Main Objectives

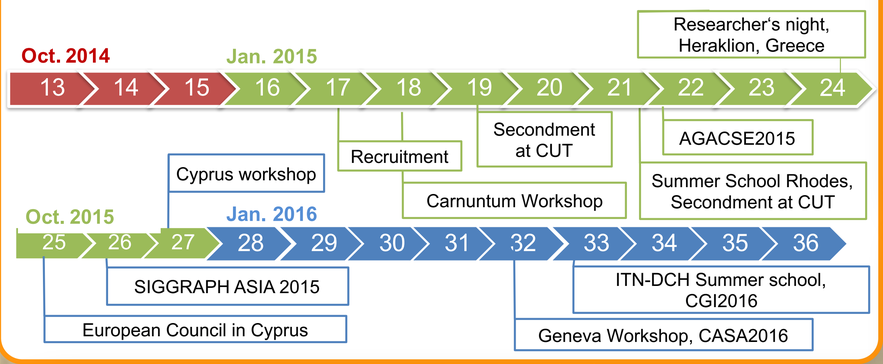
- Vision based user gesture tracking and activity recognition
- Geometric and Illumination registration for dynamic scenes in AR
- Context-Aware Adaptive Rendering System for User-Centric Pervasive Computing Environments

BACKGROUND

University of Cyprus

- BSc in Computer Science
- MSc in Computer Games and Interactive Technologies

ITN-DCH TIMELINE



PUBLICATIONS

[1] A Conformal Geometric Algebra framework for Mixed Reality and mobile display, AGACSE15

[2] An inclusive Conformal Geometric Algebra GPU animation interpolation and deformation algorithm, The Visual Computer Journal, CGI2016

[3] A fast and robust pipeline for populating mobile AR scenes with gamified virtual characters, SIGGRAPH Asia 2015

[4] A Conformal Geometric Algebra code generator comparison for Virtual Character Simulation in Mixed Reality" AACA Journal, GACSE workshop, CGI 2016

[5] Life-sized Group and Crowd simulation in Mobile AR, CASA2016

[6] A comparison of gamified, immersive VR curation methods for enhanced presence and human- computer interaction in digital humanities, euromed2014

[7] Mixed Reality Serious Games for smart education, ECGBL2016

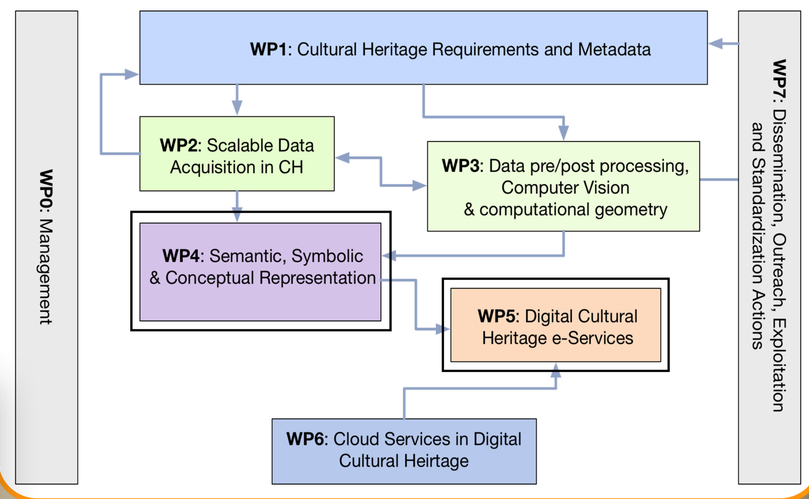
SECONDMENTS

CUT (6th – 20th April, 20th June-27th July)

WORK PACKAGES

WP4: Deliverable 4.1

WP5: Deliverable 5.1, 5.2, 5.4



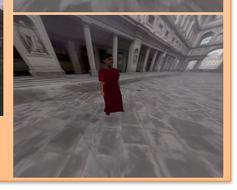
RESEARCH FIELDS

Augmented Reality

- gIGA: a lightweight shader-based C++ CG framework
- MetaioSDK: markerless tracking using SLAM
- Supported by gIGA framework and Unity3d
- **envisaged innovation:** Attaining a high level of believability and realism of real-time registration between real scene and virtual augmentation. To accomplish this the camera position-orientation and projection should be consistent (geometrical registration). Moreover, lighting-shading of virtual objects with respect to real objects should be consistent (illumination registration). We will focus on developing a method for Illumination registration for deformable characters using PRT and HDR IBL methods

Precomputed Radiance Transfer

- Method used for Global Illumination in order to produce more realistic results using environment maps
- Soft shadows and intereflections
- Low order Spherical Harmonics (SH) to present lighting and transfer functions
- **envisaged innovation:** Development of novel methods for Spherical Harmonics handling using a single GA framework. By using GA objects (rotors) the spherical harmonics real-time management will be more efficient compared to existing methods



Geometric algebra (GA) and Conformal Geometric Algebra (CGA)

- Powerful computational framework
- CGA framework as the mathematical background for character animation control:
  - animation blending
  - GPU-based geometric skinning
  - achieve high performance
  - improve the performance and consistency of transformations compared to other mathematical frameworks like linear and quaternion algebra
  - single representation for rotation, translation, scale
- Can be used to handle SH
- **envisaged innovation:** extend our CGA framework by applying GA for global illumination and specifically, for rotating spherical harmonics for Precomputed Radiance Transfer for real-time rendering.

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FORTH Institute of Computer Science

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 608013.

MARIE CURIE ACTIONS