ESR 10

Name: Margarita Papaefthymiou

Your credentials: BSc inComputer Science/ MsC in Computer Games and Interactive Technologies

Start day: 01/02/2015 **End day:** 31/07/2017

Involved in WP: WP4, WP5 Hosting Institution: FORTH

My Research Training Activity in ITN-DCH

A. Summary of the Career Development Plan:

The main aims of the Early Stage Researcher are to work on Interactive mixed reality environments and investigate novel AR character simulation techniques.

Specifically, the long term objectives of the research are:

1. Vision based user gesture tracking and activity recognition
2. Geometric and Illumination registration for dynamic scenes in AR
3. Context-Aware Adaptive Rendering System for User-Centric Pervasive Computing Environments
4. Cross-testing and validation with Europeana and MoW metadata model

For these goals to be attained further research activity and training is needed on the part of the researcher.

The researcher may attend several courses provided by University of Crete such as Computer Graphics, Interactive Computer Graphics, Advanced Computer Vision, Advanced HCI etc. Furthermore, the researcher can be trained and have the opportunity to collaborate with other fellows during the secondments in other institutions like CUT, UNIGE, UW and CERTH.

Short term objectives include: the researcher must have at least 4 publications, including contribution to the WP5, deliverable 5.1 with topic “First version of architectural design”. Also, the ESR will attend workshops, courses or perform presentations on conferences like SIGGRAPH/SIGGRAPH ASIA, EUROGRAPHICS, CGI and EUROMED.

B. Core Research Training Activity:

Since the first of day of recruitment the fellow has engaged in research and development, according to the career development plan for mobile augmented reality applications. The first aspect of the Augmented Reality application is the geometrical consistency. The end-user can perform markerless AR tracking on a specific scene by passing to the mobile application a prerecorded tracking configuration file (SLAM-based 3dmap) in order to assign the 3d models on a fixed position in the environment. Another important aspect of these kind of applications is the global illumination in Real Time. The fellow is provided with useful material in order to

perform research in Precomputed Radiance Transfer (PRT) techniques and methods. By using PRT techniques the virtual objects of the Augmented Reality scenes are illuminated realistically, based on HDR-captured environment light. Furthermore, the fellow during the Secondment at CUT and the help provided by the supervisor has begun training in Geometric Algebra (GA) and its Euclidean and Conformal Geometric Algebra (CGA) models. GA and CGA are useful in order to achieve better visual results and better performance (computation time and memory usage) in comparison to using other techniques like Linear Algebra. GA and CGA knowledge can be applied in handling Spherical Harmonics, animation blending and smoother AR camera movement.

C. **Secondments:**

CUT: for two weeks (from 6/4/2015 to 20/4/2015)

The main missions of this particular secondment were the following:

1. Visited the Assinou church during the Easter liturgy in order to capture images, videos and sound that will be useful for many fellows and record the divine service for the St Mary day celebration. This film will be useful when the fellow will develop this ceremony in the augmented reality application.
2. Tested that the Augmented Reality application at the Assinou Church provides satisfying results and can perform tracking even under special situations (e.g. when there is sun in the environment, when there is crowd in front of the tracking scene)
3. Taken screenshots of the Augmented reality application in order to include them in the Asinou e-book.
4. Had training sessions in GA with Andreas Aristidou (CUT), in order to provide the ESR with knowledge for the basic elements of Geometric Algebra as well as Comformal Geometric Algebra.

D. Dissemination & Outreach:

The Carnuntum workshop is the first workshop that the fellow attended as a member of the ITN-DCH project. During this workshop the fellow had the opportunity to attend a range of interesting presentations and visit many places like museums and archeological sites. The fellow had the chance to attend many presentations with different topics. The fellow presented its own current work, contribution to the project and future plans (secondments) and future work on the case studies and deliverables. Apart from presentations, the fellow visited the Carnuntum museum and the Archeological park of Carnuntum with the Roman monuments. Also, the fellow visited the digitalization lab in “Kultubabrik” in Hainburg and the historical castle of Hainburg. Furthermore, the fellow, was requested to work in groups and present their team work. From this collaboration, the fellow gained useful information about different research topics of the ITN-DCH project.

Moreover, the fellow visited the Assinou church during the Easter liturgy during the secondment at CUT as mentioned in the Secondments part.

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

E. <u>Added Value</u> to my Future Research Career:

By the active participation in the ITN-DCH project the research skills, communication skills as well as the strength of writing skills of the ESR would be benefit enormously. The opportunity to make research in many fields of Computer Graphics, for example real time rendering and animations as well as Computer Vision algorithms, gives the ability to the ESR to gain precious research experience and inspiration for further work and researching in these interesting topics. Furthermore, the fellow's teaching experience and presentation skills will be improved by giving lectures to the audience of Undergraduate and Postgraduate courses of University of Crete, that are organized by the supervisor.

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