Scientific Report

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Name of the *Host Organisation*	SICS
First Name / family name of the *Scientific Coordinator*	Gunnar Karlsson
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# I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

The idea

People like to gather in crowds at concerts and sports events, not only to watch the show, but also to be part of a collective and unique experience. Interactive systems that support such experiences have become increasingly popular, especially systems that create crowd-sourced light shows. However, as the size of a crowd increases, it becomes a technical challenge to capture and process the spectators' actions and hence the level of interactivity might decrease or even disappear completely. The light show created with Mickey Mouse ears in California Disneyland or the LED panels at the London 2012 Olympics closing ceremony for example, are controlled by centralized systems that orchestrate the show and do not support any interaction from the crowd. In addition, because of their centralized structure, these systems also require additional infrastructure (e.g., wired connections between devices, infrared emitters) and are therefore not affordable by most artists.

In order to address this double scientific challenge, that combines the fields of participative artistic performance and networking, I started working on the Opphos[1] project. The idea was to enhance the spectators' experience by providing them with the means to collaboratively participate and create their own artistic light and sound show. In order to reduce the cost and to increase the interaction possibilities, we chose to develop this system as a mobile application that all spectators would download on their phones. Finally, to ensure connectivity without any extra infrastructure, we decided to use the PodNet peer-to-peer network middleware (design by Gunnar Karlsson's research team) that allows phones to connect directly to one another via Wi-Fi Direct or ad-hoc mode.

Because this scientific report needs to be kept short, it only contains the outline of my work but you can find more information and articles on the Opphos project page[2].

Crowd simulator

During the first months of the project, I developed a realistic crowd simulator to test and visualize the possible visual effects that could be created with peer-to-peer networking. With the help of this multi-agent simulator, I managed to define an algorithm that allows a crowd to produce light shows with waves of colour and sound[2].
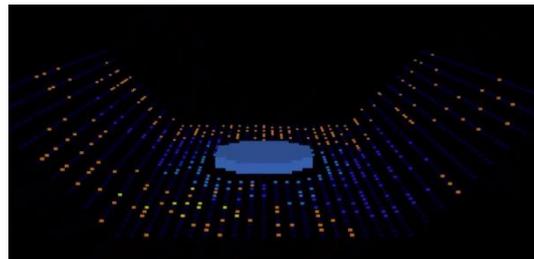

Interaction design

In the meantime, with the help of Jonas Celander Guss, a master's student under my supervision, we conducted field observations and interviews at concerts in order to determine what type of activities Opphos could support to enhance the spectators' experience. Also, because traditional user interactions based on clicking the screen draws the spectators' attention away from the event, we analysed their natural movements in order to find another way of interacting with the phone.

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[1] Opphos comes from the words "opportunistic" and "phos" (light in Greek).

[2] More information at www.sics.se/projects/opphos

Finally, we came up with two modes for Opphos that are triggered by a combination of natural movements (swaying back and forth or fist pumping) and cheering, without any need to touch or look at the screen. The *Battle mode* encourages the crowd to make noise and is designed to help the artist warm up the crowd at the beginning of a concert. On the contrary, the *Ambiance mode* is designed to create a calm and breath-taking light show in rhyme with the swaying movements of the crowd (similarly to what spectators used to do with lighters).

Ambience Mode   Battle Mode
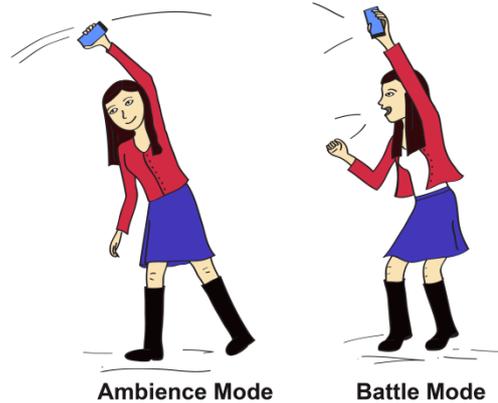
Prototyping and user testing

We developed Opphos in an iterative and incremental way, by gradually implementing and testing the different features of the application with users. The first Opphos prototype had all the functionalities to recognise the user interactions and was tested in June 2013, at our lab, with 20 participants. They were given phones with the application and were placed in a dark room with the projection of a live concert and without further instructions on what to do. We were very happy to see that the testers naturally engaged in the interactions we had chosen for Opphos: first pumping and swaying with the phones in their hands. The test also allowed us to improve Opphos by adding vibration feedback and by adapting to the different ways the testers held the telephones which we had not foreseen. The second prototype integrates the peer-to-peer communication and will be tested with 35 participants at the ExtremCom conference in Iceland at the end of August 2013. Finally, we have collected a set of communication material (drawings, videos, text, web page…) in order to contact artists that would be willing to test the third and complete Opphos prototype during one of their concerts.

Preparing the future

Jonas would like to continue working on the project after the end of his master's thesis in September and we are therefore filing several grant applications. We have also collected a list of event organization companies that we will contact once we have more pictures from the user testing and the final complete prototype. Two of these companies (event360 and boxfram) actually contacted us during the project to say they would be interested in testing a functional prototype when it would be ready. We also put effort into documenting the code, including the Podnet peer-to-peer network we are using, so that the project can be continued or modified by other developers and researchers.

Finally, we are currently working on several articles for scientific conferences but also documents for large public communications such as the "Forskarfredag" science fair in Stockholm, where our research team will be presenting Opphos.

II – PUBLICATIONS DURING YOUR FELLOWSHIP

Accepted publications

Full paper in an International conference

Iza Marfisi-Schottman, Jean-Marc Labat, Thibault Carron, « Building on the Case Teaching Method to Generate Learning Games Relevant to Numerous Educational Fields *», Proceedings of the International Conference on Advanced Learning Technologies, ICALT*, 15-18 June 2013, Beijing, China, pp.156-160.

Full paper in a national conference

Iza Marfisi-Schottman, Jean-Marc Labat, Thibault Carron, « Approche basée sur la méthode pédagogique des cas pour créer des Learning Game pertinent dans de nombreux domaines d'enseignement *», Proceedings of the french national conference Environnements Informatiques pour l'Apprentissage Humain, EIAH*, Toulouse, France, 29-31 May 2013, pp.67-78.

Short paper in an International conference

Bertrand Marne, Thibault Carron, Jean-Marc Labat, Iza Marfisi-Schottman, « MoPPLiq: A Model For Pedagogical Adaptation of Serious Game Scenarios » *Proceedings of the International Conference on Advanced Learning Technologies, ICALT*, 15-18 June 2013, Beijing, China, pp.291-293.

Demo in an International conference

Iza Marfisi-Schottman, Gunnar Karlsson, Jonas Celander Guss, « Demo: Opphos – a participative light and sound show using mobile phones in crowds », *Proceedings of the International Extreme Conference on Communication*, 24-29 August, Eyjafjallajökull, Iceland, *in press*.

Submitted publications

Paper in a journal

Iza Marfisi-Schottman, Damien Djaouti Michelle Joab Sébastien George, « *State of the Art on Authoring Methods and Tools for Designing Learning Games* », submitted to the International Journal of Learning Technology.

Planed publications

- "Enhancing spectator experience in large crowd events" for the CHI or NORDICHI conference.
- "Supporting auto-collaborative behaviour in large crowds" for the INTERACT conference.

III – ATTENDED SEMINARS, WORKHOPS, CONFERENCES

Seminars

Internal Seminar: every week, I attended to the internal seminars organized by SICS and the Mobile Life Institute. On the 27th or March 2013, I also presented the research I had lead before starting my post-Doctorate. The presentation was entitled "Two projects for designing effective Learning Games".

Course: In January, I gave a two day course on Learning Game design at the University of Laval, in France.

Conferences

29-31 May 2013: Conférence sur les Environnements Informatiques pour l'Apprentissage Humain, EIAH in Toulouse, France.

15-18 June 2013: International Conference on Advanced Learning Technologies, ICALT, in Beijing, China.

24-29 August 2013: International Extreme Conference on Communication, ExtremCom in Eyjafjällajökull, Iceland.

Experimentations

During my stay at SICS, I participated in several experimentations and user testing sessions to help out the researcher of the Mobile Life Institute. I also organized one for the Opphos project.

IV – RESEARCH EXCHANGE PROGRAMME (REP)

Visit to the Dept. of Computer Science, University of Cyprus

Dates: Monday the 22nd of April to Tuesday the 30th of April

Colloquium: "Participative Crowdsourcing and Effective Learning Games using Mobile Phones" on Tuesday, April 23, 2013, from 10 to 11. I mainly presented my current work on the Opphos project and my former work on Learning Games.

Discussions: During my stay, I had the time to talk with several members of the department of computer Science that had come to my presentation: Demetris Zeinalipour, Yiorgos Chrysanthou, Stathis Baretos and Marios Dikaiakos. I also exchanged a few emails with Demitris Kypriakos who had seen my presentation online. These discussions allowed me to get more familiar with the wide range of research currently being conducted in Cyprus. They also allowed me to collect valuable information in the field of peer-to-peer communication and opened the possibility for further collaboration between our two institutes. For example, the SmartLab mobile phone network simulator designed by Demetris Zeinalipour, seems like a very good way of testing our Opphos application. The same research team has also worked on the Airplace indoor positioning platform that could be very useful for the future development of Opphos. Finally, I also learned about the AppCampus funding project that gives out grants from 20.000 to 70.000 euro and that we could apply for in the near future. This financing would give us the opportunity to further develop Opphos' functionalities and test it in large crowd settings.

Visit to the Institute for Informatics and Telematics, CNR, Pisa

Dates: Friday the 17th of May to Tuesday the 21st

Colloquium: on Monday, May 20, 2013, from 3 to 4 PM. I gave two presentations to the members of the lab. The first presentation was on my former work on Learning Games: "Two Projects for Designing Effective Learning Games" and the second one, on my current work: "Opphos – a Participative Light and Sound Show using Mobile Phones in Crowds".

Discussions: During my stay, I had the time to talk with several members of the CNR. First, I had a meeting with Claudia Buzzi and Marina Buzzi, who both work on learning systems in order to help therapists train mentally impaired children. We discussed about the projects that they were involved in, such as the ABCD software for autistic children, and the possibility of future collaborations related to educational Games. One of the ideas was to get high functioning autistic children to create educational games for the lower functioning autistic. This meeting was very useful and we definitely will keep in contact for future European research projects. After my talk, I had a group meeting with the Ubiquitous Internet Group. During this meeting, each of the researchers briefly presented their projects related to peer-to-peer networking: participative sensing in intelligent cities, sensor networks, finding adaptive routes depending on pollutions and noise sensors… I was especially interested in Andrea Passarella's and Franca Delmastro's new system called "CAPA", that detects when a person suffering from Alzheimer's disease is lost (walking around in circles for a long time) and warns people in the vicinity that have signed up as "potential helpers". Indeed, I find it is quite original to see a mobile application that helps people engage in unmediated human-human interactions. My visit also turned out to be a good occasion to test the "system for sharing running and cycling experiences" that the team was going to demo at a conference a few weeks later. Finally, I exchanged a few emails and articles with Andrea Passarella in order to perfect my understanding of the research being lead at the CNR Institute.