

UbiCom Series

TCG Software LP

Waleed Ahmed

[TCG AND 2ND OPEN UBI INTERNATIONAL CONFERENCE]

Paper briefly provides the overview of conference activities accomplished in a supervision of highly competent UBI experts. It also highlights some of the UBI ideas and applications discussed during the seminar and workshops.

June, 2010

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Revision Details

| Date | Version | Name | Comment |
|------------|---------|----------|--|
| June, 2009 | 1.0 | Ahmed, W | Report on TCG participation in UBI conference created. |
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Introduction

Oulu hosted a great UBI International conference and Summer School the first week of June, organized by Prof. Timo Ojala. The school attracted 77 great students from 22 countries. It all started with the 2nd Ubiquitous City Seminar, which included talks from the cross-disciplinary teachers of the workshops ranging from Context-awareness to Ubiquitous art. The aim of the conference was to discuss and evaluate the ongoing UBI research in the world with different aspects. Conference comprised of one day seminar consisting of presentations given by different international UBI experts, three days of hard workshops and one day for presentation of results of workshops and declaration of UBI challenge for future UBI city.



Ubiquitous City Seminar

This high profile seminar featured many distinguished international experts addressing various aspects of ubiquitous and urban computing.

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Professor Anind Dey of Carnegie Mellon University, USA, discussed the topic “Real World Context-Aware Systems”. In his presentation he gave the basic idea of UbiCom applications and related them with the modern technologies. Some of the application examples included step green, child play and activity manager.

Professor Marcus Foth of the Queensland University of Technology, Australia, studies the different aspects of human-computer interaction. In the seminar, he spoke about “Urban Informatics and Sustainable Cities”. In his presentations, he came up with different ideas, for example, bluetooth fish sensor network, fix-it application for providing appropriate solution of damages in surroundings etc

Professor Vasillis Kostakos of the University of Madeira, Portugal, is researching urban computing from various aspects. In the seminar, he talked about “Urban Social Networks Analysis”.

Jürgen Scheible of the Aalto University, Finland, is a researcher, musician and media artist. In his research, he focuses on designing multimodal user interfaces for creating and sharing interactive artistic experiences. Scheible’s speech discussed the topic “Creating and Sharing Artistic Experiences with Ubiquitous Technology”. He showed different UBI applications based on his artistic interest which included mobileIn to vote for music in bar, mobiToss, digital story telling game and mobiSpray which is used to paint buildings in night using mobile, projector and laptop.

Head of Research Zach Shelby of Sensinode Ltd, Finland, presented a topic “IP-based Wireless Sensor Networks”. He released the importance of using IPv6 over low power PAN to connect embedded devices with the global internet. He introduced the concept of panOulu which is a city wide wireless internet access using different access points made of low power sensor nodes and antennas. His application examples included UBI-AMI, panOulu and asset management systems.

Professor Mikael Wiberg of Umeå University, Sweden, focuses on different aspects and applications of interaction. In the seminar, Wiberg speaks about “Interactive Textures – rethinking materiality”.

Workshops

International UBI experts coordinated five different workshops for three days which included theoretical and practical training of the 80 researchers. Following is the brief summary about all workshops:

1. Real World Context-Aware Systems

Instructor: Professor Anind Dey, Carnegie Mellon University, USA

This workshop discussed the design and development of context-aware systems. In the workshop, instructor discussed the details for building context-aware systems in domains such as healthcare, mobile computing, and transportation.

2. Urban Informatics and Sustainable Cities

Instructors: Professor Marcus Foth, Queensland University of Technology, Australia, Dr. Jaz Choi, Queensland University of Technology, Australia, Patrick Hofmann, Google Australia

One way to build more sustainable cities through network technologies is to start with monitoring the level and usage of resources as well as encourage citizens to participate in sustainable everyday practices. This workshop focused on three fundamental areas of sustainable cities through urban informatics and ubiquitous computing:

- Environment: climate change adaptation
- Health: Food practices and cultures
- Civic engagement: citizen participation and interaction

In particular, the workshop seek to come up with locally (Oulu) specific 'mash-up' solutions that enhance the interactions of citizens with the physical city using data from various sources such as sensor networks.

3. Urban Social Networks Analysis

Instructor: Professor Vassilis Kostakos, University of Madeira, Portugal

This workshop introduced students to the analysis of urban social networks. These are networks of encounter and co-presence that exist in a city. In this workshop they presented an overview of this topic, and gave students the necessary skills to capture and analyze such networks. Finally, the students explored the new kinds of applications that these analyses enable, such as "Urban Facebook".

4. Creating and Sharing Artistic Experiences with Ubiquitous Technology

Instructor: Jürgen Scheible, Aalto University, Finland

This workshop investigated new ways of deploying ubiquitous technologies for creating and sharing artistic experiences in the context of a city. The aim was to design and build tools and applications for artistic expression by utilizing the latest mobile technologies, public displays as well as small and large-scale projections.

5. IP-based Wireless Sensor Networks

Instructor: Zach Shelby, Head of Research, Sensinode, Finland

Internet Protocol technology is quickly becoming critical for low-power wireless sensor network applications e.g. for the smart grid, building automation and logistics. In this workshop Zach Shelby gave a hands-on introduction to this exciting new application of IP technology and the recent IPv6 over Low-

Power Area Network (6LoWPAN) standard based on his new book "6LoWPAN: The Wireless Embedded Internet". During the workshop students will learn and try the basics of 6LoWPAN networking, application protocol and embedded web services.

6. Interactive Textures – rethinking materiality?

Instructor: Professor Mikael Wiberg, Umeå University, Sweden

In this workshop they worked through current research within the fields of tangible user interfaces (TUIs), interactive architecture, and applications of new dynamic and computational materials in our everyday lives. The workshop heavily focused on the notion of texture as a tool to rethink materiality in the context of unified digital and physical materials.

TCG Participation

TCG participated in "IP-based wireless sensor networks" workshop for three days and learned different sensor networks technologies specially 6LoWPAN. Zach presented the basics of 6LoWPAN, protocol stack, network topologies, addressing and routing, tunneling between IPv4 and IPv6, security and its applications. He also introduced new CoAP (constrained application protocol) to enable web-services for low power wireless sensor networks.

Zach also gave an overview about the panOulu which provides city wide wireless internet connectivity for free to all urban people. The panOulu is based on 20 sensinode 6LowPAN (868MHz) base stations which covers downtown and other populated areas in Oulu.

As a result of workshop, participants developed a rapid application prototype called Ubiquitous Security Control which simulates a door and panel access control mechanism using QR codes, CoAP over 6LoWPAN and HTTP over panOulu. Following is a brief summary of work done during the workshop:

1. Design of the 6LoWPAN network deployment for the Oulu SensorCity deployment of 20 public 6LoWPAN access points in downtown Oulu, Finland. See their final presentation.
2. Based on a group idea competition, the whole class implemented an entire Ubiquitous Security demonstration using the new IETF Constrained Application Protocol (CoAP) in a mere 24 hours! The setup included QR Code based tag recognition, a RESTful access control design, a Web UI and custom implementations of a CoAP server and client. Best of all the students pulled off a live demonstration of the system in the workshop closing seminar.

Result of all workshops and introduction to UBI Challenge

On a last day, all the participants from each workshop presented the results of corresponding workshop. Most presentations were focused towards the final outcome of students learning about ubiquitous

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computing. Some students came up with new ideas for UBI-hotspot applications. For example, ubike, avatar, UBI friend finder, Oulu heat map.

On the other hand some participants developed rapid applications based on learning from the workshops. These applications included interactive mobiles and ubiquitous security control etc. In interactive mobiles, students developed applications for mobile phone in python. The application uses mobile phones, small projectors and a server working as sms gateway. The purpose of the applications was to project all incoming messages from the mobile to some surface using small projectors. Using the application, user can send multimedia messages, requesting some images or text to show through projector. The main idea of the application was to have some fun among the friends in a party. Another application called ubiquitous security control was developed using qr code implementation and socket programming in java. The purpose of the application was to provide security for different events by enabling the authentication process of valid participants of the event. For more details, see the attached power point slide.

At the end, Prof. Timo Ojala inaugurated 1st International Open Ubiquitous City Challenge ("UBI Challenge" for short) for prototyping real world urban computing application. The UBI Challenge challenges the global R&D community to design, implement, deploy and evaluate novel applications and services in real-world setting in the City of Oulu, Finland.