

ISSUE 5: WINTER 2015

FUNDAMENTALS OF COLLECTIVE ADAPTIVE SYSTEMS

FoCAS

Newsletter of the FoCAS Coordination Action Initiative

**Edinburgh International
Science Festival**

ECAL, SASO, CFPs

**Project news, reports
articles, publications
and more...**



www.focas.eu

Editorial

Happy New Year!

Issue five of the FoCAS newsletter finds us and our project friends amidst a sea of activities. As we approach our final year there are many plans afoot and lots of opportunities for collaboration on systems that are - fundamentally collective and adaptive.

In early April we host a talk by Prof. Jon Timmis at the Edinburgh International Science Festival - Can robots evolve? Full details inside. We also highlight CFP's for the upcoming ASCENS Spring School (deadline Feb. 23), and workshops on Distributed Adaptive Systems (with chairs from FoCAS and Allow Ensembles) and Adaptive Learning Agents where FoCAS sponsor a best paper. We're also sponsoring two travel bursaries for a Doctoral Symposium at AAMAS2015 - see inside for full details. Other related events are also publicised.

We have reports from recent FoCAS events at UBICOMP2014 in Seattle and ICTCC in Vietnam and the FoCAS Training App Sprint.

Diversify and Quanticol both sent in interesting articles on their current research and we have snippets of news from all the projects too.

FoCAS have also adopted two ERC projects, ASAP (Adaptive Security and Privacy) and COLLMOT (Complex Structure and Dynamics of Collective Motion) - that's 11 projects now under the FoCAS umbrella - you can find out more about them inside.

We also draw your attention to a selection of papers from all the projects as well as providing the usual contact details and useful URL's.

Finally, we'd like to congratulate our coordinator - Prof. Emma Hart for her appointment as one of three chair's at this years SASO in Boston, along with Gregory Sullivan and Jan-Philipp Steghofer - well done Emma!

Our website at www.focas.eu houses an ever-growing suite of useful resources and our FoCAS membership now stands at over three hundred researchers who receive regular e-bulletins. If you're not already a member, see opposite on how to get involved.

Best wishes, the FoCAS Initiative

**JON TIMMIS TALK at Edinburgh International Science Festival: Can robots evolve?
Sunday 12 April 2015 at 8pm**

CFP: 1st Workshop on Distributed Adaptive Systems

Tuesday 7th July 2015 @ ICAC 2015 Grenoble, France: Paper Submission April 13, 2015

**CFP: ASCENS Spring School - Engineering Collective Autonomic Systems
March 23-27 2015: Lucca, Italy: Registration deadline: February 28, 2015**

GET INVOLVED!

PLEASE TAKE OUR THREE MINUTE SURVEY

Contribute to future research in this area:
www.focas.eu/three-minute-survey/

or, **SUBMIT A RESEARCH CHALLENGE**
www.focas.eu/research-landscape/challenges

JOIN THE FoCAS COMMUNITY

That way you can keep informed about our research via occasional e-bulletins:
www.focas.eu/join-focas

FoCAS READING ROOM

The FoCAS Reading Room provides online access to a series of specially-commissioned feature articles on all aspects of collective adaptive systems, and links to relevant news-feeds and articles from other publications. As a collective adaptive system itself, there are opportunities for the community to get involved, either by nominating prospective authors for feature articles, or by contributing a features article.

Please contact the the FoCAS editor:
Jeremy Pitt
(j.pitt@imperial.ac.uk).

www.focas-reading-room.eu

FoCAS TWEETS

We like to use Twitter to communicate our work and that of our partners and associated individuals and organisations.

Follow us: @FETFoCAS | #FETFoCAS

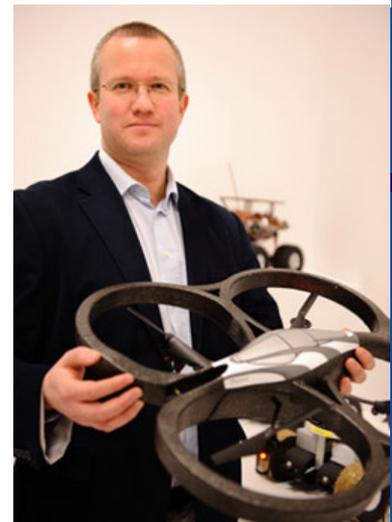
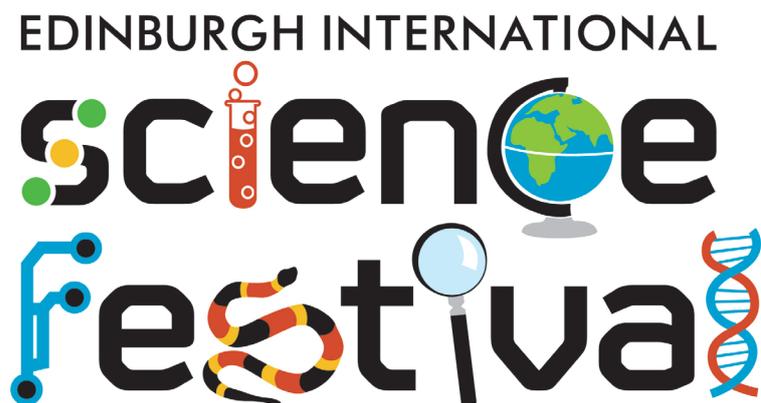
CFP: Workshop on Adaptive Learning Agents (ALA) held in conjunction with AAMAS in Istanbul, May 4-5, 2015

Submission Deadline: February 11, 2015

Edinburgh International Science Festival: Can robots evolve?

Sunday 12 April 2015 at 8pm in the Main Hall at Summerhall, Edinburgh

As robots increasingly are becoming more embedded within everyday life, they are also cooperating and adapting to each other, similar to the 'swarming' behaviour seen in ants, birds and fish. Professor **Jon Timmis**, Director of the York Robotics Laboratory and Co-Director of York Computational Immunology Lab at the University of York will explain how biology is now influencing robotics research in a wide variety of ways. Through understanding biological systems, it is possible to unlock a number of key concepts to understand how robots will be designed and operate in future. Bio-inspired design looks to nature, for example, how insects or birds can navigate with minimal input and yet perform complex interactions or how the immune system repairs itself or how evolution comes up with innovative solutions to very complex problems. Prof Timmis will discuss how such bio-inspired robotics provide significant implications for a range of human activities in the home, in transport, medicine, industry and defense and will consist of a number of interactive demonstrations.



Prof. Jon Timmis

BIOGRAPHY

Jon Timmis is Professor of Intelligent and Adaptive Systems, in the Department of Electronics, University of York. His work cuts across many disciplines, including engineering, computing and immunology. He works in the area of computer modelling of the immune system to understand how the body responds to disease and the development of swarm robotic systems where there are many robots working together to solve certain problems. He has a degree in Computer Science, and a PhD in Artificial Intelligence and is currently a Royal Society-Wolfson Research Merit Award Holder and a Royal Academy of Engineering Enterprise Fellow and has recently set up a company to sell computer software for understanding the effects of therapeutic drugs on disease. He is committed to the public engagement of science and engineering and frequently talks at schools and public events.

WEBPAGE: www.elec.york.ac.uk/staff/jt517.html

FoCAS Workshop on the Superorganism of Massive Collective Wearables at Ubicomp 2014 in Seattle

Alois Ferscha ran a well-attended workshop at Ubicomp in September investigating the ever-growing field of ‘wearables’.

The workshop asked questions on the potential and opportunities of turning massively deployed wearable systems to a globe-spanning superorganism of socially interactive personal digital assistants. While individual wearables are of heterogeneous provenance and typically act autonomously, it stands to reason that they can (and will) self-organize into large scale cooperative collectives, with humans being mostly out-of-the-loop. A common objective or central controller may thereby not be assumed, but rather volatile network topologies, co-dependence and internal competition, non-linear and non-continuous dynamics, and sub-ideal, failure-prone operation. We refer to these emerging massive collectives of wearables as a “superorganism”, since they exhibit properties of a living organism (like e.g. ‘collective intelligence’) on their own.

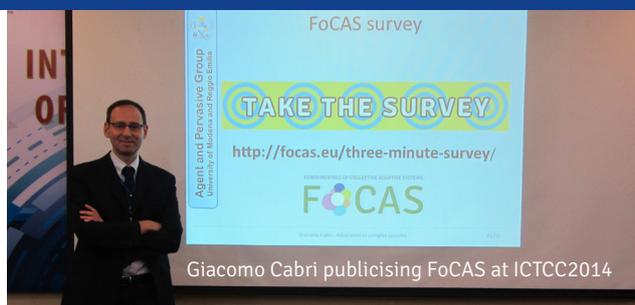
More details on the event and presentations for download are available on the FoCAS website: www.focas.eu/ubicomp-2014



Photos from UBICOMP2014 Workshop

FoCAS at ICTCC in Vietnam

FoCAS’s **Giacomo Cabri** attended the International Conference on Nature of Computation and Communication (ICTCC2014) from November 24–25, 2014 in Ho Chi Minh City, Vietnam, where he garnered resources for the FoCAS research agenda, such as research challenges and replies to the FoCAS survey .



Giacomo Cabri publicising FoCAS at ICTCC2014

Other recent FoCAS interactions

Gusz Eiben delivered a talk titled: New biology through self-reproducing machines? at ELTE University in Budapest in late November and another at EPFL in Lausanne in December: Embodied evolution through self-reproducing machines.

FoCAS adopt two ERC projects

FoCAS have adopted projects: Adaptive Security and Privacy (**ASAP**) and Complex Structure and Dynamics of Collective Motion (**COLLMOT**). So, welcome to both! More details can be found within this newsletter and via our website community page. If your project has an interest in collective adaptive systems please contact us via: www.focas.eu/about-focas



www9.open.ac.uk/ASAP
ADAPTIVE SECURITY AND PRIVACY
Bashar Nuseibeh, ERC Advanced Grant 281692 - ASAP



The Open University



lero THE IRISH SOFTWARE
ENGINEERING
RESEARCH CENTRE



To view all of our projects please visit: www.focas.eu/community

FoCAS Training App Sprint

From 24 to 26 September 2014, a dozen researchers who are active in Collective Adaptive Systems (CAS) research sequestered themselves in Barcelona to collect and curate training material for CAS research. The researchers represent diverse CAS topics ranging from evolutionary robotics to communications engineering and multi-agent systems. The researchers collated over a hundred items and identified nine categories to group these contributions. They also collaborated to provide introductory text describing each of the categories and to introduce the CAS research field.

The collected training material forms the content of the FOCAS App. The app, suitable for iOS as well as Android, will provide a 'living textbook' that offers content of various types and levels. Content types include scientific publications, presentations, tutorials, videos, interactive demo software, and links to miscellaneous external material, such as books or relevant websites.

Although the form of an app is unconventional for a textbook, its function is the usual one: it provides an introduction to the scientific / technical field of CAS). Its target audience includes students, PhD students and researchers in all areas that are concerned with almost any aspect of CAS. Inherently to the novel form, the app contents are not finalized, but are continually extended and adjusted. In fact, a second gathering of experts from the FOCAS projects will take place this fall.



Screenshot of App 'in development'

CFP: 2nd FoCAS@ECAL Workshop on Fundamentals of Collective Systems: Looking Forward

22nd July 2015, 10am-1pm, York, UK

Collective Adaptive Systems (CAS) is a broad term that describes large-scale systems that comprise of many units/nodes, each of which may have their own individual properties, objectives and actions. Decision-making in such a system is distributed and possibly highly dispersed, and interaction between the units may lead to the emergence of unexpected phenomena. CAS are open, in that nodes may enter or leave the collective at any time, and boundaries between CASs are fluid. The units can be highly heterogeneous (computers, robots, agents, devices, biological entities, etc.), each operating at different temporal and spatial scales, and having different (potentially conflicting) objectives and goals.

Understanding the mechanisms that underpin the design and operation of CAS systems poses significant challenges: the workshop solicits discussion papers that will stimulate the thinking and discussion required to progress research within collective adaptive systems.

Call for participation

This workshop solicits discussion papers that will stimulate the thinking and discussion required to progress research within Collective Adaptive Systems. Rather than describing technical results, we solicit two-three page extended abstracts that do one or more of the following:

- describe radical or inspirational approaches and ideas
- identify open problems in current thinking
- propose controversial ideas
- propose novel application areas
- raise doubts about current approaches
- identify the most significant challenges/hurdles to be overcome

Abstracts are likely to draw on inter-disciplinary research, e.g. from communities such as ALife, Biology, Game Theory, Evolutionary Computing, Network Science, Complexity, Swarm Intelligence etc.

Chairs

Emma Hart - Edinburgh Napier University

Ben Paechter - Edinburgh Napier University

Submission details available soon at www.focas.eu

Main ECAL site: <http://www.cs.york.ac.uk/nature/ecal2015/>

CFP: The Ninth IEEE International Conference on Self-Adaptive and Self-Organizing Systems (SASO 2015)

21-25 September 2015, Boston, Massachusetts

Aims and Scope

The aim of the Self-Adaptive and Self-Organizing systems conference series (SASO) is to provide a forum for the foundations of a principled approach to engineering systems, networks and services based on self-adaptation and self-organization. The complexity of current and emerging networks, software and services, especially in dealing with dynamics in the environment and problem domain, has led the software engineering, distributed systems and management communities to look for inspiration in diverse fields (e.g., complex systems, control theory, artificial intelligence, sociology, and biology) to find new ways of designing and managing such computing systems. In this endeavor, self-organization and self-adaptation have emerged as two promising interrelated approaches. They form the basis for many other self-* properties, such as self-configuration, self-healing, or self-optimization. Systems exhibiting such properties are often referred to as self-* systems. The topics of interest include, but are not limited to:

- Self-* systems theory: theoretical frameworks and models; biologically- and socially-inspired paradigms; inter-operation of self-* mechanisms;
- Self-* systems engineering: reusable mechanisms, design patterns, architectures, methodologies; software and middleware development frameworks and methods, platforms and toolkits; hardware; self-* materials;
- Self-* system properties: robustness, resilience and stability; emergence; computational awareness and self-awareness; reflection;
- Self-* cyber-physical and socio-technical systems: human factors and visualization; self-* social computers; crowdsourcing and collective awareness; human-in-the-loop;
- Applications and experiences of self-* systems: cyber security, transportation, computational sustainability, big data and creative commons, power systems; swarm systems and robotics.
- Self-* in education: experience reports; curricula; innovative course concepts; methodological aspects of self-* systems education

Important Dates

Abstract submission: May 8, 2015

Paper submission: May 15, 2015

Notification: June 30, 2015

Camera ready copy due: July 17, 2015

Conference General Chairs

Howard E Shrobe - MIT CSAIL, Cambridge, MA, USA

Julie A McCann - Imperial College London, UK

Program Chairs

Emma Hart - Edinburgh Napier University

Gregory Sullivan - BAE Systems AIT

Jan-Philipp Steghöfer - University of Gothenburg, Sweden

Full details: <https://saso2015.mit.edu/>

CFP: ASCENS Spring School

www.ascens-ist.eu

ascens 



Engineering Collective Autonomic Systems

www.ascens-ist.eu/springschool

March 23-27 2015: Lucca, Italy

Keynotes by **Marco Dorigo**, ULB, Brussels, and
Joseph Sifakis, EPFL, Lausanne

Industry talks by **Henry Bensler**, Volkswagen Research, and
Maximilian Ahrens, Zimory GmbH

The ECAS Spring School is aimed to give PhD students and other young researchers a comprehensive overview of theoretical, practical, and technological issues related to collective autonomic systems - so-called ensembles. Special emphasis will be on the pragmatic work to be realized by the participants applying languages, techniques and tools developed in the ASCENS project to different case studies.

Registration deadline: February 28, 2015

www.ascens-ist.eu/registration

There are 20 scholarships available.

CFP: 1st Workshop on Distributed Adaptive Systems

held in conjunction with ICAC 2015



Tuesday 7th July 2015 @ ICAC 2015

Grenoble, France

Paper Submission April 13, 2015

Notification May 15, 2015

Camera Ready May 22, 2015

Workshops July 07, 2015

Details: www.focas.eu/workshop-distributed-adaptive-systems

Workshop chairs from FoCAS and Allow Ensembls

On the account of the recent advances in technology, computational systems have to be thought as ever growing distributed artificial environments in which requirements, constituent components and user needs dynamically change in unpredictable ways. Coping with such uncertainties represents an interesting challenge for the designer of these systems, specifically regarding how to guarantee adaptivity towards both functional and non-functional requirements, as well as autonomously handling coordination and collaboration aspects among constituent units that have to act as autonomous and heterogeneous agents. These agents more often rely on incomplete information regarding the whole system in which they are integrated, but yet, in order to foster their Self-* properties, they need to discover, learn and evolve their behavior by taking into account how other agents are performing within the considered environment. The purpose of this workshop is therefore to create an useful forum of discussion on how Self-* properties and design & implementation concepts that are nowadays considered in Autonomic Computing literature can be extended and exploited in case of distributed autonomous systems, hence how to create adaptivity as a whole by starting from single autonomous units. Practitioners and researchers are therefore invited to submit interesting contributions both in theoretical work and real world applications so to create a fruitful discussion regarding the presented challenges and the following related topics:

- Distributed learning and experience sharing among agents
- Advances in Multi-Agent System coordination
- Formal methods and languages for distributed adaptive systems
- Modelling distributed adaptive systems
- Collectivism in distributed adaptive systems
- Optimization in distributed adaptive systems
- Framework and design patterns for distributed adaptive systems
- Bio-inspired and evolutionary approaches to distributed adaptive systems
- Tools and simulation software for distributed adaptive systems
- Case studies and real world applications.

Accepted papers will be included in the ICAC Workshop 2015 Proceedings, which will be published in IEEE Xplore.

Program Chairs

Antonio Bucchiarone, Fondazione Bruno Kessler, Trento, Italy bucchiarone@fbk.eu

Giacomo Cabri, Università di Modena e Reggio Emilia, Modena, Italy giacomo.cabri@unimore.it

Nicola Capodieci, Università di Modena e Reggio Emilia, Modena, Italy nicola.capodieci@unimore.it

Haibin Zhu, Nipissing University, Canada haibinz@nipissingu.ca

Full details: www.focas.eu/workshop-distributed-adaptive-systems

FoCAS sponsor best paper at ALA 2015



CFP

Adaptive Learning Agents (ALA) encompasses diverse fields such as Computer Science, Software Engineering, Biology, as well as Cognitive and Social Sciences. The ALA workshop will focus on agents and multiagent systems which employ learning or adaptation.

The goal of this workshop is to increase awareness and interest in adaptive agent research, encourage collaboration and give a representative overview of current research in the area of adaptive and learning agents and multiagent systems. It aims at bringing together not only scientists from different areas of computer science (e.g., agent architectures, reinforcement learning, and evolutionary algorithms) but also from different fields studying similar concepts (e.g., game theory, bio-inspired control, mechanism design)

The topics of interest include but are not limited to:

- Novel combinations of reinforcement and supervised learning approaches
- Supervised multiagent learning
- Reinforcement learning (single and multiagent)
- Planning (single and multiagent)
- Reasoning (single and multiagent)
- Distributed learning
- Adaptation and learning in dynamic environments
- Evolution of agents in complex environments
- Co-evolution of agents in a multiagent setting
- Cooperative exploration and learning to cooperate and collaborate
- Learning trust and reputation
- Communication restrictions and their impact on multiagent coordination
- Design of reward structure and fitness measures for coordination
- Scaling learning techniques to large systems of learning and adaptive agents
- Emergent behaviour in adaptive multiagent systems
- Game theoretical analysis of adaptive multiagent systems
- Neuro-control in multiagent systems
- Bio-inspired multiagent systems
- Learning of Co-ordination

This year's workshop is organized by:

Daan Bloembergen (University of Liverpool, UK)

Daniel Hennes (European Space Agency, Katwijk, NL)

Logan Yliniemi (Oregon State University, Corvallis, USA)

Submission Deadline: February 11, 2015

Notification of acceptance: March 6, 2015

Camera-ready copies: March 19, 2015

Early registration: t.b.a.

Workshop: May 4-5, 2015

Contact: ala.workshop.2015@gmail.com

Full details available here: www.focas.eu/best-paper-award-ala-2015

FoCAS sponsor travel burseries for AAMAS DS

FoCAS are pleased to sponsor two travel bursaries for the **AAMAS doctoral symposium** held on **5 May 2015** in Istanbul. Applications will be selected from successful entrants to the AAMAS doctoral mentoring programme who also apply for student travel support, with winners decided by the co-chairs and announced by mid-March. Travel reimbursement up to a maximum value of 400 EUR or equivalent will be paid retrospectively after the event by FoCAS.

To be eligible an applicant must:

- be registered as a full-time student at a higher education institution (e.g. University);
- have applied for the AAMAS 2015 Doctoral Mentoring Program;
- do research in the field of collective adaptive systems;
- preference will go to students who are part of one of the FoCAS projects.

To apply please refer to <http://www.aamas2015.com/en/STUDENT-TRAVEL-SUPPORT.html> and complete the application form linked there. The deadline for the application is February 15, 2015 (11:59pm, Hawaii time).

Please see <http://www.aamas2015.com/en/CALL-FOR-DOCTORAL-MENTORING.html> for applying for the AAMAS 2015 Doctoral Mentoring Program.

Other upcoming related events

SEAMS 2015: 10th International Symposium on Software Engineering for Adaptive and Self-Managing 18-19 May 2015, Florence, Italy

ICAC 2015: 12th IEEE International Conference on Autonomic Computing 7-10 July 2015, Grenoble, France

ECAL 2015: 13th European Conference on Artificial Life 20-24 July 2015, York, UK

SASO 2015: 9th IEEE International Conference on Self-Adaptive and Self-Organizing Systems 21-25 September 2015, Boston, USA

Project News

ASSISI_bf

Assisi_bf sister project CoCoRo have launched A Year of CoCoRo. Every week they're presenting a new video showing the scientific/engineering outcome of their recently ranked "excellent" EU-ICT project CoCoRo (Collective Cognitive Robotics). That's 52 videos! CoCoRo holds the largest autonomous underwater swarm in the world - 41 robots of 3 different kinds. Details available here: www.focas.eu/year-of-cocoro-52-videos-in-2015



Jeff, a very fast and agile small autonomous swarm robot

CASSTING

The Cassting team are organizing a seminar in Dagstuhl, from February 2nd to February 6th. The aim of the seminar is to push forward and integrate the rapidly developing research on non-zero-sum games in its many facets (e.g., timed games, priced timed games, stochastic games, energy games, games with multidimensional optimization criteria, etc.), and to build bridges to related fields, in particular to control engineering. The seminar will be the occasion to detect problems and approaches where the represented communities from automata theory, logic, formal methods, game theory, and supervisory control can join their forces.

In early November 2014 Cassitng partner Seluxit presented the advances obtained by the partners of the Cassting project at the European Utility Week, held in Amsterdam. Many visitors expressed a high interest in the topics addressed by the project, and have discussed other possible applications in energy innovation.

Finally, Wolfgang Thomas (RWTH Aachen) was invited to give the 2014 Milner lecture. The lecture took place in Edinburgh on 3rd October 2014; Prof Thomas gave a lecture on “Finite Automata and the Infinite”, which is available on <https://www.youtube.com/watch?v=JqLX4LzFBn4>

DIVERSIFY

Diversify have recently produced a promo video that details the premise of their project. You can view the video here:

www.focas.eu/diversify-project-animation

QUANTICOL

The QUANTICOL project held an intensive two-day workshop in Edinburgh on 19th and 20th November 2014 to review progress on the design of the modelling language for the project, a domain-specific process calculus for describing collective adaptive systems. The meeting took input from the case studies experience and reviewed the progress made in the project on bringing together the language ideas from the project partners before synthesising this into a unified language design. The language’s semantics were drawn up in an intensive creative endeavour involving input from all of the project partners.



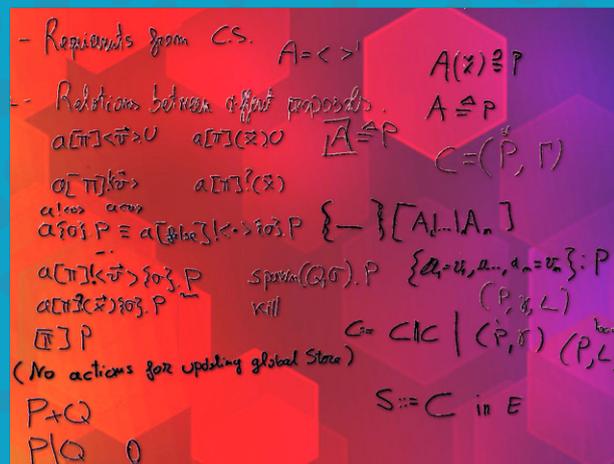
Cassting at European Utility Week



Wolfgang Thomas lecture in Edinburgh



Still from Diversify promo animation



Whiteboard bokeh

SMART SOCIETY

Smart Society researchers recently won a Best Paper Award at the 6th International Conference on Mobile Computing, Applications and Services (MobiCASE 2014). The paper titled “*Recognizing Hospital Care Activities with a Pocket Worn Smartphone*”, was authored by **Gernot Bahle, Agnes Gruenerbl, Enrico Bignotti, Mattia Zeni, Fausto Giunchiglia** and **Paul Lukowicz**.

Smart Society are also developing a ridesharing application: Smart Share.
For full details visit the Smart Society website:
www.smart-society-project.eu

SWARM ORGAN

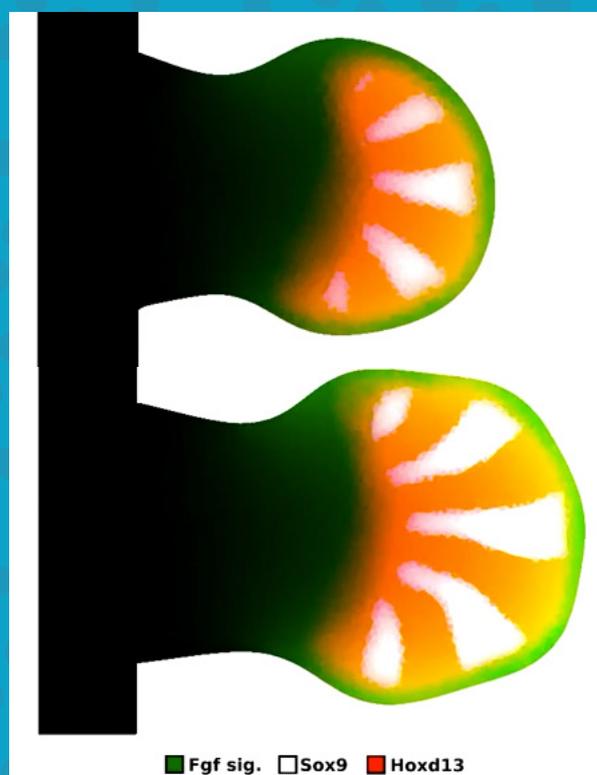
CRG researchers confirm that a mathematical theory first proposed by Alan Turing in 1952 can explain the formation of fingers

In a paper published recently in Science, researchers from Multicellular Systems Biology lab at the Centre for Genomic Regulation (CRG) in Barcelona led by ICREA Research Professor **James Sharpe**, show that BMP and WNT proteins are the so-called “Turing molecules” for creating embryonic fingers. This confirms a fundamental theory first proposed by the founding father of computer science, Alan Turing, back in 1952. BMPs and WNTs interact in a self-organising process, producing a repetitive pattern of gene expression that determines which cells should become fingers. This explains why polydactyly – the development of extra fingers or toes – is relatively common in humans, affecting up to 1 in 500 births.

Full details at:
www.swarm-organ.eu



Scenarios from Smart Share App



Stills from Alan Turing Math Model

ASCENS (Autonomic Service-Component Ensembles)

Blog entry: **Distributed Exploration with a Robot Swarm**

<http://blog.ascens-ist.eu/2015/01/distributed-exploration-with-a-robot-swarm>

ORGANIC COMPUTING

Educational resources: Organic Computing - Quo Vadis?

<http://www.organic-computing.de/education>

ASAP (Adaptive Security and Privacy)

Congratulations to **Mu Yang** who received the Best Paper Award at TrustCom 2014, for her paper on Adaptive Sharing for Online Social Networks: A Trade-off between Privacy Risk and Social Benefit, co-authored with **Yijun Yu, Arosha Bandara, and Bashar Nuseibeh** (Beijing, China, September 2014)

COLLMOT (Complex Structure and Dynamics of Collective Motion)

Watch the YouTube video of the first autonomous outdoor flying multi-copter flock ever!

<https://www.youtube.com/watch?v=qRPuXtIZjuU&feature=youtu.be>



Investigating the diversity of browser fingerprints

Browser fingerprinting is the systematic collection of information about a browser, for identification purposes. Client-side scripting languages allow the development of procedures to collect very rich fingerprints: browser and operating system type and version, screen resolution, architecture type, lists of fonts, plugins, microphone, camera, etc. In 2010, the Electronic Frontier Foundation demonstrated that fingerprints are so diverse that they can be used to identify users uniquely and track them [4]. Since then, more work has demonstrated how fingerprints are used to track users [5] and has proposed fingerprinting scripts that are more and more sophisticated [6].

This growing concern for user privacy has been widely covered in the general press and in technical magazines [7] in the past months. In essence, a fingerprint becomes a threat for user privacy because of two characteristics: the unicity of the fingerprint and its great stability over time. These two properties emerge from the availability of massive quantities of software modules that users can install to customize their environment (increasing the odds of making it unique) and the fact that users who have set a comfortable environment do not change it very often.

The DIVERSIFY project investigates how software diversity can be used to automatically reconfigure user's platform to modify the fingerprinting and thus prevent its exploitation for tracking. The first step for this work consists in observing the diversity of actual fingerprints that can be collected on the web.

In November 2014, we have launched a website [1], which aims both at informing users about fingerprinting and at collecting real fingerprints. This work has been demonstrated in several open source forums and has had a substantial interest from big open source projects such as Mozilla. A complete article about this work has appeared in the general-audience magazine Clubic [2], it has appeared in Le Monde (one of the largest daily French newspaper) [3] and more recently on slashdot.org. The code for the web site is open source under an MIT licence [4].

We now have more than 30000 different fingerprints and the database keeps growing. This unique source of data about software diversity allows us to understand browser fingerprinting in details and provides an essential foundation for an effective defense.



Figure 1 - Distribution of browsers and of versions of Firefox among 40800 fingerprints

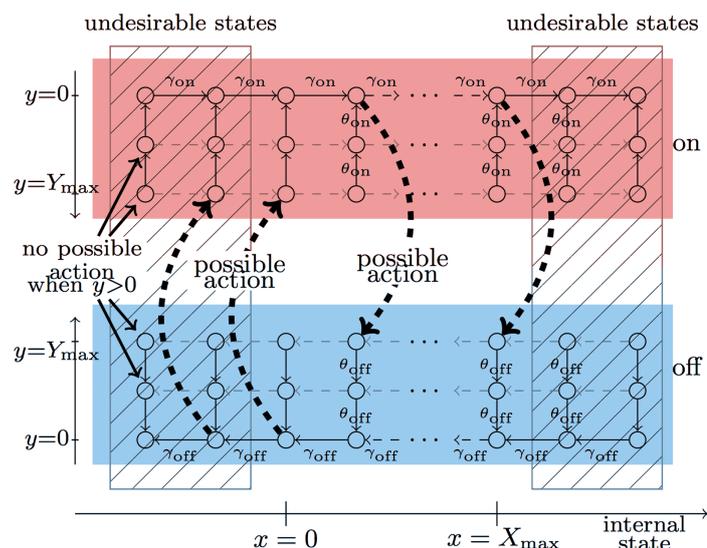
References.

- [1] <https://amiunique>
- [2] <http://pro.clubic.com/webmarketing/publicite-en-ligne/actualite-742853-fingerprinting-cookies.html>
- [3] http://abonnes.lemonde.fr/sciences/article/2014/11/24/le-fossa-bazar-techno-participatif_4528568_1650684.html

Electricity markets are developing worldwide, replacing tightly regulated systems by decentralised control mechanisms. Demand-Response mechanisms have emerged in order to take advantage of flexible demand in a system where demand is traditionally considered to be inflexible.

Demand-Response mechanisms can compensate for mismatches between production and consumption, thus increasing the potential deployment of renewable generation by reducing the necessity for regulation reserve. It can be implemented by having consumers react to prices or to congestion signals.

Researchers in INRIA and EPFL in the QUANTICOL project have been working to extend previous approaches to Demand-Response to model a two-stage electricity market that features generation constraints, inelastic loads, and elastic loads corresponding to a set of appliances. The elastic load model used in the project captures several key features of controllable thermostatic loads. The loads are elastic in the sense that it is possible to perform price arbitrage by delaying or anticipating the consumption of each load, but an appliance's consumption cannot be arbitrarily reduced by augmenting



Each appliance has an internal state representing an attribute such as its temperature. A load that is delayed for too long reaches an undesirable state: for thermostatic loads, this corresponds to having the temperature outside a given dead-band. An appliance that has just been switched on should not be switched off immediately. This mini-cycle avoidance is added to the system by including another dimension in the state space: a counter indicates the waiting time before the appliance is allowed to respond to Demand-Response signals. A mean-field model is used in numerical evaluations to keep track of the empirical distribution of the appliances' states.

In conjunction with the Swiss Nano-Tera project "Smart Grid", the QUANTICOL project has developed a numerical methodology based on the Alternating Direction Method of Multipliers which computes the market equilibrium for a realistic forecast error model. Forecast errors are modelled using multiple trajectories generated from multivariate Gaussian random variables. The correlation matrices are derived from traces of data from the UK.

Recent project publications



ALLOW
Ensembles

Hahn, Michael; Gómez Sáez, Santiago; Andrikopoulos, Vasilios; Karastoyanova, Dimka; Leymann, Frank: Development and Evaluation of a Multi-tenant Service Middleware PaaS Solution. In: Proceedings of the 7th International Conference on Utility and Cloud Computing (UCC 2014)

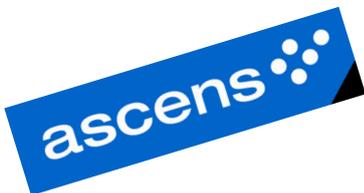
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