The Sixteenth International Conference on Autonomic and Autonomous Systems
ICAS 2020
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Panel:
Autonomy Control at Work: Cars, Robots, Drones, Satellites and all other resources
(Main Features, Vision, Sensing, Trustfulness, Stability, ...)

Chair
Roy Sterritt, Ulster University, Northern Ireland. r.sterritt@ulster.ac.uk

Panellists
Petr Skobelev, Knowledge Genesis Group / Samara Technical University, Russia petr.skobelev@gmail.com
Mario Döller, Fachhochschule Kufstein, Austria Mario.Doeller@fh-kufstein.ac.at
Petre Dini, IARIA, EU/USA petre@iaria.org
Claudius Stern, biozoom services GmbH - Kassel | FOM University of Applied Sciences - Essen, Germany Claudius.Stern@gmx.net
Giulia De Masi - Zayed University, UAE Giulia.DeMasi@zu.ac.ae
Timothy Patten, Automation and Control Institute, TU Wien, Austria patten@acin.tuwien.ac.at
Pedro Forero, Naval Information Warfare Center Pacific, USA pedro.a.forero@navy.mil

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Panellist Position

Towards Industry 5/0: Adaptive Managing of Autonomous Swarms in Real Time

Peter Skobelev, Knowledge Genesis Group / Samara Technical University, Russia petr.skobelev@gmail.com
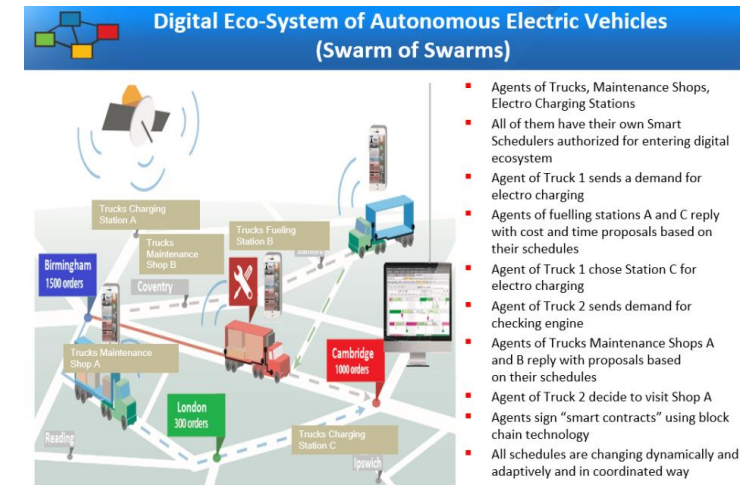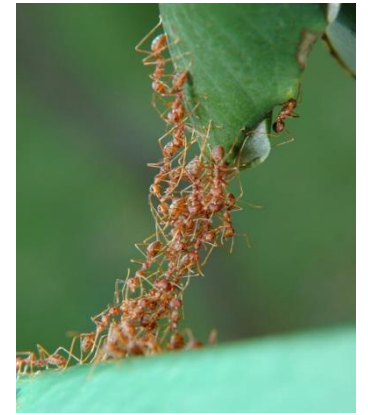
Analysis of enterprise management problems shows that resource management is a complex multi-criteria problem that requires coordinated solution according to the situation and interaction of many participants (customers, managers dispatchers etc.) with their own interests, decision criteria, preferences and restrictions.

The complex problem posed must also be solved adaptively in the course of continuous changes in the initial conditions according to events in real time. Multi-agent system help to solve the problem using collective "swarm intelligence".

The new challenge is to manage adaptively not just one fleet of trucks or factory workshop but to form digital eco-systems of smart schedulers for managing resources (swarm of swarms).

Have a look on "Swarm of Satellites" based on multi-agent technology:

• Short version: https://youtu.be/JOjhaIRBVdI (5 min)

• Extended version: https://www.youtube.com/watch?v=r7vKK9XnTCE (10 min)

Digital Eco-System of Autonomous Electric Vehicles (Swarm of Swarms)

- Agents of Trucks, Maintenance Shops, Electro Charging Stations
- All of them have their own Smart Schedulers authorized for entering digital ecosystem
- Agent of Truck 1 sends a demand for electro charging
- Agents of fuelling stations A and C reply with cost and time proposals based on their schedules
- Agent of Truck 1 chose Station C for electro charging
- Agent of Truck 2 sends demand for checking engine
- Agents of Trucks Maintenance Shops A and B reply with proposals based on their schedules
- Agent of Truck 2 decide to visit Shop A
- Agents sign "smart contracts" using block chain technology
- All schedules are changing dynamically and adaptively and in coordinated way

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Panellist Position

Data processing pipeline for automated multimodal mobility

Mario Döller University of Applied Sciences Kufstein Tirol, Austria Mario.Doeller@fh-kufstein.ac.at

and colleagues: Kris Raich, Robert Kathrein

Automated vehicles will become a reality in the future in several dimensions
(e.g. 2D: street, sea, railway / 3D: UAS). A prerequisite for automated mobility
is the establishment and long-term management of a stable and sufficient communication
(C), navigation (N) and surveillance (S) infrastructure. In our research projects,
we develop together with several industry partners a mobile CNS infrastructure including
a real time data processing engine in order to support safe and secure mobility applications.
For simplicity, in our first focus, we are concentrating on UAS and its secure operation.
However, our approach is designed to be multimodal in order to manage automated vehicles
across several traffic domains by one real time data processing engine and its visualization.
In the core of our system a digital twin represents the operational environment.

https://owncloud.fh-kufstein.ac.at/index.php/s/sSi3exBV7pqI3Ww

0:35 / 1:47   Visualization of traffic corridors based on data model

Panel:
Autonomy Control at Work: Cars and Drones
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Panellist Position

Managing Fleets of Drones and Driverless Cars

Petre Dini, IARIA, EU/USA petre@iaria.org

- Mobility-as-a-Service

- Fleet cognition plan

- Fleet member adaptability

- Fleet embedded monitoring

- Fleet-as-a-Service (hospitals, wars, property security, emergency services on vast areas)

→ Private cars will become obsolete

→ Hybrid fleet harmonization (underwater, terrestrial, aerial) for a complex service delivery

→ Fleets of fleets

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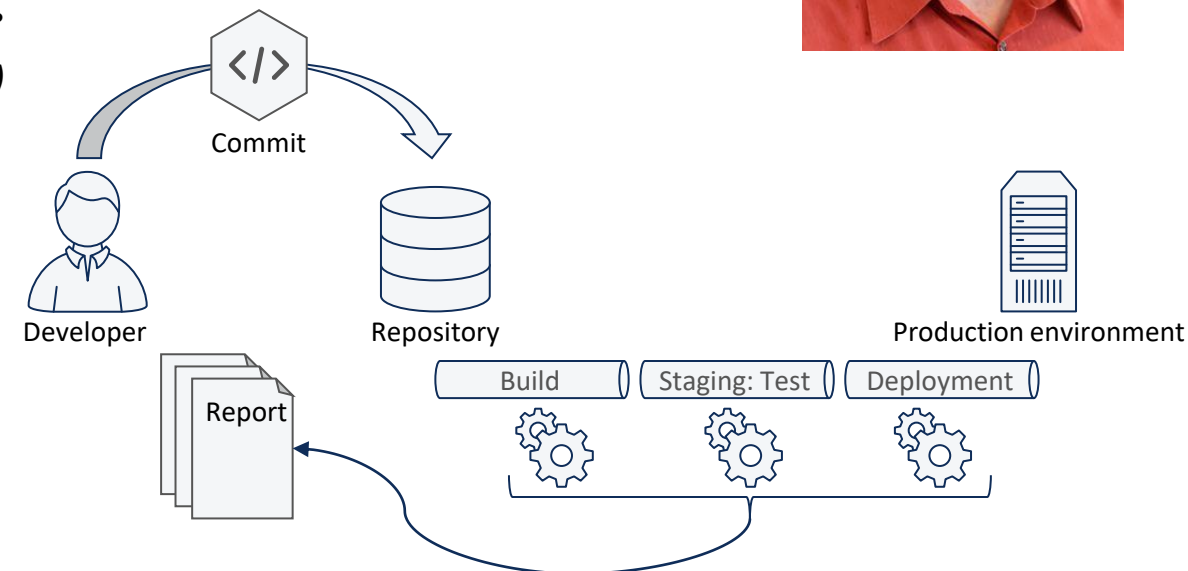*(Main Features, Vision, Sensing, Trustfulness, Stability, ...)*

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Panellist Position

Autonomy @ Work

Claudius Stern, biozoom services GmbH - Kassel | FOM University of Applied Sciences - Essen, Germany Claudius.Stern@gmx.net

Today's megatrend "Digitalization" comes with many challenges in different areas: private households, ubiquitous devices connected to the internet and last but not least business processes in small and medium enterprises. This causes traditional workflows to get scattered between traditional and digital processes. Autonomous systems may help to cope with those challenges, taking load from the user. Robotic Process Automation (RPA) is one (renewed) approach to cope with scattered workflows.

The digitalization trend raises expectations regarding transparency, reliability, quality and time to delivery. Therefore, another approach being currently in focus is Continuous Integration / Continuous Deployment (CI/CD) which uses automated processes to take reiterating tasks from the user.

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Panellist Position

Swarm robotics: how it will help in the near future for real world applications.

Giulia De Masi - Zayed University, UAE Giulia.DeMasi@zu.ac.ae

Giulia De Masi is a PhD in Physics, with 15+ years of experience both in Academia and Industry.
Always oriented to multidisciplinary applications, she led several Research and R&D projects in Machine Learning and Robotics.

Currently she is Principal Scientist in the Autonomous and Robotics Research Center (TII) in Abu Dhabi.

Her main scientific interests are Swarm Robotics, Statistical Physics, Stochastic Processes, Machine Learning.

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Panellist Position

Robot vision in the wild: Towards Lifelong Learning

Tim Patten, *Automation and Control Institute, TU Wien, Austria patten@acin.tuwien.ac.at*

*Vision is a key component for autonomous systems to understand their surroundings. A strong limitation, however, is the common closed-set assumption, which prevents general and robust deployment.
Two aspects, namely, anomaly detection and open-set recognition, aim to address this limitation by exploring methods that enable machines to not only realise what they do not know but to react in a safe and appropriate manner.
Such techniques are essential for developing the next generation of robots that can adapt and continuously learn over their operational life.*

Dr. Timothy Patten received his PhD from the Australian Centre for Field Robotics at the University of Sydney, Australia. He is now a postdoctoral researcher with the Vision for Robotics laboratory at the Technical University of Vienna, Austria. He has been involved in a number of research and industry sponsored projects in which he worked on object segmentation, recognition, grasping and task planning. Currently, he is the principal investigator at TU Wien in the CHIST-ERA project InDex, for which he is developing methods for object tracking and semantic grasping..

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Panellist Position

Autonomy Challenges for Long-endurance AUV Deployments

– Trust and Reliability

Pedro A. Forero, Naval Information Warfare Center Pacific, USA pedro.a.forero@navy.mil

Claudius

Advances on autonomous underwater vehicle (AUV) technologies will extend the duration of and reduce the requirements for frequent human intervention in a wide range of undersea missions. Although autonomy advances in the terrestrial and air domains have translated into broad technology adoption, a similar trend has not been observed for AUVs. Cost and limited access to the operational domain considerations aside, two major roadblocks for the adoption of autonomy technologies remain for civilian and military communities that operate regularly undersea, namely trust and reliability. In the undersea domain, these roadblocks are exacerbated by the limited communication options that operators have available to interact with AUVs after deployment. Thus, additional emphasis is needed to explore and develop effective human-on-the-loop autonomy solutions that enable the operator to have insight into the AUV as it executes the mission and fault management autonomy able to adjust the AUV mission goals, within the scope defined by the AUV operator, in response to AUV faults and payload performance degradation.

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Panel Chair

Autonomy @ work via Autonomicity

Roy Sterritt, Ulster University, Northern Ireland.   r.sterritt@ulster.ac.uk

From a software engineering perspective, to achieve autonomy we need a separation of concerns;

autonomicity deals with the self-management of the actual systems (of systems) to enable autonomy of the task/mission/user oriented goals.

From this perspective, autonomicity is a specialization of autonomy, where the task is the management of the system (self-healing, self-configuring, self-optimizing, self-protecting).

*As an example, a PhD study by **Clement Gama**, into specifying capability levels of autonomicity for cubesats that can assist in the autonomy (and capability) of such missions from single craft, to constellations and towards swarms, is presented.*

https://gama-c.wixsite.com/smartsats/intro

Roy's main focus of research is Systems and Software Engineering of Autonomic (Self-Managing Computer-Based) Systems, essentially a research area developed from a call from industry to deal with the complexity and total cost of ownership of our systems of systems (IBM 2001). To date he has 200+ publications in the field including research collaborations with NASA, IBM TJ Watson Center, BT, SAP, HP and Core Systems as well as many academic partners. The research with NASA also lead to 16 US patents. He was the founding chair of the IEEE Task Force and subsequently Technical Committee on Autonomous & Autonomic Systems and elected chair of IEEE Technical Committee on Engineering of Computer-Based Systems. He has held many other IEEE roles such as; IEEE CS Publications board member, chair of the Conference Publications Operations Committee (CPOC); served on the IEEE CS Technical & Conferences Activities Board (T&C Excom and Opcom) and chaired the Conference Advisory Committee (CAC). He has been appointed to the many editorial boards including the NASA Journal on Innovations in Systems and Software Engineering, ACM Transactions on Autonomous and Adaptive Systems (TAAS), AIAA Journal of Aerospace Computing, Information, and Communication, Journal of Autonomic and Trusted Computing, and Multiagent and Grid Systems - An International Journal; and served on steering and/or program committees of the majority of the conferences in his field at some stage during the last 20 years.