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Domaine L&R Kox, Luxsense, SnT and AERO41 join European Research and Development Project Investing €7M in Platform for Developing Safe and Reliable Multi-Robot Systems

Consortium of Leading European Universities and Research Institutes, Robotics Manufacturers and Technology Suppliers, and Industrial and Government Organisations Developing Technologies to Streamline the Design, Development, Testing, and Safety/Security Assurance of Multi-Robot Systems

Luxembourg — 7 April 2021 — Domaine L&R Kox, Luxsense, SnT at the University of Luxembourg and AERO41 today announced they are partnering with a consortium of leading European Universities, Research Institutes, Industrial and Government Organisations to address the complexity of developing systems of interconnected robots to perform tasks whose complexity and cost are too high for a single robot. The project will provide advanced software design and deployment capabilities that handle the uncertainty, variability, and interplay of safety and security assurance challenges posed by Multi-Robot Systems (MRS).

The advanced development and deployment technologies will enable a new generation of MRS to deliver solutions for key European sectors including Healthcare, Manufacturing, Agri-

food, and Infrastructure Inspection, where groups of interconnected robots are better able to carry out critical tasks such as disinfecting hospitals, managing farms and crops, rapidly adapting production lines to new products, and maintaining energy transmission facilities. The SESAME project (**Se**cure and **Sa**fe **M**ulti-Robot Syst**e**ms) is investing €7 million to develop an open, modular, configurable platform for systematic engineering of dependable MRS.

Domaine L&R Kox, SnT, Luxsense and AERO41 will be involved in the pilot deployments and validation of the new SESAME platform and will target use of the new technologies in viticulture to validate the capabilities provided for new MRS solutions. The goal of the three partnering companies Domaine L&R Kox, Aero41 and LuxSense is, with the help of SESAME, to develop a data acquisition and analysis system to be applied in viticulture. SESAME will facilitate to pursue the digital transformation in viticulture. Two research groups at SnT, the Space Robotics research group (SpaceR) and the Automation & Robotics research group (ARG), will develop novel sensor fusion and planning algorithms to assure safety and security while operating multiple robots.

The SESAME technologies will focus on addressing key aspects of MRS including emergent behaviour, uncertainties in the operating environments, security threats and safety, heterarchy of systems, variability of robotic hardware platforms, and tailorability. Key technological advances being developed in the project include:

- Simplifying MRS configurations by using new languages that hide the complexity and intricacies of robotic platforms
- Machine learning of MRS tasks and scenarios that are adaptable and reusable to exploit past knowledge and experience for subsequent tasks
- Advanced automation of effective safety and security analysis during MRS design providing substantial savings in time and costs
- Novel forms of safety and security assurance that uses advanced run-time monitoring capabilities
- Seamless configuration and reconfiguration at design and run-time enabling MRS to be rapidly adapted for different applications and scenarios

The innovative framework will be extensively validated through five industrial pilots addressing MRS for Healthcare, Manufacturing, Agri-food, and Infrastructure Inspection. The resulting platform will be made available in open source.

Coordinated by The Open Group and under the Technical Direction of University of York, the SESAME consortium includes leading universities and research institutes: ATB, Bonn-Rhein-Sieg University, FORTH, Fraunhofer, KIOS, University of Hull and University of Luxembourg (SnT); leading robotics manufacturers and technology providers: KUKA,

Locomotec and TTS; and industrial, agricultural and government organisations that rely on robotic systems: Aero41, Domaine L&R Kox, Luxsense, AVL, and Cyprus Civil Defence Agency. Partners are based in Austria, Cyprus, Germany, Greece, Italy, Luxembourg, Switzerland, and the United Kingdom.

"We will use a set of methodologies, analyses and processes to develop a multi-robot system to be applied for crop protection and disease detection in vineyards", said Dr Corinne Kox, manager of Domaine L&R Kox. *"Crop growth modelling and disease detection will be key to contribute significantly to environmental sustainability in viticulture."*

"To bring the idea of precision agriculture – in this case precision viticulture – to reality, the complete system needs to be translated to a digital world. Remote sensing provides us with the tools we need to create digital twins of vineyards." declared Dr. Gilles Rock, CEO of Luxsense geodata sàrl. *"We use drones equipped with various sensors to collect high resolution datasets that can be analysed using machine learning and artificial intelligence. That's how we detect disease hotspots in the vineyards."*

"A Multi-robot system will enable large scale operations with drones and ground robots." said Prof. Miguel Olivares-Mendez, Head of the Space Robotics (SpaceR) Research Group at SnT. *"Thanks to the experience of SnT in data fusion, situational awareness and trajectory planning techniques, in this project, we will develop new heterogeneous data fusion techniques not only to increase the accuracy of the data gathered, but also to increase the resilience of the global system.".*

"This project will give us the opportunity to further develop an ecosystem that will reduce the use of plant protection products while ensuring optimal plant protection," said Frédéric Hemmeler, CEO of Aero41. *"The fusion of data and the rapid processing of its content should make it possible, by making several robots work in a coordinated way, to obtain much more optimal performances, respectful of the environment and people in the crop protection sector. Aero41 benefits from a proprietary control system that is perfectly open to welcoming new technologies from our partners in this project."*

"The SESAME project brings together Europe's leading experts in software development technologies for robotic systems that will go beyond the state-of-the-art to develop new and creative engineering tools and methods for implementing safe, secure, and reliable multi-robot systems" said Scott Hansen, from The Open Group, who are coordinating the project. *"The new SESAME technologies hold tremendous promise in providing effective solutions to challenges faced by key European industries and governments and will make*

possible the development of a new generation of robotics applications that exploit the capabilities of multi-robot systems across Europe."

The SESAME project is financed in part by the Horizon 2020 Framework Programme, an initiative of the European Community created to foster European research and development of new technologies, applications and industries. The SESAME project will run through the end of 2023. More information about the project is available at www.sesame-project.org.

About Domaine L&R Kox
Domaine L&R Kox is a small family-run winery located in the Moselle valley in Luxembourg. Domaine L&R Kox plays a pioneering role in using modern technologies in vineyards. Domaine L&R Kox has been the first winery in the EU to use UAV technology in crop protection.
Further information on Domaine L&R Kox can be found at www.domainekox.lu.

About Luxsense Geodata
Luxsense geodata is specialized in high-resolution earth observation. Luxsense geodata provides expertise in data collection as well as in processing and analysis of UAV based earth observation data. Founded in 2015, Luxsense's main fields of application include innovative acquisition techniques in engineering and agriculture.
Further information on Luxsense Geodata can be found at www.luxsense.lu.

About SnT
SnT at the University of Luxembourg, brings together researchers from its faculties and partners to carry out research and PhD education. They achieve high impact and excellence beyond the academic community by establishing collaborations with external partners, such as industries, government bodies, institutions, and internal actors. Automation Research Group (ARG) and Space Robotics (SpaceR) research groups have been leading the research in robotics in Luxembourg for the last 10 years.
Further information on SnT can be found at https://www.uni.lu/snt.

About AERO41 SA
Aero41 SA brings together a team of experts in the fields of robotic flying, aviation and advanced applications in the commercial civil drones' sector. AERO41 SA is a European pioneer in the development of UAVs dedicated to crop protection and chassis with high payload capacity.
Further information on AERO41 can be found at www.aero41.ch.

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