



FLEXIGROBOTS

Newsletter #1

September 2021



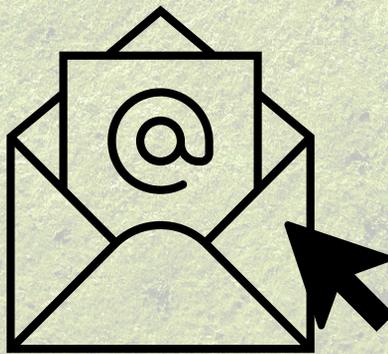


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EDITOR'S NOTE

One of the lessons learnt during the coronavirus pandemic that has devastated the world during the last year is the importance of the essential sectors that sustain our lifestyle. Medical doctors, nurses, emergency services and in general healthcare systems have been our first line of defence against the disease. Nevertheless, we must not forget the role that other professionals have played while most of us sheltered at home during the several lockdowns, e.g., road hauliers, carriers, cashiers, policemen...

Of course, the farmers have gone on working in these difficult conditions to provide the whole society with high-quality and fresh products. Their relevance is also fundamental to mitigate the progressive abandonment that many rural areas are suffering all over the world or even to improve the sustainability of the food value chain, since the consumption of local products prevents the need to import goods from other countries or even continents, with the consequent carbon emissions.

To improve the labour conditions of our agriculturists, their competitiveness, the quality of their products and to reduce the negative impact in the environments of pesticides and other chemical substances, new digital technologies are starting to be adopted.

Thanks to IoT sensors, Big Data or Artificial Intelligence, the traditional procedures and tools used in agriculture are being radically transformed.

Drones and robots are starting to be used as an additional and powerful way to obtain high-quality information from the crops and to execute actions including fertilisers spreading or even harvesting. Nevertheless, in most cases, current agro-robotics systems are designed to automate very specific tasks, being highly specialised and working in isolation with respect to the rest of the systems deployed in the crops, leading to a low return of investment and high risks for the farmers.

FlexiGroBots project will define a reference architecture and implement enablers for building **mission control of heterogeneous multi-robot systems which collaborate to**

accomplish complex missions for precision agriculture, integrating planning and supervising functionalities.

The architecture will be designed to enable secure and sovereign data exchange; to store, access and analyse geospatial information; and to be interoperable with the European Artificial Intelligence on Demand platform.

A set of AI methods and services will be built to exploit available information or to be embedded within the robots for perception, decision and actuation. They will consider by-design Ethical, Legal and Socio-Economic issues, ensure scalable human oversight and intervention and compliance with trustworthy requirements.

The project includes three real-world and large-scale pilots dealing with varying levels of complexity regarding types of crops, geographical regions, weather conditions, and national regulations.

Daniel Calvo Alonso, Project Coordinator



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FlexiGroBots – Project Updates

WP2 – Requirements, architecture and standardisation

Objectives:

WP2 is divided into **5 well-coordinated tasks** to jointly achieve the goal of providing the requirements specification and architecture guidance of the platform to be developed in the FlexiGroBots project.

Thus, specific objectives include:

1. Analysis of the FlexiGroBots system from stakeholders' point of view.
2. Elaboration of the list of specific requirements for the platform implementation.
3. Analysis of important questions such as portability and interoperability as well as the proper application of currently available standards, in the fields of agricultural safety, agricultural machinery and autonomous machinery.
4. Special consideration in the design and implementation of the platform of Ethical, Legal and Socio-Economic (ELSE) issues, generating new insights on the relation between AI, robotics and ELSE factors.
5. Definition of an appropriate framework that favours synergies and re-use between pilots., not only by sharing the architecture and solution building blocks between the different heterogeneous multi-robot solutions developed in each pilot, but the methodologies and best practices to do so.

Progress:

After the first 5 months of the project, a well-elaborated questionnaire for an internal survey of the stakeholders involved in the project is already available.

A first version of the **FlexiGroBots platform architecture** is also available, as well as a fairly detailed high-level description of all the use cases involved in the three pilots.

The FlexiGroBots high-level architecture is designed considering the results achieved by previous R&D projects and initiatives like International Data Spaces Association (IDSA), Internet of Food and Farm 2020, FIWARE or GAIA-X.



FlexiGroBots – Project Updates

WP3 – Platform development

Objectives:

The aim of work package is to **develop the FlexiGroBots common platform** and the building blocks that support the implementation of the project pilots' applications.

The platform will satisfy the stakeholders' requirements specified by WP2 and it will realise the reference architecture for building **mission control systems** for diverse and **heterogeneous robots' fleets**.

FlexiGroBots platform will be based on the following elements:

1. An Artificial Intelligence platform that will support the management of the complete lifecycle of Machine Learning models for robotics systems.
2. An IDSA-compliant agricultural data space that enables and facilitates the access to common data repositories and enabling services (dealing with spatial and non-spatial information).
3. To provide a series of AI for robotics services which can be reused across pilots and/or future agricultural multi-robot solutions, providing AI methods for perception, decision and action in intelligent robotics systems.
4. To provide a platform to develop the high-level planning, supervision and control of agricultural heterogeneous multirobot missions, covering a higher level of control than conventional robotic platforms.

Progress:

During the first six months of the FlexiGroBots project, WP3 has focused its efforts on the deployment of **early prototypes of the components for supporting AI and geospatial analysis**, providing **interoperability** with relevant platforms and initiatives like **AI4EU**, **Open Geospatial Consortium (OGC)** or **International Data Spaces Association (IDSA)**.

In addition, a set of AI services that will be common to the three project pilots and reusable in many other agricultural use-cases are being specified.



FlexiGroBots – Project Updates

WP4 – Pilot 1: Grapevines



Objectives:

FlexiGroBots first pilot has the global objective of **automating and improving the management tasks** that are carried out in a vineyard during the season.

The pilot team is composed of **SERESCO, CSIC, WUR, and Terras Gauda**.

These are the three particular objectives:

- **Early detection of botrytis:** Anticipating the appearance of visible symptoms in the plant, through the data collected by a fleet of unmanned air vehicles (UAV or drones) and sending Unmanned Ground Vehicles (UGV) for a close inspection.
- **Phytosanitary treatments:** Applying the treatments in a localized and accurate way on the bunch of grapes that suffers the disease, employing UGV.
- **Transport of the grapes:** That will be carried out by UGV, which will imply time and cost savings. The aim is to have robots carrying baskets, autonomously following operators and going to the vineyard line when the baskets are fully loaded with grapes.



Progress:

The first tasks were focused on the **pilot's specification and planning**: obtaining and processing of aerial and terrestrial images, development of the Decision Support System (DSS) application and robotic platforms. At the same time, we worked with the identification of technologies, hardware devices and datasets that will be used in the pilot.

The next step was the **elicitation of requirements**, user stories and use-cases. We also worked on Risk Management planning: identification, assessment, mitigation, monitoring, and reporting risks for coverage and security requirements.

Finally, the preparation of the Individual's Communication & Dissemination Plans.



Find out more



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FlexiGroBots – Project Updates



WP5 – Pilot 2: Rapeseeds



Objectives:

The second pilot is focused on **multi-robot fleets and data space driven AI on rapeseed pest management and silage harvesting.**

The objectives of the second pilot are to demonstrate the use of a multi-robot fleet flexibly in agricultural tasks in the case of rapeseed pest management and silage harvesting.

In rapeseed pest management it means three activities. First is the execution of **survey missions using drones** where pests themselves or damages caused by pests are detected and their locations are recorded.

Second is the creation of spraying mission either for spraying drones or unmanned ground robots. Finally, **autonomous spraying missions** are executed.

The silage harvesting is supported by **autonomous weeding tasks, multi-tractor harvesting mission**, and separate situation **monitoring mission to increase the safety** of complex human-robot interaction in the field.

Technically, the second pilot involves **interaction between various data owners and services** from different stakeholders, and the development of advanced AI services to support both the operations of autonomous robots and the overall execution of use cases.

We must create a network of services that consist of a farm management system from **Mtech Digital Solutions Ltd**, multiple robot platforms e.g., agriculture robot from **Probot Oy**, ISOBUS-based tractors and various drone platforms, IoT service provider, and AI service and development platform.

We plan to use the **agriculture data space based on the IDSA approach**, so that sovereignty of data can be preserved and trust creation between data owners and service developers and providers can be automated allowing a real digital business ecosystem to emerge.

The development work is coordinated by the **VTT Technical Research Centre of Finland** and piloting facilities, and agriculture technology competence is provided by **Natural Resources Institute Finland (LUKE)**.



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FlexiGroBots – Project Updates

WP5 – Pilot 2: Rapeseeds



Progress:

During the first months of the FlexiGroBots project, we have detailed the pilot concept and divided and modelled the problems in use case descriptions.

We have also created the **initial pilot implementation architecture** and identified the data collection requirements for developing the needed AI services for pest and weed mapping and surveillance needs.

We have also started the data collection with a drone by aerial imaging missions conducted by LUKU in southern Finland as the growing season is currently starting.



Find out more



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FlexiGroBots – Project Updates



WP6 – Pilot 3: Blueberries

Objectives:

The goal of the third pilot is to **demonstrate the potential of novel robotic solutions for blueberry farming** in real (farm) operational environments, supported by advanced remote sensing, deep learning and decision-support techniques.

Pilot 3 is structured according to 3 main objectives and areas of foreseen technological development and innovation:

1. **Detection:** integration of current and novel blueberry monitoring solutions
2. **Assessment:** providing actionable insights for decision making and optimization
3. **Action:** autonomous robot for operations in blueberry farms.

The WP6 aims to plan, develop, deploy, test and evaluate the 3rd pilot. More specifically, the objectives of this WP are the following:

- To develop a plan for the analysis of the initial **business cases** into a set of **service demonstrators** and their pilot evaluation with real users.
- To collect **functional and not functional requirements** and clearly define the use case of the pilot.
- To **develop the components involved** in the pilot demonstrators so that they can be realistically tested.
- To implement the pilot and **run demonstrators with end-users** (Zeleni hit and AgroSmart) that will represent the communities targeted by the developed applications.
- To **collect and analyse evaluation results** to make suggestions on the improvement of the demonstrator from a technical perspective, and its impact in ELSE.
- To **provide actual ICT solutions** supported by **AI-driven robotics** state of the art technologies that can be reused by other solutions (e.g., demonstrators) even beyond the project lifetime.



Find out more



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FlexiGroBots – Project Updates

WP6 – Pilot 3: Blueberries



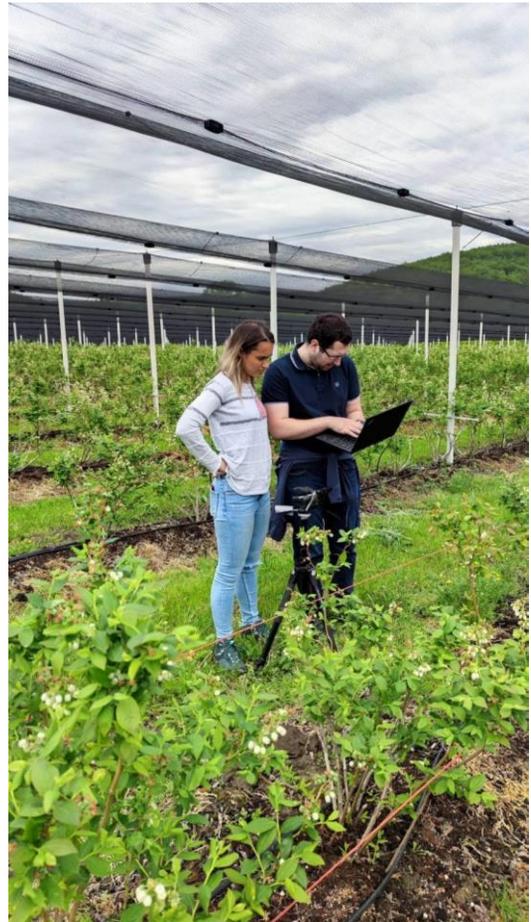
Progress:

During the first stage of project implementation, WP6 prepared the entire **system architecture** and defined the list of **all AI operations** which will be developed.

Furthermore, a **blueberry field** on which the experiments will be deployed has been determined and **scanned** with the **electromagnetic probe** and **drone**.

A test scan with the Plant-O-Meter device has been performed on a part of the field (0.5 ha) to get **initial measurement results** that could be further analysed. This is a starting point for the in-depth analysis of the key elements that affect the production process.

Currently, the process of the **procurement of robot and drone is ongoing**. However, the process of blueberry production has been completely defined together with the list of elements that should be automatically analysed by the robot.



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FlexiGroBots – Project Updates

WP7 – Dissemination and Exploitation

Objectives:

The purpose of the **dissemination and exploitation** work package is to realize the overall ambitions of the project by **facilitating the uptake and long-term sustainability** of the FlexiGroBots Platform and the pilots.

Specifically, the key WP7 **objectives** are:

- Project result and know-how **dissemination** among international **industry, academic, innovation and public communities**, networks and initiatives.
- **Communication** about project activities and **results** to the general public, prospective **end-users, industry stakeholders** and **innovation partners**.
- Development of **business models** and exploitation strategies for the platform and pilots, the building of partner ecosystem for innovation co-creation and **joint commercial exploitation**.
- Facilitation of **technology transfer** and pilot demonstrator roll-out.
- Developing strategies that ensure the **sustainability** and long-term operations of the platform and pilots **beyond the scope of the project**.
- Provide lessons learned and **recommendations** regarding **ethical AI** use in agriculture robotics.

Progress:

With the start of the project, WP7 has been actively engaged in laying the groundwork for sustained and **impactful communication and dissemination** about FlexiGroBots, its ongoing activities and outcomes.

To this end, extensive work on the development of dedicated dissemination and communication strategies including branding was been initiated, with the strategies presented in June 2021.

Meanwhile, **active communication and dissemination actions** had already begun with the launch of the **project website** (<https://flexigrobots-h2020.eu>) and the creation of dedicated social media channels on **LinkedIn, Twitter** and **YouTube** to reach relevant communities and inform stakeholders on the progress of the project.

The project has already been presented in various **conferences and major events**, as well as has published its **first press release**.

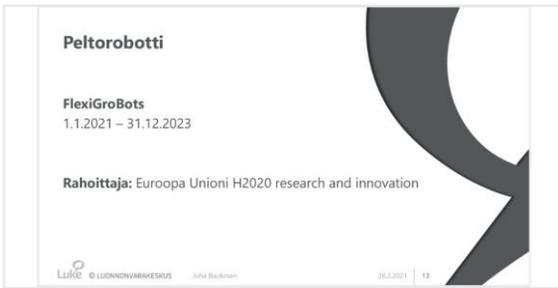
Project partners have also, on their own behalf, **engaged in promoting FlexiGroBots within their own ecosystems**, innovation networks and national audiences.



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FlexiGroBots – News & Events

Events



Workshop: Field robotics is coming

25/02/2021 | Virtual

FlexiGroBots was featured in the presentation "Where to go in field robotics and projects in Finland" by our partners from LUKE.

<https://flexigrobots-h2020.eu/events/workshop-fieldrobotics-coming>



Satelec ETSIT Forum 2021

18/02/2021 | Virtual

The event was organised by students at the Higher Technical School of Telecommunications Engineers of the Polytechnic University of Madrid (ETSIT - UPM). Within the session "Atos Research & Innovation: Shaping The Future", our **Project Coordinator, Daniel Calvo Alonso** made the presentation "FlexiGroBots - Robotics and AI for the automation of Precision Agriculture operations"

<https://flexigrobots-h2020.eu/events/satelec-etsit-forum-2021>



European Robotics Forum 2021

14/04/2021 | Virtual

FlexiGroBots was invited to participate within the EC Project Track - New Horizon projects. The project coordinator, **Daniel Calvo** from Atos Spain, held a pitch presentation highlighting the project's contribution to the field and its expected impact on the European Robotics community.

<https://flexigrobots-h2020.eu/events/european-robotics-forum-2021>



European Regions for Smart Communities Summit

05/05/2021 | Virtual

FlexiGroBots was featured on a 10-min presentation held by the project communication manager, **Ana Morales**. The Summit was organised by H2020-AURORAL project led by CCDR Alentejo.

<https://flexigrobots-h2020.eu/events/european-regions-smart-communities-summit>



AI4EU Café

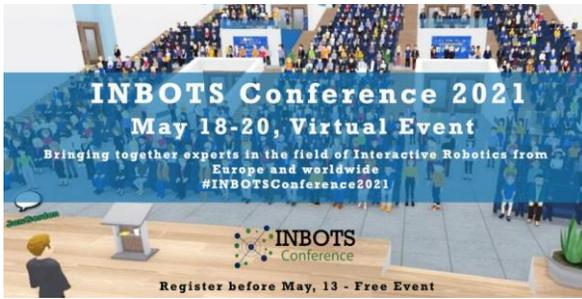
12/05/2021 | Virtual

Organised by AI4EU Project, this Café invited our Project Coordinator, **Daniel Calvo** to present FlexiGroBots motivation, objectives, and innovative platform.

<https://flexigrobots-h2020.eu/events/ai4eu-cafe-flexigrobots-flexible-robots-intelligent-automation-precision-agriculture>



FlexiGroBots – News & Events



INBOTS Conference 2021

18/05/2021 | Virtual

The annual event organised by the INBOTS project brought together relevant stakeholders in the field of robotics. FlexiGroBots was featured on a 10-min pre-recorded presentation, within the Session "Showcasing H2020 European projects in Robotics".

<https://flexigrobots-h2020.eu/events/inbots-conference-2021>

Workshop: "The role and importance of ICT in Agriculture future development"

04/06/2021 | Virtual

The online workshop was held online as part of the international conference "Agriculture for life, life for Agriculture". Joao Valente from WU held the presentation: "FlexiGroBots - a versatile and flexible multi-robot system to precision agriculture"

<https://flexigrobots-h2020.eu/events/viral-workshop-role-and-importance-ict-agriculture-future-development>

Webinar - Intelligent Ground Transportation Systems

11/06/2021 | Virtual

Angela Ribeiro from CSIC held the presentation "Autonomous multi-robot systems" on this webinar organized by Madrid Robotics Digital Innovation Hub (Robocity2030).

<https://flexigrobots-h2020.eu/events/webinar-intelligent-ground-transportation-systems>

Webinar: Agri-robotics for a Smart Agriculture - Glance to field robotics

21/06/2021 | Virtual

Juha-Pekka Soininen from VTT presented the project within the webinar showcasing the state-of-the-art field robots in Scandinavia, and ongoing research on autonomous machinery in agriculture.

<https://flexigrobots-h2020.eu/events/sah-rc-scandinavia-webinar-agri-robotics-smart-agriculture-glance-field-robotics>



11 de junio de 2021
11:00

Jornada Virtual
Sistemas Inteligentes de
Transporte Terrestre



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FlexiGroBots – News & Events

News

1st Press Release

22/03/2021

<https://flexigrobots-h2020.eu/news/1st-official-press-release>

WP7 issued a press release announcing the start of the project, its objectives and expected results. The press release was sent by partners to local media, which contributed to having a great impact on digital, printed, radio and TV media outlets! Click the images below to see the hits we had on each one:



Videos

If you were not able to participate in the virtual events where FlexiGroBots was presented until now, check the Video section on the project website to watch the recordings of some sessions:

A screenshot of the FlexiGroBots website's video section. It features a navigation menu with "About", "Library", "News & Events", "Blog", and "Contact". Below the menu is a "Videos" header over a green field background. Four video thumbnails are displayed, each with a play button icon and a brief description of the content.

Webinar – Agri-robotics for Smart Agriculture

The webinar presented the state-of-the-art field robots in Scandinavia and ongoing research on supporting background systems and the feasibility of autonomous machinery in agric

European Regions for Smart Communities Summit

The Summit was organised by H2020-AURORAL project led by CCDR Alentejo, with the support from Alentejo Europe Initiative, Open & Agile Smar

INBOTS Conference 2021

Organised by the INBOTS project funded under the H2020 programme from the European Commission, this was a key event where relevant stakeholders in the field of robotics were inv

A14EU Cafe – FlexiGroBots Flexible robots for intelligent automation of precision agriculture operations

This A14EU Café presents Daniel Calvo Alonso (Head of AI, Data & Robotics Unit at Atos Research and Innovation – FlexiGroBots Project Coordinator)

Meet FlexiGroBots Partners

Atos

Atos is a global leader in digital transformation with 105,000 employees and annual revenue of over € 11 billion. European number one in cybersecurity, cloud and high-performance computing, the Group provides tailored end-to-end solutions for all industries in 71 countries

The purpose of Atos is to help design the future of the information space. Its expertise and services support the development of knowledge, education and research in a multicultural approach and contribute to the development of scientific and technological excellence. Across the world, the Group enables its customers and employees, and members of societies at large to live, work and develop sustainably, in a safe and secure information space.

The **Research & Innovation group** is the R&D hub for new technologies and a key reference for the whole Atos group. Thanks to our large expertise in research, development and innovation projects, we are able to bring new solutions and innovative elements to customers' business.

The group focuses on project development, combining economic exploitation of investigations' results and the most up-to-date technological achievements with high awareness of human and social factors. The main objectives of the Research & Innovation group are to:

- Participate in research, development and innovation (RDI) projects that enrich Atos offer portfolio, market view or position with respect to emerging technologies.
- Be a source of innovative solutions to be used by Atos sales force and technical staff.
- Become an entry gate to European institutions for the different units and customers of Atos, thanks to the large background of European Commission projects (since 1987).
- Support Atos business units in other countries, as well as their customers, thanks to the network of public and private partners across Europe, which in turn, are current or potential customers of the company.

Within FlexiGroBots:

Atos is the project coordinator of FlexiGroBots. In addition, it actively participates in the requirements analysis and architecture work by leading the reference architecture description and synchronizing, aligning and seeking synergies in the three pilots' demonstrator solution implementation.

Atos coordinates the development of the FlexiGroBots, being the technical lead and main contributor in the development of the robotic mission control capability, the robotic services enabled by computer vision techniques and the application of geospatial data analysis. As member of IDSA (International Data Space Association) works in the development of the data space enablers. Finally, Atos is be the communication manager of the project.



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Meet FlexiGroBots Partners



CSIC The Spanish National Research Council (Agencia Estatal Consejo Superior de Investigaciones Científicas, CSIC) is the largest public multidisciplinary research organisation in Spain. Its mission is to promote, coordinate, develop, and disseminate multidisciplinary scientific and technological research to contribute to economic, social, and cultural development. It has a staff of more than 10.000 employees, including more than 3200 scientists. CSIC has 126 Institutes or Centres in Spain and a delegation in Brussels. CSIC has considerable experience in both participating and managing RTD projects. Under the 7th Framework Programme, CSIC has signed 280 projects and it is the 5th organisation in Europe in project execution and funding.

The Centre for Automation and Robotics (CAR), is one of the biggest Research Centres focused on Robotics, Automation and Perception in Spain. The CAR is particularly well positioned to lead their ambitious work plan, nurturing the studies in the fields of Automation, Perception and Robotics at its possible highest levels, by using their excellent conceptual and instrumental resources. The CAR activities are organised around the key scientific and technical domains: Intelligent Supervision and Control, Artificial Perception and Robotics. The CAR undertakes a high-quality research within an overall

methodology and a multidisciplinary approach, contributing both to the knowledge advancement and to the resolution of specific problems of social, economic and industrial relevance. The CAR is well renowned due to their participation in a great number of projects and programmes funded by the European Commission, the Spanish National Research Programme, the Research Programmes of the Autonomous Communities and the Spanish Agency for International Development Cooperation (AECID). Furthermore, a large effort is devoted to providing innovation capacity in a wide range of highly demanding, real-world application domains for enhancing the performance of complex systems.

Within FlexiGroBots:

The CSIC-CAR group involved in the FlexiGroBots project has proven skills in robots for outdoors, artificial intelligence and machine vision in general, and autonomous navigation, weed detection and discrimination in particular. Beside the CSIC-CAR has participated in many EC project and has managed four research Projects at European programmes as the coordinator: INCO-Copernicus Project 960054, ESPRIT 02/76100, GRD1-1999- 11153 and RHEA FP7 N. 245986. The CSIC is currently membership of two DIHs: [AIR4S](#) and [ROBOCITY2030](#).

CSIC will act as technical coordinator of the project. CSIC will lead the requirements, architecture and standardisation and actively contribute to the Spanish pilot.





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Atos



CSIC
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS



VTT

seresco



AgroSmart

AgriFood Lithuania

PROBOT

Mtech
DIGITAL SOLUTIONS

WAGENINGEN
UNIVERSITY & RESEARCH

Luke
LUONNONVARAKESKUS

INTERNATIONAL DATA SPACES ASSOCIATION

BODEGAS TERRAS GAUDA

art21

Zelenihit

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 www.linkedin.com/company/flexigrobots

 <https://www.youtube.com/channel/UC0itJ63TktGaBM3BTsJFghA>

Thanks for your collaboration, for any questions or content recommendation, please contact us: ana.morales@atos.net

