

AGRICULTURE 4.0 AND RURAL DEVELOPMENT

Robotics / Mechanization

KEYNOTE SPEAKER

Filipe Santos, is Senior Agricultural Robotics Researcher at INESC TEC (since 2014). He was Co-founder and COO of a start-up OMNITA – Autonomous systems for monitoring (2007-2010). He is a formal robotics researcher since 2003, with a large experience on robotics R&D. MSc in Automation and Robotics (Instituto Superior Técnico - University of Lisbon) (2007) and PhD degree (Faculdade de Engenharia da Universidade do Porto) (2014).



CHALLENGES

In this session, participants were engaged to think how “Robotics / Mechanization” can help to solve two big societal questions: Can Mother Earth Feed 9 Billion of persons by 2050? Can we produce sufficient food from 0.2 hectare to feed each person? (in 2010, were used 0.5 in average per person).

Robotics / Mechanization is not the complete answer for these two questions. However, this kind of technology can act on the environment with higher levels of precision and solve smaller problems.

PRESENTATION

To produce with more efficiency, less human effort, with the minimal resources and losses, we need robotics, agricultural machinery and tools that can help gather all relevant/type/amount of available information; apply the products with right amount at right time and place; act surgical at the right time and place.

Indeed, robotics and mechanization are already promoting the precision agriculture and at least in some competitive and extensive crops and livestock context, they are bringing clear benefits for society and farmers, like improves yield, land use, environmental impact and management; Increases precision and quality in the process; Extends operation time and reduces unit costs; and, provides a quantitative decision base (ability to gather data and assess the state of crops and livestock).

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However, the use of robotics/mechanization in agriculture is not fully democratized in all agricultural/forestry contexts.

Several questions/challenges arise from these points: How we move/promote robots/mechanization for more complex scenarios, permanent crops, fruit, vegetables, small farmers? How to make this technology more cost-effective for low competitive countries/regions? One of the biggest issues for the farmer is the return of investment in advanced machinery.

Agriculture is cost driven; unit costs and yield improvements are the only real argument for automation. However, automation reduces environmental impact, for example with selective pesticide dosing reduced levels of ground compaction and higher levels of land utilization and promotes the economy of rural areas.

In this sense, should R&D on mechanization/robotics be driven only by the end-users/farmers?

In factories we can easily increase the production to satisfy the demand. Provide in-field processing and packing crop monitoring to livestock management and harvesting. Should be promoted more food-processing in the field, to reduce logistics costs and increase the products' tastiness?

Another point, should we go with multiple small machinery/robots VS one big machinery/robots? (less soil compaction, better adaptation to the farm size). For example, Bio-agricultural Farming Practices reduce pesticide usage. However, more modular, electrical and smaller agricultural machinery/robots are needed to promote these practices. Robotized Agriculture can be more ecofriendly/Bio (let the ecosystem do the job of plant protection) by promoting less monoculture and more polyculture.

Should be food only produced in rural areas? Why not promote more urban farms and food factories? Local VS Intensive VS Rural VS short chains? Robotics/Mechanization are not fully adapted for these new contexts.



Fully automation of machinery will help solve the labor scarcity/costs. However, safety is a big challenge because the unknown behavior of autonomous machines in low-deterministic environments.

Control in mixed environments, how to get a robot to the field and the driver back home and safely interoperate with humans?

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MAIN OUTCOMES FROM THE DISCUSSIONS

After these points and projects presentation, and considering that Robotics / Mechanization is already the answer to the second question of AIS2017. The participants were asked to answer this question *Q1 - What stands out as more innovative in the projects presented?* All participants agree that more research and development in robotics/Mechanization is needed for other realities than extensive crops. The participants' answers can be summarized in three blocks:

- Robotics/Mechanization is a domain with a lot of agro/economic/ecological potential. By using user-driven approaches the most can be made of win-win solutions.
- Application of existing technologies combined with data collection sharing and integration in order to increase production, lower costs and assure social sustainability.
- Creates additional benefits, beside labor reduction, like: Precision Spray, Less Contamination, more accurate results, selective mechanical harvesting (tastier products).

INNOVATION PROJECTS

At this thematic session, each participant assisted to the presentation of 3 of the following posters:

- Control of invasive species *Vespa velutina* and losses minimization in beekeeping production and honey production;
- **FixPomo** - Fixed spraying system to apply plant protection products;
- Identification of common wild oat and other weeds from drone images;
- **IntenSusVITI** - Sustainable intensification of viticulture through mechanical pruning;
- **MIKÄ DATA** - Agricultural business development with intelligent data analytics;
- **NomaTrack** – Planning tool for reindeer management companies;
- Performance trialing of a dynamic, automated cherry-orchard cover system to protect crop against rain, hail and pests;
- **ROMOVI** - Modular and cooperative robots for slope vineyards;
- **SheepIT** - An IT based grazing control system.

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