Can photonic technologies improve food safety? Success stories of ainia

ainia

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European Photonics Roadshow New Technologies in agriculture & food industry

Who we are

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Organization We adopt a specific organizational model

Market We listen to the market and learn from it

Flexibility We adapt to every SME

Sectoral breadth Solutions in Food, Pharma, Chemistry, Cosmetics, Energy and Packaging

Resources High-level

Innovation Creating value

We are a technology center whose MISSION is to bring value to the company by leading innovation and technological development in a responsible and committed way.

Our solutions

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Ingredients and raw materials

- Studies of Functionality
- Microencapsulation
- Bioproduction
- Extraction with SCF
- Formulation and reformulation of new products

Productive process

- Advanced Vision
- Industrial Hygiene
- Extraction Processes
- Extraction of active principles through Supercritical Fluids
- Optimization of shipping and filling manufacturing process in situ

Improvement and development of products

- Natural Products. Technological validation
- Healthy food
- Functional products
- Packaging
- Preservation and useful life

Industry 4.0

- Advanced manufacturing
- Hyperconnected consumer
- Integrated value chains

Environment, Energy and Water

- Bioplastics
- Biogas
- Sludge treatment
- Optimization of water cycle:

Support to innovation

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Analysis and Assays

- Microbiology
- Physico-chemical assays
- 24 hours alert service
- Molecular biology
- Cell culture

Specialized Training

- Customized training projects
- Classroom training
- On line training

Consumer Studies

- Market and consumer. AINIAForward
- Sensory studies
- Trained tasting panels

Competitive Intelligence

- Market research for innovation
- Technology foresight
- Competitive intelligence

Food Law

- Legislative services
- Advisory services
- Internacional law
- Litigation and arbitration

International Activity

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We develop international projects and accompany companies on their way to internationalization

66 activities

22 countries

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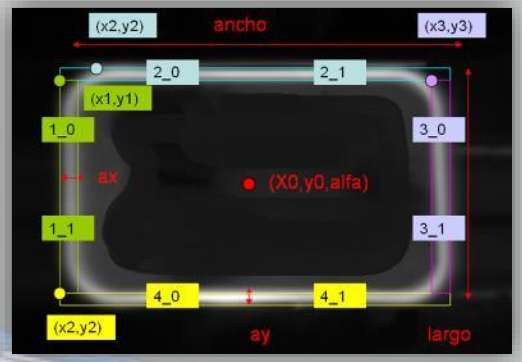
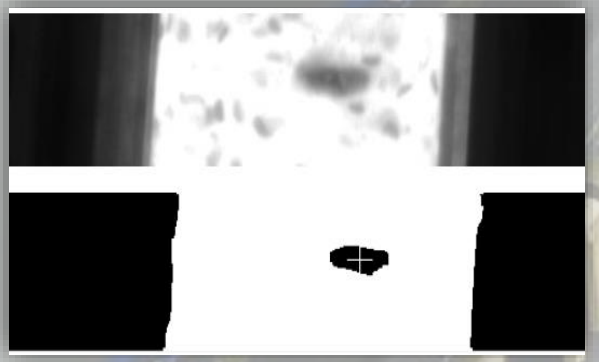
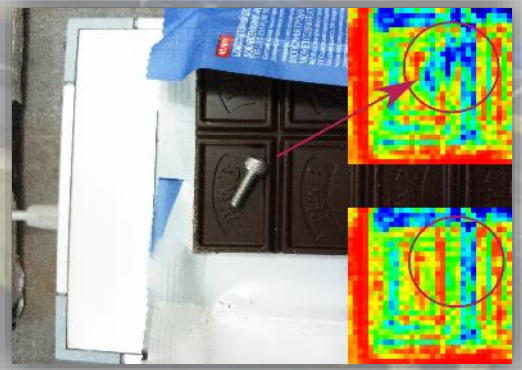
Advanced vision

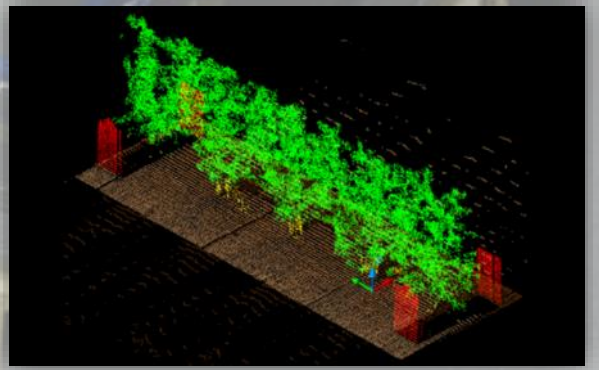
Image sensors able to detect properties that can not be detected by human eyes combined with advanced techniques in image processing (MIA, ML…)

- **Fluorescence**
- **NIR imaging**
- **Laser vision: 3D, LIDAR**
- **Multiespectral vision**
- **Thermography**
- **Terahertz**





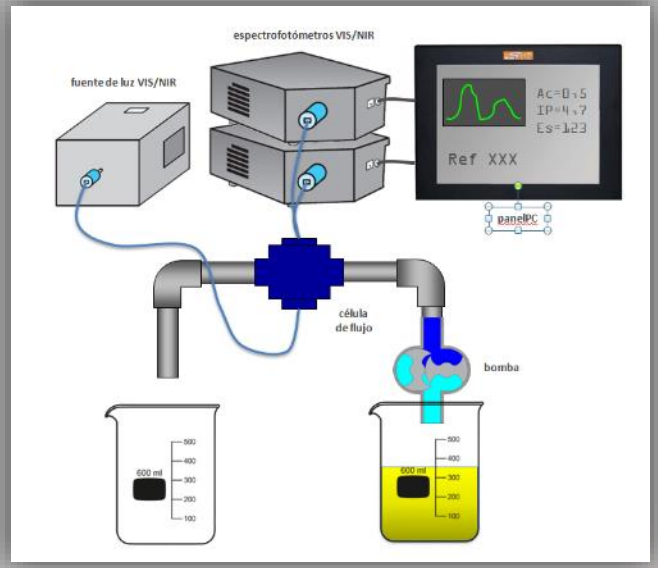


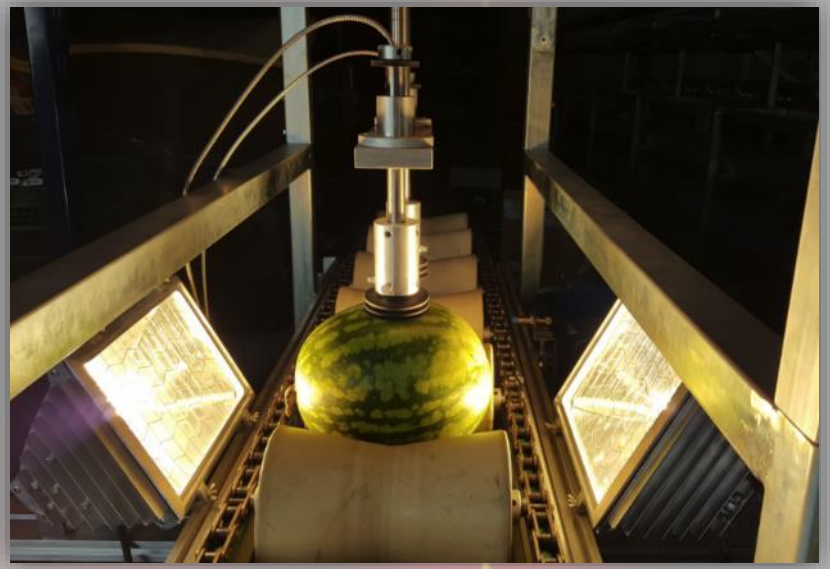


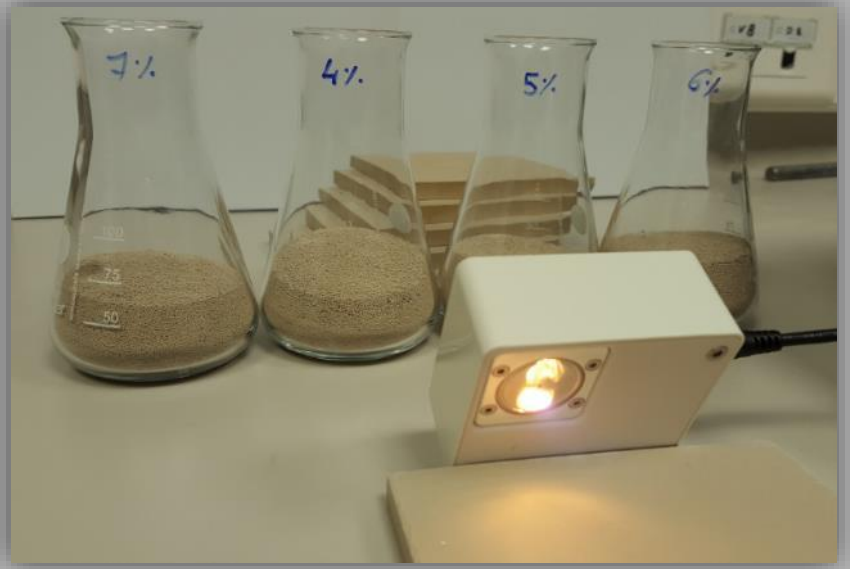
Optical spectroscopy

Measurement of the interaction between infrared light and food to identify chemical compounds or its concentration.

- **Conventional spectroscopy:** application of microspectrometers in quality control, process optimisation or waste reduction.







- **Chemical imaging or hyperspectral vision**

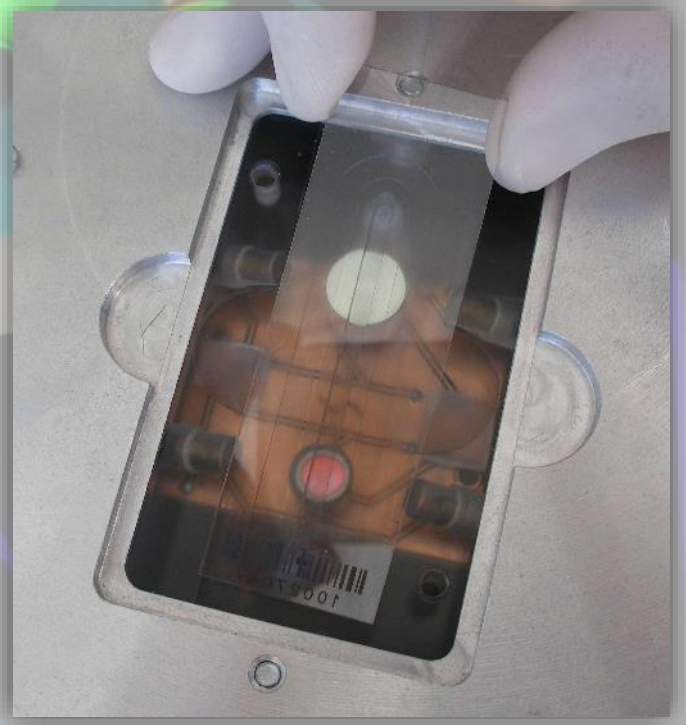
Technology that combines the advantages of machine vision and spectroscopy. It allows to obtain the spectral fingerprint of each point of the sample and measure its composition to optimise the process, classify the product depending on its quality or detect contaminants.

Optical biosensors

Analytical device based on a sensitive element of biological nature that in contact with a physic or chemical transducer can give an electronic signal proportional to the interest analyte in the sample.

Applications:

- **Composition of minor compounds** (glucose, acids, etc)
- **Contaminant detection** (pesticides, toxins)
- **Bacterial detection** (Listeria M., E. Coli)



Data analysis and decision support tools

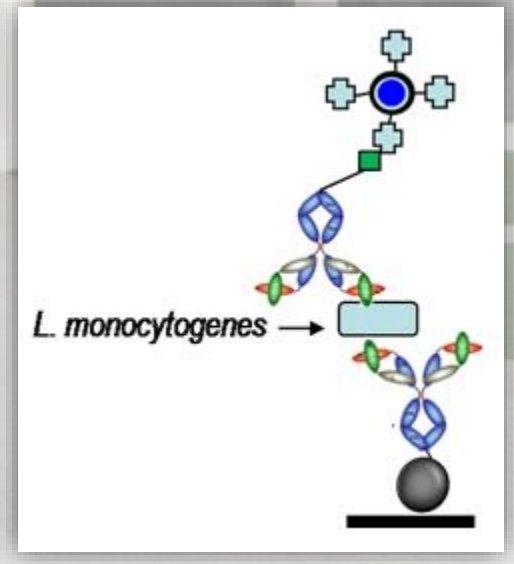
Acquisition and data analysis in real time:

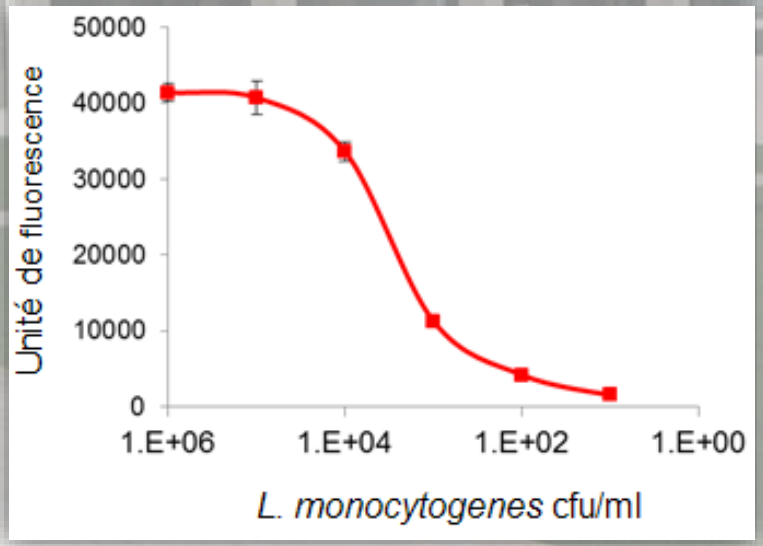
- Control & **process optimisation** by means of MA (Multivariate analysis), PAT (Process Analytical Technology), ML (Machine Learning)…
- **Automatic classification** depending on quality and composition
- Systems of quality and shelf life **prediction**
- **Decision support** systems
- **Digital lab on line** (take the laboratory to the production line)
- Detection of **contaminants** & **foreign bodies** in food products

Projects and success stories

European Project BIOLISME: Biosensor for Listeria Monocytogenes detection

System able to recover biofilm from surfaces and perform a selective detection in less than 3 hours easily and automatically (http://www.biolisme.eu)





"Este proyecto ha sido cofinanciado por el IVACE"

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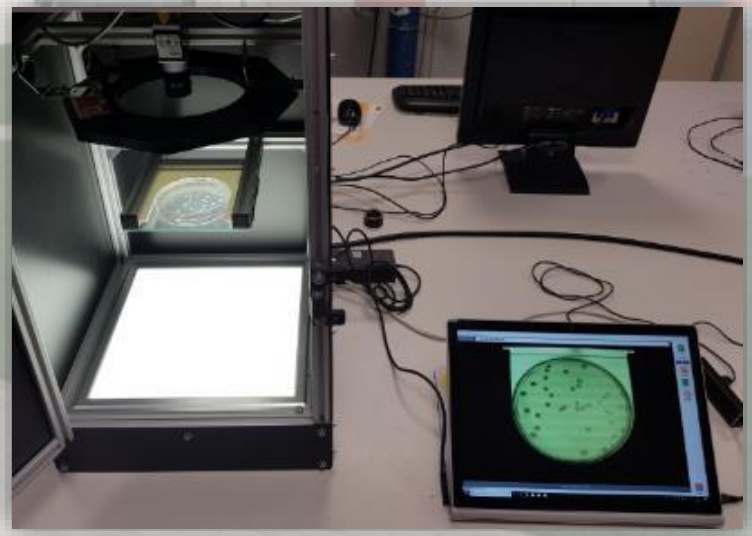
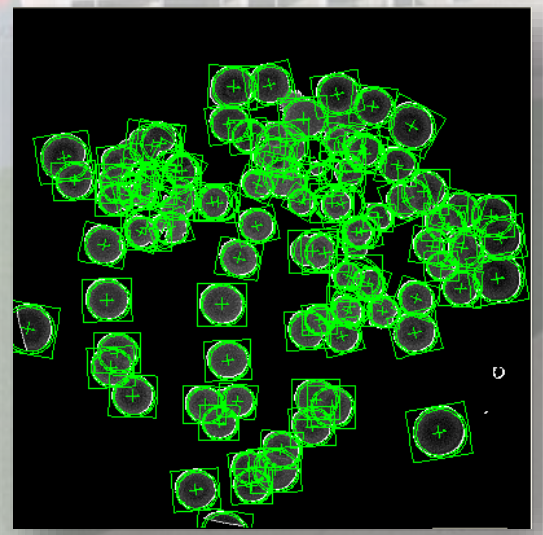
Advanced image technologies to automate the counting of microbiological cultures (MICROBOT)

Optical system that automates the task of counting colonies in microbiological cultures through artificial vision and machine learning techniques. The system consists of a robotic feeder that positions the plates, an artificial vision camera that captures the image, a software that processes it and presents the results. The system consists of an augmented reality interface to train new crops using a stylus and a Tablet. The software is based on a library based on neural networks that allows efficient detection of colonies in clusters.





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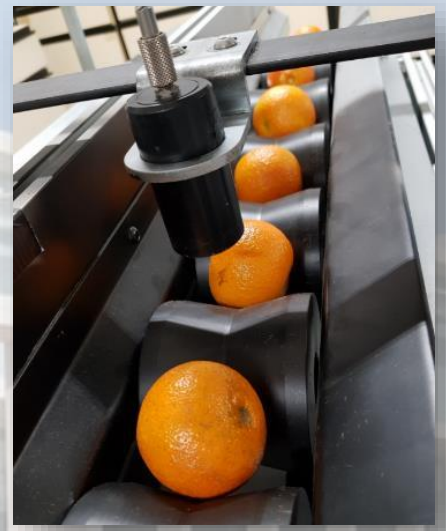
Fruit sorting at high speed depending on its internal quality

Fruit is usually classified according to its external properties (size, colour, defects), but it is also possible to classify it according to its internal quality.

AINIA has developed a very fast and low cost technology able to measure ripeness in fruit and separate into different classes according to its sugar content or acidity.

Light passes though the fruit to measure its internal ripeness. Validated with oranges, kiwis, melons and water melons.



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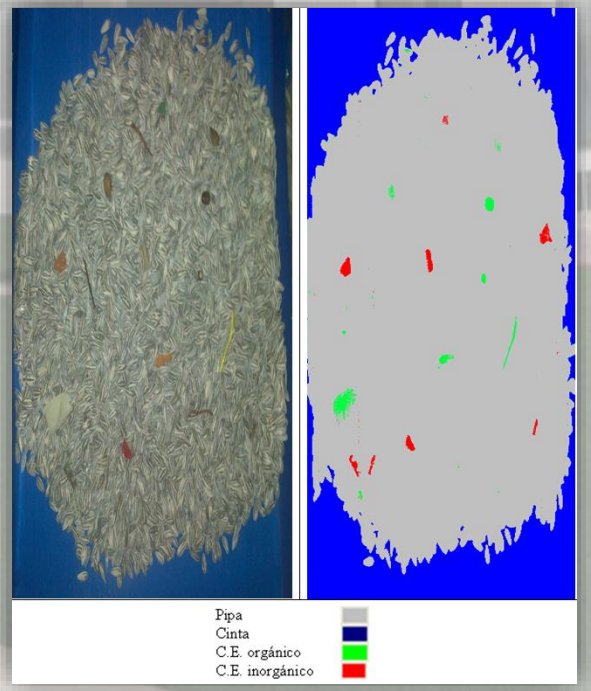
Detection of foreign bodies in nuts based on hyperspectral vision

Inspection system based on hyperspectral vision capable of inspecting 100% of the production obtaining quality indicators and detecting foreign matters regardless of density. With automatic expulsion capability of foreign matters.

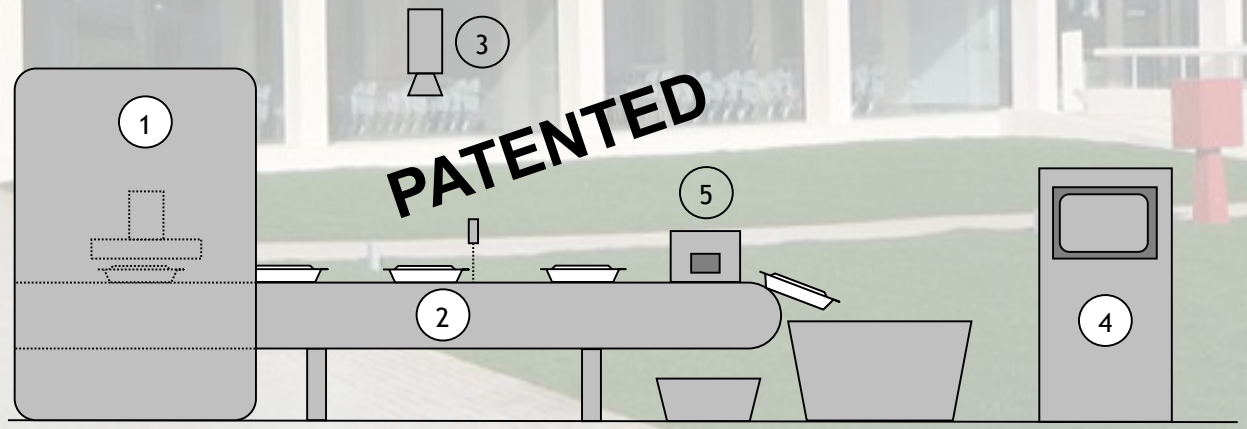
- Detection of foreign matters in 100% of the production.
- Ability to work 24 hours a day, 7 days a week.
- Possibility of detecting all types of foreign matter, including those of low density or similar to the product.
- Reduction of claims.
- Reduction of costs by automating manual tasks and reducing incidents and returns.
- Detection of lots or items in bad conditions.
- Supplier analysis based on the quality and cleanliness of your product.

Product based on state-of-the-art inspection technology that combines hyperspectral vision, processing software with full spectral fingerprint analysis capability, parallax computation through GPU and ejection using dozens of precision electrovalves. The adaptation of the technology to the product requires a preliminary research phase. For customization to the conditions of the product and the installation a design is made with a manufacturer of machinery with extensive experience in the food sector. Application for producers of nuts, cereals, legumes, fruits and vegetables of small size ...



Sealing inspection in plastic packaging (©AINIA)

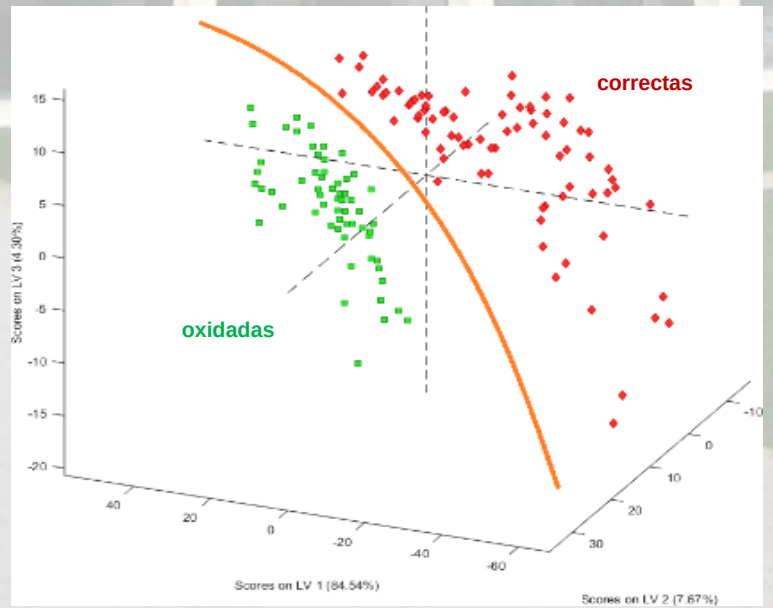
Supervision of the sealing process detecting any variation in the sealing conditions by means of the analysis off the thermographic images and the environment conditions. The system is able to detect defects and fails in the sealing area of each polymeric container that are not visually appreciated and which can affect to the quality and safety of the food.

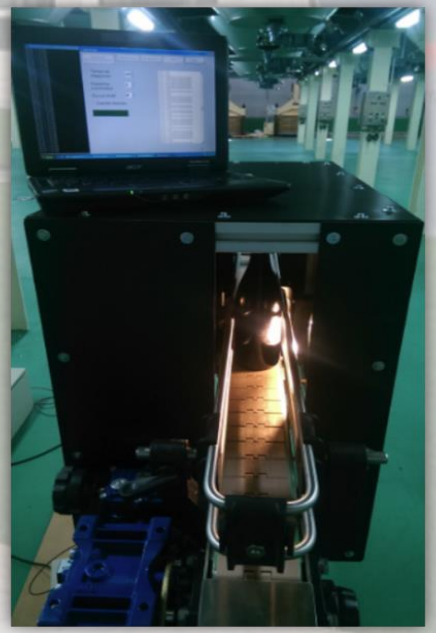


Oxidation detection in cellar wines(©AINIA)

Oxidation is one of the main defects in high quality wines and a constant struggle of the cellars, which is produced by microfiltration in the cork that allows oxygen to enter the bottle.

The OXIDETECT system measures the characteristic footprint of wine bottled in line at high speed and detects if it is oxidized, rejecting the defective bottle completely automatically. The system is based on an optical sensor capable of passing through the bottle and measuring the wine inside.





Application of photonic technologies combined with drones and AGVs for the optimisation of crops (Agridrone project)

Development of a platform that combines the potential of hyperspectral sensors with the power and flexibility of drones and AGVs with autopilot for the characterisation of crops with high spatial resolution and the full spectral signature in real time.

- Water stress
- Production (fruit load and ripeness)
- Harvest planning
- Pest and disease detection

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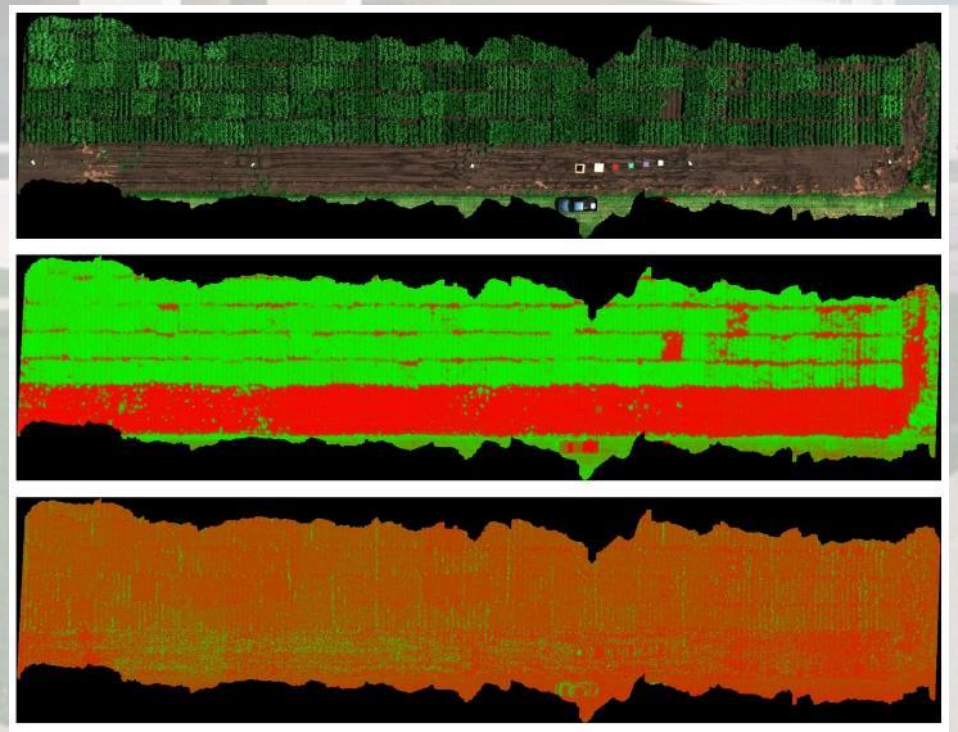

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Thanks for your attention

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