

AGRO-DEM-VR

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Centro Tecnológico
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IMMERSIVE VIRTUAL WORLDS APPLIED TO THE DESIGN OF AGRICULTURAL MACHINERY TO AVOID DAMAGE AND BRUISES OF TABLE OLIVES. AGRO-DEM-VR Project

The AGRO-DEM-VR cooperative project was approved within the framework of the Spanish 2020 call for aid to support innovative business groups in order to improve the competitiveness of SMEs of the Ministry of Industry, Trade, and Tourism. The project coordinator is INOLEO and CETEMET. CTNC and the company ILDEFONSO ROSA RAMIREZ E HIJOS S.L. participate as partners.

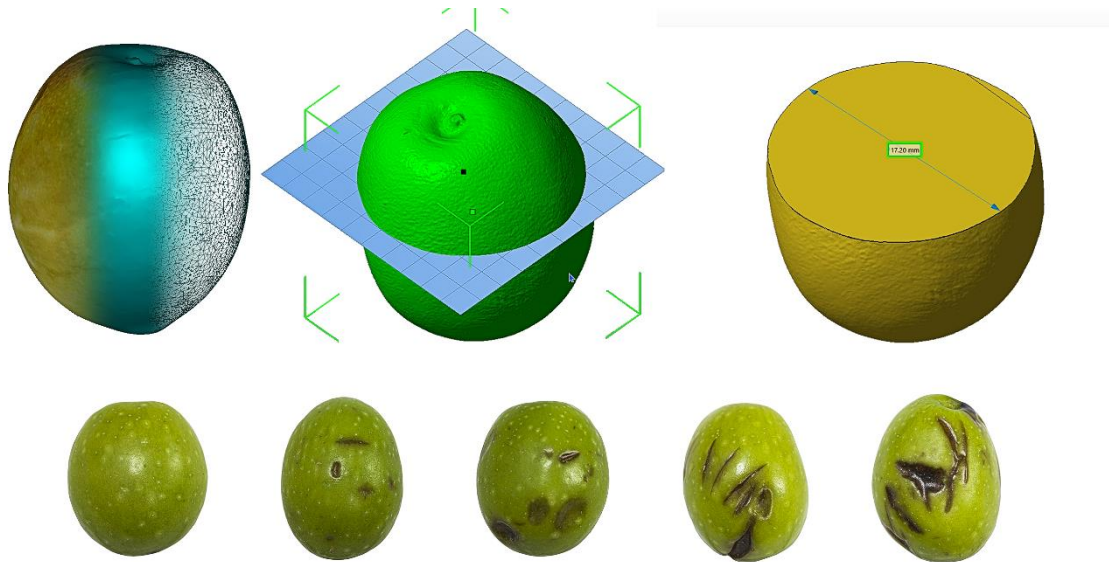
The general objective of the project is to obtain a digital twin through virtual reality (VR) that allows combining the results of mathematical simulations of the interactions between machines and fruit, creating a new concept of machine design and helping its commercialization by means of immersive experiences.

The specific objectives of the project are set out below:

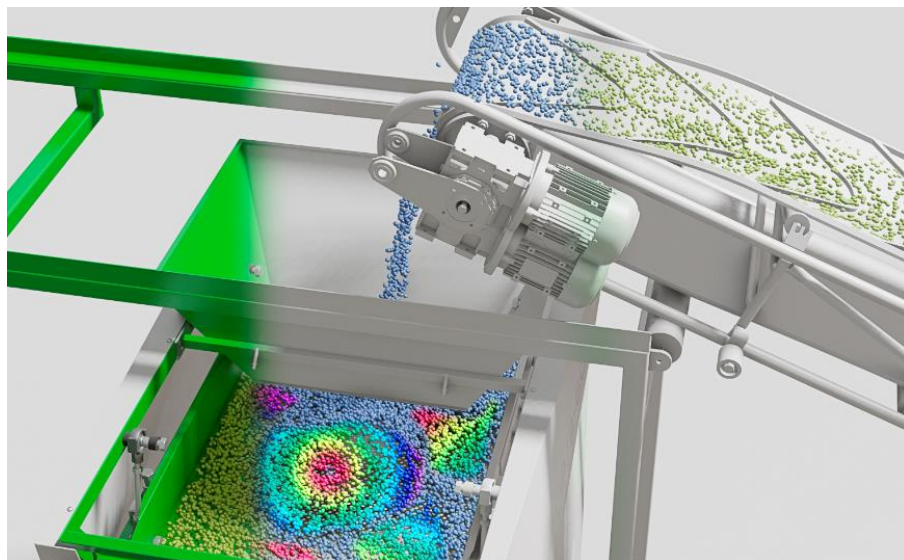
- Reduce the damage and bruise time evolution of table olives during production processes, establishing design guidelines that minimize the damages of olives.
- Develop a new design system using VR. Inclusion in the agroindustrial sector of the use of immersive technologies belonging to Industry 4.0, exploiting its benefits in the design of machinery.
- Generate the detailed virtual model of the olive for DEM (*Discrete Elements Method*) simulations. The model will serve for the study of the different machines and processes for both, the table olive and olive oil sectors.
- Extrapolate the results from virtual models to different kind of fruits. The fundamental principles and methodology to face different models of fruits will be established.
- Feedback the models. The development models will be refined through the results of simulations and obtained virtual models.
- Reduce manufacturing time by means of use of VR. The ability to simulate and experiment immersively reduces the chance of errors and speeds up design and prototyping time for final models.

The agricultural machinery sector is facing a radical change in the era of digitization, going from being a very traditional and low-tech sector to entering fully into Industry 4.0. International competition creates the need to automate, mechanize, and digitize the olive

sector in order to face its future, be competitive, and continue to lead multiple international markets.



Virtual models of olives, obtained using a high-resolution 3D scanner (*upper*). Real olive images for DIA (*Digital Image Analysis*) of damages and bruises (*lower*).



Render of DEM simulation