Phenotyping Strategies for Agricultural Robots: Massive Sampling and Real-time Fruit Assessment

Abstract

Artificial intelligence has the capability of setting an alliance with farmer knowledge to get further away by letting computers do what they excel at, and by keeping farmers doing what they can do best. The VineScout (2017-2020) and Cerberus (2024-2027) projects are EU-funded grants that use ground robots for automating data collection as a systematic way of approaching big-data conditions, and thus facilitating the application of AI algorithms that heavily rely on data. The former robot modeled water stress as a phenotype-derived quality indicator for assessing the potential of grapes to get a great wine that required large amounts of data. Massive sampling with the robot let us move from less than 50 manual samples per hectare to over 20,000 measuring points per hectare. This talk will discuss the result of this AI-based classification strategy and the opportunities that robotic harvesting offers to map and assess quality properties in high-value crops. The challenge for competitive wineries and fruit producers for the fresh market is how to keep up to the consumer expectations under the climatic uncertainties being faced today.

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RESEARCH AREAS AND EXPERTISE

- General area: Digital agriculture
- Specific area: Robotics, precision farming, automation
- Robotics view: doi.org/10.1007/978-3-030-89123-7_147-2

SELECTED AWARDS AND RECOGNITION

- 6 US patents and 1 EU patent granted
- 4 ASABE paper awards
- Edmund Optics Research & Innovation Award (2011)

Francisco Rovira-Más received a degree in Agricultural Engineering in 1996 from the Universitat Politècnica de València, Spain, where he was an Assistant Professor from 1997 to 2000. He obtained his Ph.D. in 2003 in the University of Illinois at Urbana-Champaign, Urbana, IL, USA. He has been a member of the Intelligent Vehicles System group at the John Deere Technology Center in Moline, IL, USA. He has also been a Research Associate with the Department of Agricultural and Biological Engineering in the University of Illinois, conducting research at the John Deere Intelligent Vehicle Systems unit (formerly Agricultural Management Solutions --AMS) in Urbandale, IA, USA. Currently, Francisco is a Professor at the Universitat Politècnica de València in Spain and director of the Agricultural Robotics Laboratory. His research interests include autonomous vehicles, machine vision, controls, off-road equipment automation, robotics, and artificial intelligence. Francisco has been the technical manager of the European project VineRobot and the coordinator of the EU H2020 FTI project VineScout. At present, he is the coordinator of project Cerberus, funded with 4.8 M€ and involving 13 institutions from Slovenia, Italy, Cyprus, and Spain.