Πρόσκληση

Διερεύνηση Νέων Μεθόδων Μηχανικής Συγκομιδής Φρούτων με Προσομοίωση Βάσει Μοντέλων

(Exploring New Approaches for Mechanical Fruit Harvesting via Model-based Design)

Παρασκευή
30 Ιουνίου 2017
Ώρα 12:00 - 13:00

Αίθουσα 6,
Κτήριο Τάσσος Παπαδόπουλος
Θέμιδος & Ιφιγενείας γωνία,
Λεμεσός

Cyprus University of Technology

Fruit Sciences/
PostHarvest Group

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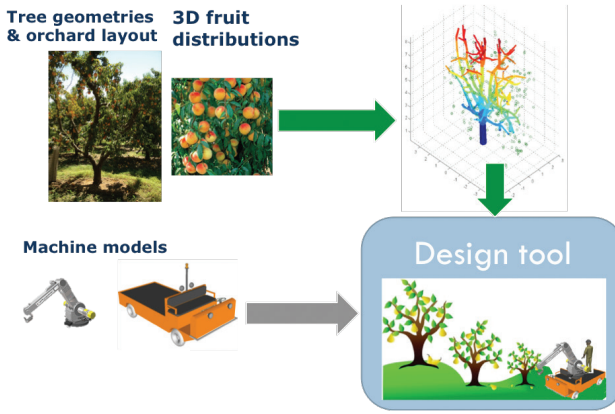
Διερεύνηση Νέων Μεθόδων Μηχανικής Συγκομιδής Φρούτων με Προσομοίωση Βάσει Μοντέλων (Exploring New Approaches for Mechanical Fruit Harvesting via Model-based Design)

Ομιλητής: **Σταύρος Βουγιούκας**, Αναπληρωτής Καθηγητής
University of California at Davis



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Abstract

Mechanizing the hand harvesting of fresh market crops constitutes one of the biggest challenges to the sustainability of the fruit and vegetable industries. Depending on the crop, labor contributes up to 60% of the variable production cost, and recent labor shortages have led to loss of production and reduction of planted acreage in several crops. Innovation is desperately needed in the design of mass – shake-and-catch – harvesters and selective fruit-picking robotic harvesters. This seminar will present the challenges related to mechanized harvesting and how concepts and tools from model-based design and robotics can be used to provide solutions. Regarding robotic fruit harvesters, most developed prototypes utilize multiple-degree-of-freedom arms, often kinematically redundant. The hypothesis is that as branches constrain fruit reachability, redundancy is necessary to navigate through branches and reach fruits inside the canopy. Modern commercial orchards increasingly adopt trees of SNAP architectures (Simple, Narrow, Accessible, and Productive). In this seminar results will be presented from a recent simulation study on linear fruit reachability (LFR) on high-density, trellised pear trees, when linear only motion was used to reach the fruits. Results based on pear tree digitized geometric models and fruit locations showed that up to 93.5% of the fruits were reachable with just three proper approach angles. This implies that for trees of SNAP-type architectures fruit reachability may not require complex and expensive arms with many degrees of freedom. For shake-and-catch harvesting, results based on physics-based simulation of falling fruits will be shown, which indicate that when fruit-intercepting rods are inserted optimally into the tree canopies during shaking, the percentage of fruits hitting branches can be lowered by more than 50%. Such designs could enable mass - harvesting with low fruit damage, and, hence, provide mechanized harvesting solutions for some crops.

Biosketch

Dr. Stavros Vougioukas is Associate Professor of Biological and Agricultural Engineering at the University of California, Davis. He joined the Department in 2012 and directs the Bio-Automation Lab, where his research group focuses on the development of robotic and automation systems for agricultural applications, with emphasis on mechanized harvesting of specialty crops. Dr. Vougioukas earned his Diploma in Electrical Engineering (1989) at Aristotle University, Greece. He undertook graduate studies in the U.S. under a Fulbright Fellowship. He completed his M.Sc. (1991) at SUNY Buffalo and Ph.D. (1995) at Rensselaer Polytechnic Institute, Troy, NY, in Electrical, Computers and Systems engineering. His PhD thesis addressed force-guided assembly and robotic fine motion planning. He was a post-doctoral researcher for one year at the University of Parma, Italy. After his military service he became faculty at Aristotle University, Greece, where he worked on agricultural automahttp://faculty.engineering.ucdavis.edu/vougioukas/