Abstract

Intelligent Systems for Commercial Application in Perennial Horticulture †

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Abstract: Production in perennial horticulture relies on a high degree of crop management, but, due to that perenniality, management decisions need to balance short- and long-term impacts. Optimising these decisions requires information about the plants and it requires that information at multiple time-points. The development of intelligent systems, based on new technologies and new data analytics that take advantage of always available high-performance edge computing, provide a unique opportunity to create a step-change in the management of perennial horticulture crops. For example, combining LiDAR (3D laser imaging) with simultaneous localization and mapping (SLAM) enables the capture of 3D canopy structure on a per tree basis at the orchard scale. Vegetation indices like light penetration, light distribution or foliage density can be estimated directly, in real-time, without a labour-intensive process. Overlaying such an analysis with the output of other sensing modalities extends their application to provide real time, on-farm, decision support by monitoring the condition of every plant in 3D. Even consumer RGB video cameras provide a resolution and frame-rate adequate for a wide range of applications when combined with computer-based image segmentation and machine learning techniques. Such technologies offer the prospect of imaging and analysing a future orchard at any phenological time-point and having a block-level result for the parameter of interest, together with the spatial variability data that will assist in long-term management decisions. In this presentation we will provide examples of these technologies, their current application and how they will be utilised in a future orchard system.

Keywords: crop management; digital imaging; LiDAR; machine learning; perennial horticulture; SLAM