Agri-2014

OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Conference on
Agricultural & Horticultural Sciences

February 03-05, 2014 Hyderabad, India

Apple crop load estimation with over-the-row machine vision system

Manoj Karkee

Washington State University, USA

Abstract

Accurate crop load estimation is important for efficient apple orchard management. This information is important for planning and assigning appropriate labor pool and equipment for harvesting and transportation of fruits from orchard to packing houses. Current machine vision-based techniques for crop load estimation have achieved only limited success. Two primary factors affecting the accuracy of such systems are the occlusion of fruit, and variable outdoor lighting condition. In order to minimize the effect of these factors, an over-the-row platform with a tunnel structure was developed to take images of apple trees from two opposite sides. Average visibility of apples increased from 70% to 97% when imaged from both sides of a row of apple trees in a modern commercial orchard. The tunnel structure minimized illumination of apples with direct sun-light; hence reducing the variability in lighting condition. The platform, equipped with artificial lighting, was capable of night-time operations also. Images captured during day and night time were processed for identifying apples. Location of apples in three-dimensional space was used to eliminate repeated counting of apples that were visible from both sides of the tree. Root-mean-squared error on identifying apples and repeated apple counting were estimated to be 12% and 9.5% respectively. Over-the-row machine vision system showed a promise for accurate and reliable apple crop-load estimation that may substitute for traditional way of crop load estimation using visual inspection. Accurate identification and 3D localization of apples will also provide a foundation for the development of robotic harvesting system.

Biography

Manoj Karkee is an Assistant Professor in the Biological Systems Engineering Department and Center for Precision and Automated Agricultural Systems (CPAAS) at Washington State University. Dr. Karkee was born and raised in Nepal, some 400 km east of Kathmandu. After completing high school, he moved to Kathmandu for his undergraduate degree. He received his bachelor's degree in Computer Engineering in 2002 from Tribhuvan University, and then moved to Asian Institute of Technology, Thailand where he earned his Master's Degree in Remote Sensing and GIS. In 2009, Dr. Karkee received his PhD in Agricultural Engineering and Human Computer Interaction from Iowa State University. Dr. Karkee works in the areas of agricultural automation and mechanization, with particular emphasis on machine vision systems for robotics and automation of production agriculture. He has been working on various research projects in this area, including apple tree pruning, apple crop-load estimation, apple and cherry harvesting, water and nutrient stress monitoring, and solid set canopy delivery. In his personal life, Dr. Karkee enjoys spending time with his family, singing Nepali songs, reading and writing literature and playing sports including Volleyball and Badminton.