

# Machine vision based citrus mass estimation during post harvesting using supervised machine learning algorithms

J.S. Shin, W.S. Lee, R.J. Ehsani

Acta Horticulturae 965: 209-216. 2012.

---

## Abstract

A machine vision system was investigated as a means of estimating citrus fruit mass during post harvesting operation. The system consisted of a CCD color camera with a high frame rate, two lamps, an incremental encoder and a data acquisition card. The system was implemented toward the development of an advanced citrus yield mapping system. Such yield mapping system is one of the viable precision technologies that allows the citrus grower to efficiently manage in-grove spatial variability of different factors such as soil type, soil fertility, moisture content, etc., and helps increase yield and profit. Thus, an image processing algorithm was developed to identify citrus fruit in images acquired in a commercial citrus grove located in Fort Basinger, Florida. Supervised machine learning algorithms, such as naive Bayes classifier, artificial neural network and decision tree, were utilized to implement fruit detection and segmentation. For the fruit mass estimation, an equation mapping fruit pixel area to fruit mass was established through a mass calibration process. Using the mapping equation, the fruit mass was estimated. The  $R^2$  values in mass estimation using naive Bayes and artificial neural network yielded more than 0.92, whereas decision tree based mass estimation resulted in the  $R^2$  of 0.804.