設施蔬果類作物智慧省工採收系統之研發

謝廣文

中興大學生物產業機電工程學系主任

摘 要

　　臺灣為海島型氣候，常應用各類設施以改善作物之栽培環境，在設施產業精緻化的生產下，所需農業勞力更密集，依據「104 年農林漁牧業普查總報告統計結果提要分析」顯示，2015 年底台灣從事農牧業之經營管理者平均年齡為 63.5 歲，2016 年農業就業人口僅占 4.94%，台灣農業缺工已經不是新聞了，這問題卻持續存在而且對設施栽培者而言更是日益嚴重。為解決上述問題，本研究以設施栽培之牛番茄為標的，開發牛番茄的智慧省工採收系統。由於牛番茄的成熟不具一致性，往往需以人工判定挑選適於採收的牛番茄進行採收，相當耗費人工，本研究乃以機器視覺技術及卷積神經網路，開發蔬果影像成熟度辨識與定位系統，作物在產季時進行影像辨識，分辨果實成熟與否及成熟果實定位，並開發採收手臂與爪具採摘作業平台，整合為牛番茄的智慧省工採收系統。

關鍵詞：設施栽培蔬果、牛番茄、機器視覺、卷積神經網路、採收用機器手臂

Development of intelligent labor-saving harvesting system for facility vegetables and fruits

Hsieh Kuang-Wen

Department of Bio-Industrial Mechatronics Engineering,

National Chung-Hsing University.

Abstract

Taiwan has an island climate, The facilities are often used to improve the cultivation environment of crops, under the refined production of the facility industry, the required agricultural labor is more intensive. According to the "Summary Analysis of the Statistical Results of the General Census of Agriculture, Forestry, Fisheries and Animal Husbandry in 104", the average age of managers engaged in agriculture and animal husbandry in Taiwan was 63.5 years old in 2015, in 2016, the agricultural employment population accounted for only 4.94%. The lack of agricultural labor in Taiwan is no longer news, the problem persists and is getting worse for facility growers. To solve the above problems, In this study, the beef tomato cultivated in facilities was used as the target, to develop a smart labor-saving harvesting system for beef tomatoes. Due to the inconsistency in the ripening of beef tomatoes, it is often necessary to select mature beef tomatoes by manual judgment, it's quite labor-intensive. This research is based on machine vision technology and convolutional neural network, to develop a vegetable and fruit image maturity identification and positioning system., Image recognition of crops during the production season to distinguish whether the fruit is ripe or not and the location of the ripe fruit. And developed a harvesting arm and claw picking operation platform, which was integrated into a smart labor-saving harvesting system for beef tomato.

Key words：Facility cultivated fruits and vegetables, Beef tomato, machine vision, Convolutional Neural Network, Harvesting robotic arm