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具影像辨識之採收輔助器
Harvesting Aid with Image Recognition

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研究領域
行動運算、人機介面、虛擬實境、雲端運算、虛擬化技術與虛擬機器、嵌入式系統與Android系統、平行處理、多執行緒與多核心技術、自動化系統

作品摘要

葡萄種植產業在許多地區都面臨著缺乏足夠工人的困境。傳統上，葡萄的成熟度是由經驗豐富的老農進行評估，他們通常依靠直覺和視覺判斷葡萄的顏色、大小和質地等特徵。然而，由於勞工短缺，尤其是缺乏經驗豐富的工人，這種評估方法變得困難且不準確。

為了解決這個問題，本團隊開發了這個作品。利用了影像處理技術和深度學習算法，並結合了鏡頭、雷射、OpenCV和YOLO (You Only Look Once) 辨識模型。

首先，使用者需要使用鏡頭將葡萄拍攝下來。由於畫面中可能會有多串葡萄，為了準確地辨識每串葡萄，我們使用雷射指向每串葡萄。雷射產生的光點可以被鏡頭捕捉到，並且這些光點將成為後續辨識的目標。

接著使用OpenCV圖像處理庫來處理這些鏡頭拍攝到的畫面。我們可以檢測並提取出畫面中的雷射光點，一旦我們檢測到了畫面中的雷射光點，我們就將其傳送到訓練好的YOLO模型中進行辨識。該模型將分析每串葡萄的成熟度，並提供相應的結果。這樣，使用者就能夠準確地知道每串葡萄的成熟度，並根據需要進行相應的處理和收穫。

總結來說，這個作品利用鏡頭、雷射、OpenCV和YOLO技術實現了葡萄成熟度的識別。它解決了葡萄種植產業面臨的缺工問題，並且使外籍勞工能夠在沒有經驗的情況下，準確地辨識葡萄的成熟度。這個作品的應用潛力非常廣泛，將為葡萄種植者提供更多便利，同時提高生產效率和品質。

圖一 作品圖。

圖二 各種辨識版本。

Abstract

The grape cultivation industry is facing a shortage of sufficient labor in many regions. Traditionally, the ripeness of grapes is assessed by experienced farmers who rely on intuition and visual judgment of characteristics such as color, size, and texture. However, due to the labor shortage, particularly a lack of experienced workers, this assessment method has become difficult and inaccurate.

To address this issue, our team has developed this project. It utilizes image processing techniques and deep learning algorithms, combined with a camera, laser, OpenCV, and the YOLO (You Only Look Once) detection model.

Firstly, the user needs to capture the grapes using a camera. As there may be multiple clusters of grapes in the frame, lasers are used to accurately target each cluster. The laser produces dots of light that can be captured by the camera and serve as the targets for subsequent detection.

Next, OpenCV, an image processing library, is employed to process the captured images. We can detect and extract the laser dots from the frame. Once the laser dots are detected, they are fed into a pre-trained YOLO model for recognition. The model analyzes the ripeness of each cluster and provides corresponding results. This enables users to accurately determine the ripeness of each cluster and perform appropriate handling and harvesting as needed.

In summary, this project utilizes a camera, laser, OpenCV, and YOLO technology to identify the ripeness of grapes. It solves the labor shortage problem in the grape cultivation industry and allows foreign workers to accurately identify grape ripeness even without prior experience. The application potential of this project is extensive and will provide convenience to grape growers while improving productivity and quality.
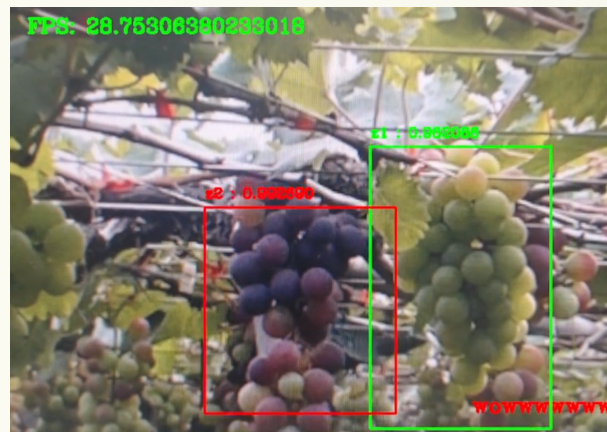
Fig.3 Detection result.

Fig.4 The operation of proposed systems with the grape harvest.