

Robotic mass removal of citrus fruit

C. Aloisio, R. Kumar Mishra, Chu-Yin Chang, J. English

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Abstract

Labor availability for harvesting is a worldwide problem. In attempts to address this, fruit harvesters have tried the mechanical methods of trunk shaking, canopy shaking, raking and mass mechanical penetration. Though they are economical alternatives for harvesting nuts, olives, cherries and prunes, these brute-force mechanical methods have found limited application to citrus. As an alternative to brute-force methods, articulated robotics with intelligent sensing has also been tried, but challenges include recognizing and locating the fruit and detaching it economically. Any mechanical or robotic system must be economically sound to warrant its use as an alternative to hand picking. Energid Technologies Corporation, based in Cambridge, Massachusetts, is developing a practical robotic fruit picking system whose concept is driven by the economics of mass harvesting while leveraging machine vision and robotic guidance and control. The system uses flexible tubes with removal tools at one end that can be individually fired pneumatically and steered robotically with sensor input coming from a grid of machine vision cameras.