Title	Primary geometric performance indices for analysis and synthesis of a fruit harvesting robot arm
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Abstract

The application of robotics in uncontrolled field environments is still in the developmental stages unlike their counterparts in industrial automation. One agricultural task with high potential for the application of robotics is tree fruit harvesting. Manipulators with a serial (open-chain) configuration lend themselves to this application. The geometric configuration selection which dictates the manipulator's workspace, dexterity, and geometric singularity avoidance capability takes precedence in the initial design of a harvesting robot. Other task performance demands such as the manipulator's load capacity, speed, stiffness, and accuracy can be optimized once a suitable configuration is selected. Though the geometric performance indices for serially configured robots are well discussed in literature, there has been minimal work in effectively applying these performance criteria for selecting a suitable configuration of an agricultural robot. In this article, the primary performance indices are identified and applied to the selection of a fruit harvesting robot configuration. Though some of these indices are cumbersome to engage in real-time trajectory generation and control schemes, they can be effectively used in the analysis and synthesis phases. Arm configurations for citrus harvesting are analyzed with the proposed measures.