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Agricultural Robotics

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Abstract

A key goal of contemporary agriculture is to dramatically increase production of food, feed, fiber, and biofuel products in a sustainable fashion, facing the pressure of diminishing farm labor supply. Agricultural robots can accelerate plant breeding and advance data-driven precision farming with significantly reduced labor inputs by providing task-appropriate sensing and actuation at fine spatiotemporal resolutions. This article highlights the distinctive challenges imposed on ground robots by agricultural environments, which are characterized by wide variations in environmental conditions, diversity and complexity of plant canopy structures, and intraspecies biological variation of physical and chemical characteristics and responses to the environment. Existing approaches to address these challenges are presented, along with their limitations; possible future directions are also discussed. Two key observations are that biology (breeding) and horticultural practices can reduce variabilities at the source and that publicly available benchmark data sets are needed to increase perception robustness and performance despite variability.

Keywords: agricultural robotics, unmanned ground vehicles, precision agriculture, plant breeding, plant canopy

Full text

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