Review of research on agricultural vehicle autonomous guidance

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Abstract

A brief review of research in agricultural vehicle guidance technologies is presented. The authors propose the conceptual framework of an agricultural vehicle autonomous guidance system, and then analyze its device characteristics. This paper introduces navigation sensors, computational methods, navigation planners and steering controllers. Sensors include global positioning systems (GPS), machine vision, dead-reckoning sensors, laser-based sensors, inertial sensors and geomagnetic direction sensors. Computational methods for sensor information are used to extract features and fuse data. Planners generate movement information to supply control algorithms. Actuators transform guidance information into changes in position and direction. A number of prototype guidance systems have been developed but have not yet proceeded to commercialization. GPS and machine vision fused together or one fused with another auxiliary technology is becoming the trend development for agricultural vehicle guidance systems. Application of new popular robotic technologies will augment the realization of agricultural vehicle automation in the future.

Keywords: agricultural vehicle; guidance; machine vision; GPS

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Keywords

Agricultural vehicle; guidance; machine vision; GPS

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This paper presents a review of automatic guidance of agricultural vehicles based on stand-off Global Positioning System (GPS) or the integration of GPS and dead-reckoning system. Key words: Automatic guidance , Global Positioning System, Dead-reckoning system. 1. INTRODUCTION. Research on autonomous land vehicle for agriculture. in: Proceedings of the International Symposium on Automation and Robotics in Bioproduction and Processing, vol. 1, JSAM, Kobe, pp. 41-48. [11] .Masuo, Y., Yamamoto, S., Yukumoto, O., 2002. Development of tilling robot and operation software.in: Proceedings of the Automation Technology for Off-road Equipment, ASAE, Chicago, IL, pp. 184-189. Guidance of agricultural vehicles has received the attention of researchers for nearly 50 years. From a review of the literature, several motivations are apparent from the effort that has been expended towards the development of a guidance system, be it autonomous or partially autonomous. The need to relieve the operator of continuously making steering adjustments while maintaining the attached or towed implement at some level of acceptable performance is perhaps the most frequently cited reason for the need for a guidance system (Wilson, 2000). Research activities concerning automatic guidanc...