Fuzzy Logic Controller Design for an Agricultural Four-Wheel Independent Mobile Robot

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Abstract

Due to their improved maneuverability in narrow spaces and increased stability, four-wheel independent mobile robots are becoming popular in several fields, such as agriculture, electrical vehicle, and planetary exploration. However, control algorithms is complicated owing to synchronization issues, mechanical constraints, and actuators equipped. This study presents a navigation controller based on fuzzy logic method for a low velocity autonomous agricultural vehicle built on a 4 wheel independent steering configuration. This paper explores the kinematic model of a 4 wheel independent steering robot and then real time 3D simulations using ROS and Gazebo. In the simulations, virtual GPS and IMU were used as sensors. Uneven terrains or obstacles were not considered for the simulated experiments. The simulation results show the capability of the fuzzy-logic controller in controlling a 4 wheel independent steering robot. In future, the simulated experiments will be compared with field experiments. Futhermore, the field experiments will be conducted in the condition of wheel slippage and low surface friction.

Keywords

Four-wheel independent steering, Fuzzy logic, Mobile robot, ROS, Gazebo.

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