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# Integrated Steering Method for Mitigating Performance Degradation in Six-Wheel Robot Caused by Obstacle Traversing

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**Abstract :** With the increasing application of six-wheel robots in various industries, including agriculture and environmental monitoring, there is a growing demand for efficient and reliable control systems that can improve manoeuvrability and at the same time reduce energy consumption. Moving on uneven terrains, various factors such as obstacles or soil heterogeneity can cause the robot to slip. There is limited research addressing this issue. Although the robot is supposed to track a predetermined path, sudden lateral deviation necessitates path planning. To further address this issue, explicit steering is added by activating actuators on steerable wheels, while the SMC controller still commands differential traction forces on all wheels. This integration improves energy efficiency and obstacle traversability while maintaining the merits of skid-steering, such as tight turning manoeuvrability. However, achieving the desired steer angles presents certain challenges. Inverse kinematics was initially employed to achieve the needed steering angles from the desired position, but this approach led to excessive steering without yawing the body. Switching to desired velocity values instead of position limited over-steering but caused zero lateral velocity on horizontal paths, which was problematic for unforeseen skidding. To overcome this, a proportional controller has been employed, using lateral error as its input and providing a proportional yaw angle as output, the P-controller contributes to modifying the steering angles. The controller's robustness has been verified through sensitivity analyses under critical speeds and turning radius conditions. Our findings offer valuable insights into designing more efficient steering controls for rocker-bogie mechanisms in challenging situations, emphasizing the importance of reducing energy¬ consumption.

**Keywords :** six-wheel robots, inverse kinematics, integrated steering, path following, manoeuvrability, energy efficiency, uneven terrains
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