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VIRTUAL PROTOTYPE-BASED KINEMATIC MODELING AND SIMULATION OF A MULTI-MODE

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Abstract

The amphibious robot , which has the capability of multi-mode motion, can maneuver diverse environments with high mobility and adaptability. These are employed in the area of reconnaissance, search and rescue operations, and monitoring. The existing amphibious robots have lower maneuverability over the crawling period on uneven and slope surfaces on the land. In this paper, a kinematic model of the amphibious robot based on virtual prototyping is designed for multi-mode locomotion. ADAMS (Automated dynamic analysis of mechanical systems) is a multi-body dynamic solver adopted to build the simulation model for the robot . The novel amphibious robot employs a Rockerbogie mechanism equipped with wheel paddles. The locomotion analysis on land involves straight-going and obstacle negotiation, which is simulated using ADAMS. The simulation analysis result demonstrates increased maneuverability, achieving a robot 's velocity of 1.6 m/s. Normal forces on the front and rear wheels show equal load distribution, contributing more to the robot 's equilibrium over uneven terrain. The simulation result reflects the accurate kinematic characteristics of the amphibious robot and provides a theoretical basis for developing an algorithm for robot motion control and optimization. Further, this research will concentrate on the kinematic simulation maneuvering in water mode with the wheel paddle. © 2022