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# ROBUST MODEL-FREE MOTION CONTROL FOR SPACE IN-CABIN SERVICE ROBOTS WITH A BIONIC CONTINUUM ARM BASED ON A ZEROING NEURODYNAMIC APPROACH

**Abstract**

As a result of the rapid development of space station technology, in-cabin service robots with a bionic continuum arm have attracted more and more attention, which could help astronauts do a lot of work in space stations. In these complex tasks, the bionic continuum space robot has great potential because of inherent flexibility and structural compliance, which could be more efficient, more flexible, and safer than the rigid space robot. However, these specialties make it difficult to acquire and control the accurate kinematics of bionic continuum space robots. This paper solves the kinematic trajectory tracking problem of bionic continuum space robots based on a zeroing neurodynamic approach. The proposed method can achieve the motion control of bellows-driven continuum space robots just relying on the actuator input, sensory output, and the attitude of base information, without knowing any information of the kinematic model, by estimating the real-time Jacobian matrix of continuum space robots. In addition, the theoretical analyses of the convergence, stability, and robustness are given for the proposed control approach. Finally, simulation results are given to show the effectiveness of the proposed control method in tracking performance and robustness.