Abstract

EHAS *is used in a variety of sectors, ensuring toughness and precision. However, nonlinearities, uncertainties, and external disturbances pose considerable hurdles to real-time control. These challenges are addressed by model-based controllers, particularly* ***feedforward*** *ones, but existing models have limitations.*

*In this work a novel Order-Separated Feedforward (****OSFF****) model that addresses variable pump operation, oil compressibility, and other overlooked issues. In terms of tracking and control effort,* ***OSFF*** *combined with* ***PI*** *feedback surpasses conventional Feedforward (****CFF****). Comparative investigations show that* ***OSFFPI*** *outperforms conventional controllers.*

Expanding from single-rod cylinders to manipulator systems, the ***OSFF*** *model is applied to a* ***quadruped*** *electrohydraulic manipulator. Real-time experiments demonstrate its effectiveness in achieving precise tracking and* ***energy efficiency****, surpassing* ***PID*** *controllers and other nonlinear approaches. The controller exhibits robust performance in various motion demands, showcasing its potential for practical applications and* ***fault diagnosis****.*

In summary, the ***OSFF*** *feedforward control algorithm proves effective in enhancing the performance of* ***electrohydraulic systems*** *across different applications, emphasizing its superiority over traditional* ***PID*** *controllers and other* ***nonlinear*** *approaches.*