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Muscle coordination during load carrying at the ant scale: an Opensim simulation based on
Messor barbarus

Insects exhibit remarkable biomechanical adaptations that enable efficient locomotion and load-bearing capabilities. However, their musculoskeletal systems are less studied than those of vertebrates, limiting our understanding of their mechanical efficiency and evolutionary adaptations. This research focuses on the musculoskeletal modeling of Messor barbarus, an ant species, to explore the relationship between its morphology, muscle function, and biomechanics. The primary aim is to develop a computational approach for estimating the mechanical properties of the ant's musculoskeletal system. Using advanced imaging techniques and biomechanical simulations, this study intends to create a functional model of muscle coordination during locomotion and load transport. The research has applications in both biological understanding and robotics, particularly in designing bioinspired robotic systems that replicate the efficient movement strategies observed in ants.