Abstract Submitted
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Exploring the neural bases of goal-directed motor behavior using fully resolved simulations[1] NAMU PATEL, NEELESH A. PATANKAR, Northwestern Univ — Undulatory swimming is an ideal problem for understanding the neural architecture for motor control and movement; a vertebrates robust morphology and adaptive locomotive gait allows the swimmer to navigate complex environments. Simple mathematical models for neurally activated muscle contractions have been incorporated into a swimmer immersed in fluid. Muscle contractions produce bending moments which determine the swimming kinematics. The neurobiology of goal-directed locomotion is explored using fast, efficient, and fully resolved constraint-based immersed boundary simulations. Hierarchical control systems tune the strength, frequency, and duty cycle for neural activation waves to produce multifarious swimming gaits or synergies. Simulation results are used to investigate why the basal ganglia and other control systems may command a particular neural pattern to accomplish a task. Using simple neural models, the effect of proprioceptive feedback on refining the body motion is demonstrated. Lastly, the ability for a learned swimmer to successfully navigate a complex environment is tested.

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