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Leveraging low-dimensional postures to resolve coiled shapes reveals new reorientation behaviors in the nematode *C. elegans*. GREG STEPHENS, VU Amsterdam and OIST Graduate University, ONNO BROEKMANS, VU Amsterdam and Lumicks, WILLIAM RYU, University of Toronto — Low-dimensionality is both a fundamental property of many living systems and an aid in their quantitative analysis. Here, we exploit the low-dimensionality of *C. elegans* body shape to develop a novel postural tracking algorithm which captures both simple worm shapes and also complex, self-occluding coils. We apply our algorithm to a thermally-evoked escape response with relatively simple coils and to more complex, spontaneous turns which occur during foraging. We divide the escape response into three post-stimulus phases, reversal, turn and post-turn, and find that the full distribution of reorientation angles is shaped by independent and significant contributions from all three phases, a result consistent with the release and presence of the monoamine tyramine during the entire response. In spontaneous coils we find two separable peaks of turning posture amplitudes, indicating distinct reorientation behaviors of large-amplitude ventral-side turns; large ventral bearing reorientations occur through a shape sequence similar to the escape response while large dorsal bearing reorientations are accomplished by overturning across the ventral side. We find that these large-amplitude turning events occur independently but with approximately matched rates that adapt on a similar timescale.

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