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Swimming Eigenworms FRANK VAN BUSSEL, ZEINA KHAN, Department of Mechanical Engineering, Texas Technical University, MIZANUR RAHMAN, SIVA VANAPALLI, Department of Chemical Engineering, Texas Technical University, JERZY BLAWZDZIEWICZ, Department of Mechanical Engineering, Texas Technical University — The nematode C. Elegans is a much studied organism, with a fully mapped genome, cell structure, and nervous system; however, aspects of its behavior have yet to be elucidated, particularly with respect to motility under various conditions. Recently the "Eigenworm" technique has emerged as a promising avenue of exploration: via principle component analysis it has been shown that the state space of a healthy crawling worm is low dimensional, in that its shape can be well described by a linear combination of just four eigenmodes. So far, use of this methodology with swimming worms has been somewhat tentative, though medical research such as drug screening is commonly done with nematodes in fluid environments e.g. well plates. Here we give initial results for healthy worms swimming in liquids of varying viscosity. The main result is that at the low viscosities (M9 buffer solution) the state space is even lower dimensional than that for the crawling worm, with only two significant eigenmodes; and that as viscosity increases so does the number of modes needed for an adequate shape description. As well, the shapes of the eigenmodes undergo significant transitions across the range of viscosities looked at.

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