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Tracking C. elegans and its neuromuscular activity using NemaFlex FRANK VAN BUSSEL, Department of Mechanical Engineering, Texas Tech University, MIZANUR RAHMAN, JENNIFER HEWITT, Department of Chemical Engineering, Texas Tech University, JERZY BLAWZDZIEWICZ, Department of Mechanical Engineering, Texas Tech University, MONICA DRISCOLL, Department of Molecular Biology and Biochemistry, Rutgers University, NATHANIEL SZEWCZYK, MRC/Arthritis Research UK Centre for Musculoskeletal Ageing Research, University of Nottingham, UK, SIVA VANAPALLI, Department of Chemical Engineering, Texas Tech University — Recently, a novel platform has been developed for studying the behavior and physical characteristics of the nematode C. elegans. This is NemaFlex, developed by the Vanapalli group at Texas Tech University to analyze movement and muscular strength of crawling C. elegans. NemaFlex is a microfluidic device consisting of an array of deformable PDMS pillars, with which the C. elegans interacts in the course of moving through the system. Deflection measurements then allow us to calculate the force exerted by the worm via EulerBernoulli beam theory. For the procedure to be fully automated a fairly sophisticated software analysis has to be developed in tandem with the physical device. In particular, the usefulness of the force calculations is highly dependent on the accuracy and volume of the deflection measurements, which would be prohibitively time-consuming if carried out by hand/eye. In order to correlate the force results with muscle activations the C. elegans itself has to be tracked simultaneously, and pillar deflections precisely associated with mechanical-contact on the worm's body. Here we will outline the data processing and analysis routines that have been implemented in order to automate the calculation of these forces and muscular activations.

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