

Rheometry using velocity measurements

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Traditional methods of rheometry employ simple flows such as viscometric flows and measure stress or volumetric flow rate to determine the rheological parameters in the constitutive equation. One can find analytic solutions for stress and volumetric flow rates for these simple flows and comparison of them with experimental data determines rheological parameter values. In the present investigation, rheological parameters are estimated by measuring velocity at certain locations. A pulsatile flow in a circular pipe, which can be implemented easily, is adopted to estimate rheological parameters in a general constitutive equation. The inverse problem of determining the rheological parameters from velocity measurements is solved using a conjugate gradient method. The present method is found to yield a reasonably accurate estimation of rheological parameters even with noisy velocity measurements.