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Design and testing of a micro-syringe pump driven by piezoelectric actuator

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Abstract:
In this paper, the design and testing of a micro-syringe pump is carried out for precision delivery of liquid inside a tiny tube. A single-axis micro-motion pump is designed by using flexure mechanisms for precision drive of the micro-syringe. Based on the required specifications of travel range and load capability, a compliant translational motion mechanism is developed. The machine parameters are designed and optimized to cater for the requirement on the pump performance. The performance is verified by conducting finite element analysis (FEA) simulations. A prototype pump actuated by a piezoelectric stack actuator is developed, a PID feedback controller is designed, and experiment studies are undertaken for performance testing of the precision pump under a microscope.

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