Characterization of a Micro Stepper Driven by Surface Acoustic Waves

Student: Shr-Ching Luo Advisor: Dr. Ching-Chung Yin

Department of Mechanical Engineering
National Chiao Tung University

ABSTRACT

The actuation technique of a surface acoustic wave (SAW) stepper with nanometer scale linear motion is experimentally investigated in this thesis. The SAW motor is composed of a stator made of a Y+128^{o} cut, X-propagation lithium niobate substrate and silicon sliders with an array of pillar projections manufactured by semiconductor fabrication technique. Two sets of interdigital transducers deposited on the substrate are used to generate Rayleigh waves with driving frequency up to 9.7 MHz. The SAW motor is driven by friction exerted on the contact area between the slider and surface acoustic waves in retrogressive elliptical locus. Stepping motion of the SAW motor is measured directly by a fiber-optic Michelson interferometer with demodulation in digital signal processing method. A several nanometer displacement in each step is achieved during the experiment.