Abstract: Electrowetting actuation of individual liquid droplets on a solid surface, known as digital microfluidics, has a variety of interesting applications. These include liquid lenses without mechanical moving parts (www.varioptic.com), novel displays for consumer electronics (www.liquavista.com), and liquid handling without the need for channels, pumps or valves (www.liquid-logic.com). In this talk, we review our group's progress in this area and describe some of the mathematical models we have developed that help us estimate the magnitudes of forces and speeds that can be achieved by electrowetting. Our models focus on the problem of electrowetting actuation of individual sessile drops on a patterned array of electrodes with a thin dielectric coating. For both the case when the drop is electrically grounded from below and when it is floating, we compute the electric field in the vicinity of the drop over a range of frequencies and use the traction derived from the Maxwell stress tensor to calculate the effective electrowetting force on the drop. At low frequencies when the drop behaves like a perfect conductor, the results are compared with previously derived lumped parameter models for the electrowetting force.