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Magnetic Actuation of Self-Assembled DNA Origami Systems S. LAUBACK, K. MATTIOLI, A. E. MARRAS, M. ARMSTRONG, C. MILLER, C. E. CASTRO, R. SOORYAKUMAR, The Ohio State University — Central to advancing DNA nanotechnology is the ability to actuate or reconfigure structures in real time. Such actuation is achieved primarily by DNA strand displacement – a relatively slow process (minutes) that transforms the structure between two distinct configurations. In this study it is shown that, through use of superparamagnetic beads, DNA constructs can not only be actuated within seconds but their reconfiguration is achieved in a continuous range of finely tuned steps. Three systems – a rod, rotor, and hinge – are built using DNA origami components. A stiff micron-scale DNA rod is constructed by attaching thick DNA origami bundles end-to-end. In this rod system, one end is attached to the surface, while in the case of the rotor the rod is attached in the center to a nano-platform fixed to the surface. The hinge system is created using two DNA rods attached to the arms of a nano-hinge forming a pair of micron length handles in which one is fixed to the surface while the other is free to rotate. In all three systems, the rods are functionalized with magnetic beads to enable their actuation with weak external magnetic fields. These results are vital to establish rapid real-time manipulation of DNA constructs.

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