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Development of a Prototype VR AFM Manipulation System Emulated by a Dispensing Machine

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Molecular manipulation using a microscope probe tip is one of promising approaches to be applied not only for observation but also for selective molecular capture and microfabrication. In order to solve difficulties in operations of molecular manipulation using microscope imaging, we propose a VR system for interactive and intuitive molecular operations. The system consists of a virtual Atomic Force Microscope (VAFM) as a molecular-sized robot arm, virtual molecules, and a remote machine operation interface. Our virtual nano-mechanical DNA origami device (VDNA pliers) attached on the VAFM can bind a single target molecule selectively, so that it works as a gripper of the robot arm.

The remote machine operation interface enables us to manipulate a real experimental equipment from the VR system. Currently, we can intuitively manipulate virtual AFM, which is a dispensing machine that emulates a real AFM, with hand movements and observe the movement. This is a first step toward a nanoscale manipulator that can intuitively manipulate target molecules with DNA pliers attached to the end of an AFM cantilever operated from the VR system.

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