

Systems Nanotechnology: Estimation, Design, and Control of Nanoscale Systems

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Nanometer length scale analogues of most traditional control elements, such as sensors, actuators, and feedback controllers, have been enabled by recent advancements in device manufacturing and fundamental materials research. However, combining these new control elements in classical systems frameworks remains elusive. This presentation discusses some promising design and control strategies that have been developed to address the challenges that arise in systems nanotechnology. A selection of novel nanoscale devices are reviewed, selected by their potential for broad application in nanoscale systems. Specific examples are provided where the estimation, design, and control of nanoscale systems have been demonstrated in experimental implementations or in high-fidelity simulations. Some recent developments are described for addressing a major challenge that must be resolved for commercial manufacturing, which is improving the integration of nanoscale devices.