

Beyond mechanical stiffness - Improving the electron microscope's motion control and reducing site demands by introducing mechatronics

Initiative: "Experiment!" (beendet)

Ausschreibung: Explorative Phase

Bewilligung: 01.03.2021

Laufzeit: 1 Jahre 6 Monate

Projekt-Website: <https://www.physik.hu-berlin.de/en/sem>

In the rush towards better resolution, transmission electron microscopes (TEM) have been made progressively stiffer; a term used in control theory to indicate that a system is very stable. Such a system is static and therefore slow to react to external stimuli. In the current operation paradigm, the overall state and the settings of the TEM are barely tracked, let alone regulated through feedback. During typical TEM measurements, the alignments are unchecked and their drift brings the microscope in a progressively less well-characterized state. In this project, concepts from control theory and mechatronics are used to continuously monitor the system and to maintain it in the desired state. This allows the abolishment of expensive and slow mechanical stiffness, in both the microscope and the site, in favor of cheaper implementations, all the while ensuring comparable resolution, much faster switching between states, and long-term unsupervised operation.

Projektbeteiligte

Prof. Christoph Koch

Humboldt-Universität Berlin

Institut für Physik & IRIS Adlershof

Berlin