TEMtilt: a tool for calculating tilt angles on a double-tilt stage

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One of the most frustrating and time consuming aspects of TEM operation, especially for inexperienced researchers studying fine grained crystalline materials, is tilting to appropriate zone axes or diffraction conditions using a double-tilt stage in the TEM. The conventional strategy to tilting is condensing the beam on the sample and following Kikuchi bands in diffraction mode. However, tilting results in sample drift that needs to be corrected for again in image mode. For large grained and low defect density samples this works well. However, constantly switching between diffraction and image mode becomes much more of a chore in samples with small grains, high misorientation inside grains due to a high defect density, and/or heavily twinned or shear transformed samples. A different strategy to tilting is finding out how the area of interest is oriented with respect to the sample holder, and then calculating the tilt angles whereby the desired orientation with respect to the beam is reached. Tilting can then be performed in image mode, which makes it easier to continuously correct for drift. To the knowledge of the authors, no such tilt helper tool exists, therefore this relatively simple calculation was implemented in the Python programming language and is distributed freely to help the community. In this presentation, the working principles behind the program are discussed using the case study of the author's research on an old Jeol microscope. Possible future applications such as dark field tomography and characterization of radiation induced defects are also discussed.

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