Opening for a PhD or PostDoc position:

Image processing in 3D electron tomography with multi-modal data fusion

Research description
3D image processing plays a key role in tomorrow's semiconductor industry. The features in integrated circuits (IC) become so small that instrumentation with atomic scale resolving power is required for metrology and fault detection. Transmission Electron Microscopy (TEM) is the instrumentation of choice for the sub-22 nm generation IC. For identification of the atom type an energy dispersive X-ray (EDX) image is recorded at the same time as the Scanning Transmission Electron Microscopy (STEM) image. From both modalities a 3D globally-consistent element-specific tomographic reconstruction is computed.

The researcher will have to devise strategies and work out image processing, computational and mathematical solutions to determine the best possible combination of multi-dimensional and multi-modal image processing steps in order to derive relevant IC device properties. We envision the development of novel multi-modal noise suppression schemes and superresolution reconstruction by atlas-based filtering. Since the total inspection time is the most critical factor for IC device characterization and fault detection in an industrial setting, we need to develop image reconstruction and image processing strategies that can perform the IC device analysis with the least possible amount of recorded data. Most challenging we need to devise and compute measures from fused image volumes that allow quantifying the quality of the IC.

The research will be performed mainly at the Quantitative Imaging Group in the faculty of Applied Sciences of the Delft University of Technology. Weekly exchange and strong collaboration will take place with researchers working at the center for mathematics and computer science (CWI) in Amsterdam under the supervision of Prof.dr. Joost Batenburg.

The industrial partners FEI in Eindhoven, The Netherlands, and IMEC in Leuven, Belgium, will be strongly involved during the project as leaders in tools for nanotechnology.

Keywords
Image processing, image analysis, tomographic reconstruction, image fusion, electron tomography.

Requirements
A Ph.D. candidate must have a strong background in image processing and holds a MSc. degree in Computer Science, Electrical Engineering, Mathematics or Physics. Excellent programming skills in C++ and Matlab are essential, image processing competences on MSc. level are required, experience with volumetric reconstruction is desirable. A PostDoc applicant must have a proven track record in image processing and analysis of volumetric data, preferable with in the field of EM or X-ray imaging.

Conditions of employment
TU Delft offers a customisable compensation package, a discount for health insurance and sport memberships, and a monthly work costs contribution. Flexible work schedules can be arranged. An international Children's Centre offers child care and an international primary school. Dual Career Services offers support to accompanying partners. Salary and benefits are in accordance with the Collective Labour Agreement for Dutch Universities. The post-doc position is for a maximum of 2,5 years. The PhD position is for four years.

As a PhD candidate you will be enrolled in the TU Delft Graduate School. TU Delft Graduate School provides an inspiring research environment; an excellent team of supervisors, academic staff and a mentor; and a Doctoral Education Programme aimed at developing your transferable, discipline-related and research skills. Please visit www.phd.tudelft.nl for more information.

Information and application
For more information about this position, please contact Dr. B. Rieger, e-mail: b.rieger@tudelft.nl. If you are interested in this position, you must send the following information in English: 1) a letter of
application, 2) a detailed CV, 3) a transcript of your grades, 4) a summary of your MSc thesis and list of publications (if any). Without a letter of application specifically for this research position we cannot take your application into consideration. Please e-mail your application by 1 February 2016 to Mrs. A. van Beek, secr-ImPhys-TNW@tudelft.nl. When applying for this position, please refer to vacancy number TNWIP14-030.