

Bachelor thesis

in the subject area of

Simulation of partial coherent imaging

The simulation of image formation is rather simple and straightforward in case of fully coherent or fully incoherent illumination light. If the illumination source is partial coherent, the situation is much more complicated. The reason for these problems is, that a 6-dimensional integration over all points of the object (2 spatial coordinates x, y) and the illumination directions (2 direction cosines) and the image (2 coordinates x, y) have to be performed. This is an extreme computational burden and most of the research for improving the speed of this type of computation deals with clever approximations in the physical model as well as the numerical algorithms. Usually a separation into various ranges of the degree of coherence make sense and depending on the coherence, the algorithm and its parametrization is selected. The main applications for this type of calculations are microscopy and lithography. Some more simple algorithms are available as Matlab tools, they can serve in this Labwork as reference. Recently a more sophisticated approach is published by Rosenbluth (Proc SPIE 10147). The main goal of this labwork is to implement this proposed algorithm and to compare it with other approaches. The work of this project can be splitted into the following concrete steps:

1. Read the relevant literature about the possibilities to simulate partial coherent imaging
2. Read the paper of Rosenbluth and extract the governing equations
3. Make some simple calculation with the available Matlab tools and define three sample sets to be compared (low, medium and high degree of coherence)
4. Develop a concept for the implementation with most comfortable runtime
5. Implement and test the new algorithm
6. Compare the various algorithms concerning speed and accuracy with the test setups

Please, send your application preferably by email to

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