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Optical Design and Measurement

MAX PLANCK INSTITUTE for the science of light

Master thesis at IOIP:

Wave-optical simulation using a neural network

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Motivation:

Simulation methods for optical system analysis have a long history. Raytracing, using geometrical optics, and wave propagation methods (WPM) are well established methods and have been used in research for many years. While WPM is a very accurate simulation tool, it's disadvantage is a very long computation time. By subdividing the area, which is chosen to be simulated, in many small slices one propagates light from slice to slice. This characteristic has a lot in common with a time series prediction, in which neural networks have become state of the art.

Aim:

The aim of this master thesis is to develop a new algorithm to simulate optical systems in an efficient way. The central idea is to modify the existing WPM and use it with a neural network. Since it is thought to show a new concept, it would be applied to simple optical systems.

The first task will be to produce training data for the neural network. In contrast to other neural network applications, such as image recognition, the generation of training data is straightforward in our case by taking the slices of the classical WPM for several systems. After acquiring the training data, the design of the neural network is the next step, which will be the main task. In the end simulations verifying the functionality of the algorithm have to be carried out.

Requirements:

- Good knowledge in optics
- Know how in matlab or python
- Previous work with neural networks desirable, but not mandatory

Further information: **https://www.optik.nat.fau.de/forschung/odem/**

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