Plasma Tomography at GOLEM Tokamak using Neural Network model

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The spectral and spatial distributions of radiation emitted by plasma is interpreted as a diagnostic tool to characterize plasma properties. In tokamak plasma, the tomographic inversion methods are implemented to reconstruct the spatial distribution of radiation using line integrated plasma projection data [1]. The importance of the computation time of the tomography reconstruction process leads to attempts in the implementation of artificial neural network-based models [2].

In this work, a neural network model is trained based on a dataset of the tomography reconstruction at the GOLEM tokamak. The dataset is constructed by samples containing two images captured by two colour cameras installed on the same poloidal cross-section and the corresponding tomography reconstruction of radiation function based on the Minimum Fisher Regularization (MFR) algorithm [3,4].

The main aim is to achieve the proper Neural Network (NN) model capable to predict the radiation function near to the spatial radiation distribution reconstructed by the traditional tomography method. To this purpose, various NN models are trained based on different dataset. The applied different dataset consists of real data and artificial profiles covering a wide range of radiation profiles. In order to evaluate the real performance of the NN models, a phantom test is performed, and the result of the various NN-model is compared at the same time.

References:

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