Visual inspection of fuel assemblies is necessary to identify potential anomalies in their behaviour associated with their condition and their future usage. One of the possible findings are foreign objects caught on the fuel spacer grid which can disrupt the cladding of fuel rods during the operation. The goal of this thesis is to accurately segment the spacer grid from an image, which is a task dual to the foreign object detection, and therefore to automate visual inspection process in this area. We created new datasets covering typical problems appearing on the fuel assembly. To perform the segmentation, we employed neural networks. We increased performance by data augmentation techniques and domain-specific output post-processing. We also measured the algorithm's performance by a newly introduced Line Distance metric, computing the size of the maximum uncertain area between the actual and the predicted transition between grids and rods. In the experiments, we found the best hyperparameters and reached very good results, outperforming our predecessor's algorithm by having three times lower Line Distance metric.