

Complex Image Transformations by Neural Networks

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<https://hdl.handle.net/2324/4475152>

出版情報 : Kyushu University, 2020, 博士 (学術), 課程博士
バージョン :
権利関係 :

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論 文 名 : Complex Image Transformations by Neural Networks
(ニューラルネットワークによる複合的画像変換の研究)

区 分 : 甲

論 文 内 容 の 要 旨

U-Net, which was suggested for precise pixel-wise segmentation of biomedical images, is one of the excellent image-to-image transformation models. Due to its effective localization representation capability, U-Net is still widely used in various research fields. There are lots of studies for improving the performance of U-Net based models or training U-Net based models with insufficient data. In this paper, we introduce novel methods to train a U-Net-based model by using a limited number of training data and to improve the performance of the model incorporating the Attention mechanism. First, the proposed method for historical document image binarization is designed by cascading modularized U-Nets. The modularized U-Nets are trained by the sufficient amount of different training data with the target data like as transfer learning. The trained modularized U-Nets are cascaded and are connected by using novel inter-module skip-connections. After cascading the modularized U-Nets with novel inter-module skip-connections, the proposed model is trained by using target data as a fine-tuning process. Second, we propose an optimal method that is to improve the performance of cascading modular U-Nets incorporating Squeeze and Excitation network (SE-Net). SE-Net is one of the Attention methods that improve the performance of conventional neural networks with simple attachments of SE-Nets. However, since cascading modular U-Nets are organized with pre-trained U-Nets, the conventional attachment strategy of SE-Nets is revised in cascading modular U-Nets. We suggested novel attachment methods of SE-Nets in cascading modular U-Net with demonstrating evaluation results. By adopting the novel method, the revised cascading modular U-Nets show the performance improvement in document image binarization. We evaluate our proposed methods by using the Document Image Binarization Competition (DIBCO) and Handwritten DIBCO (H-DIBCO) dataset.