Prostate MR Image Segmentation Method Using two Stacked U-nets

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Abstract

This document briefly describes techniques we used in automatic segmentation of the prostate in transversal T2 MRI for the PROMISE12 challenge. We trackled this problem using two stack U-nets.

1. Data Preprocessing

Uniform size. To unify the image sizes, we resized the 2D MRI slices of each image to be of size 256×256.

Gaussian normalization. Gaussian normalization was then applied to rescale the voxel intensities to has a zero mean and a unit variance.

Data augmentation. Training set has about 1200 images with corresponding masks. Therefore, data was augmented to 5000 by random rotations , shifts. zooms, flips and elastic deformations.

2. Network architecture

Our network is trained with two stack U-nets [1].

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3. Implementation Details

The proposed method was implemented in Python language, using Keras with Tensorflow backend. All experiments were conducted on a Linux machine running Ubuntu 16.04 with 32 GB RAM memory. The U-net training was carried out on a single GTX 1080 Ti with 11 GB RAM memory.

4. results

The training dataset is split into 45 training cases and 5 validation cases. The validation set were arbitarily set ti the cases $\{05, 15, 15, 35, 45\}$

Table 1: Statistics of validation slices

Mean vDSC	Median vDSC	Std vDSC
0.88	0.88	0.05

mean hauss. Dist	mean MSD	mean Rel. Abs. Vol. Diff
12.24	1.84	25.28

References

[1] O. Ronneberger, P. Fischer, T. Brox, U-net: Convolutional networks for biomedical image segmentation, in: International Conference on Medical image computing and computer-assisted intervention, Springer, 2015, pp. 234–241.