Prostate MR Image Segmentation Method Using Dense Unet

Wanli Chen\textsuperscript{a,1}, Yue Zhang\textsuperscript{a,b,1}, Yifan Chen\textsuperscript{c}, Hongjian Shi\textsuperscript{a,*}, Xiaoying Tang\textsuperscript{a,*}

\textsuperscript{a}Department of Electrical and Electronic Engineering, Southern University of Science and Technology, China
\textsuperscript{b}Department of Electrical and Electronic Engineering, The University of Hong Kong, China
\textsuperscript{c}Faculty of Science and Engineering, The University of Waikato, New Zealand

Abstract

This document briefly describes techniques we used in automatic segmentation of the prostate in transversal T2 MRI for the PROMISE12 challenge. We tracked this problem using U-net enhanced by designed dense block.

1. Data Preprocessing

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

Gaussian normalization. Gaussian normalization was then applied to rescale the voxel intensities to have 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 U-net\textsuperscript{1} and designed dense block inspired by\textsuperscript{2}.

\textsuperscript{*}Corresponding author

\textit{Email addresses:} shihj@sustc.edu.cn (Hongjian Shi), tangxy@sustc.edu.cn (Xiaoying Tang)

\textsuperscript{1}Equal contribution

Preprint submitted to PROMISE12 Challenge June 29, 2018
The U-net consists of a down-convolutional part (left side) and up-convolutional part (right side). The left side aims at extracting features for classifying each voxel into one or zero. The dense block connects each layer and its subsequent layer in a feed-forward fashion.

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.

References
