

Method of Background Subtraction for Medical Image Segmentation

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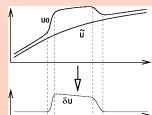
Motivation

- Medical images can involve noise, diverse artifacts, and unclear edges.
- Conventional segmentation methods show difficulties when applied to medical imagery.

Introduction

- Apply method of background subtraction (MBS) to minimize difficulties.

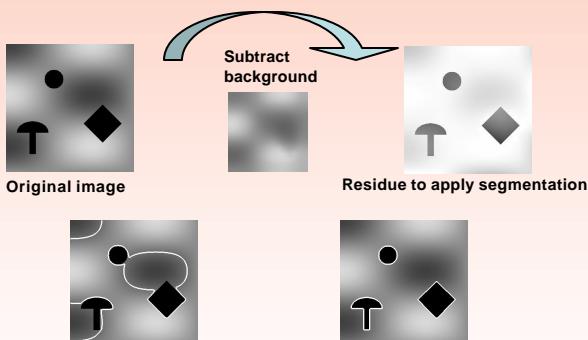
- When an appropriate background \tilde{U} is subtracted from the given image U_0 , the residue can be considered as an essentially binary image dU .



- The MBS can be used as a pre-process of various segmentation methods and can be applied to 3-D medical imagery.

Procedure of the construction of background

- Select a coarse mesh $\{\Omega_{ij}\}$ for the image domain Ω and choose a coarse image U_c on $\{\Omega_{ij}\}$. Each element Ω_{ij} in the coarse mesh corresponds to $m_x \times m_y$ pixels for some $m_x, m_y \geq 1$.
- Smooth U_c .
- Prolongate U_c to the original mesh Ω , for U_f .
- Smooth U_f . Assign the result for the background \tilde{U} .

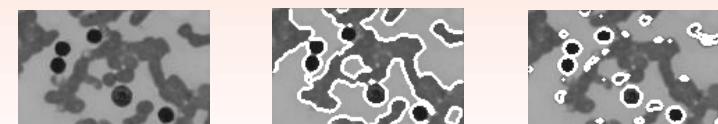
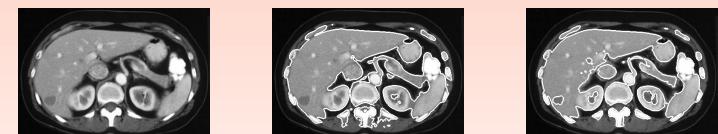
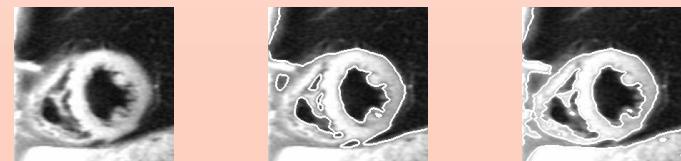


Left: segmentation without MBS, right: MBS segmentation

Strategies for background construction

- In step I, choose U_c on Ω_{ij} as $ra_{ij} + (1-r)m_{ij}$, $0 \leq r \leq 1$, a_{ij} : arithmetic average, m_{ij} : minimum of U_0 on Ω_{ij} .
- \tilde{U} must contain only background information, not objects information. Thus select $m = m_x = m_y$ such that number of blocks in U_c corresponding to objects are smaller than the number of smoothing iterations in step II.

Numerical experiments



Left: Original image, middle: segmentation without MBS, right: MBS segmentation

