Segmentation of the Heart Ventricle and Atrium in Handheld Ultrasound Images

Jun-Young Park¹, Woo-Hyuk Choi¹, Sung-Yun Park²
¹Biomedical engineering Lab., Dongguk university
Dongguk-ro 32 Ilsandong-gu, Goyang, Republic of Korea
pipen0125@gmail.com; wowoohyuk@gmail.com
²College Korean medicine, Dongguk university
Dongguk-ro 32 Ilsandong-gu, Goyang, Republic of Korea
bmepark@dongguk.ac.kr

Extended Abstract
Ultrasound is widely used to diagnose a heart disease due to non-invasive method and real time [1-4]. The handheld ultrasound is rapidly increasing on small or private hospital because of mobility, compact and cheaper than premium model.[5] This purpose of this study is to develop an automate segmentation algorithm that uses a measure a volume of heart ventricle and atrium.

The commercial device that is developed our own research centre is used to take a heart ventricle and atrium image. 6 males who have any cardiovascular disorders for 2 years were enrolled on this study. The algorithms of ultrasound image were developed based on MATLAB. The commercial device (ACUSON X300, Siemens, Germany) was used to check a performance of developed algorithm. The image analysis algorithm consists of 3 steps which are a pre-processing, separate region and segmentation. The pre-processing step includes a data size reduction and image enhancement. The separate region step includes a finding contours and convex hull, composite process between binary image and convex hull image, and extract ROI section. The segmentation step includes a calculating adaptive radius and a measuring a volume on each ventricle and atrium. The value (mean ± SD) of EDV, ESV, stroke volume and EF on one subject were 2.20 ±0.05, 0.78 ±0.1, 1.42 ±0.12, and 64.65 ± 2.14%, respectively. The accuracy (mean ± SD) of EDV, ESV, stroke volume and EF were 88.23 ± 1.71%, 88.36 ± 2.14%, 89.12 ±0.27 %, and 89.54 ±0.48 %. Further study, we will optimize the algorithm to increase the accuracy and expand the clinical testing field for a variety ages and gender.

References