
http://researchrepository.murdoch.edu.au/18258/
Acquisition of mammogram breast border reference data from non-experts

Ramachandran Chandrasekhar and Yianni Attikiouzel
Centre for Intelligent Information Processing Systems
Department of Electrical and Electronic Engineering
The University of Western Australia, Nedlands, WA 6907, Australia
e-mail: chandra@ee.uwa.edu.au and yianni@ee.uwa.edu.au

Abstract

Automatic segmentation needs validation by expert radiologists, who are few and often very busy. This paper presents an approach to manually acquiring breast border reference data from non-experts using freely available image display and manipulation programs like xv and Gimp. The resulting reference images may then be compared with those from automatic segmentation and the degree of mismatch may be used to quantify the goodness of segmentation. Preliminary results show the feasibility of this approach. Keywords: mammogram segmentation, breast border detection, manual segmentation, image display and manipulation, reference data acquisition

1 Introduction

Radiologists generally validate the results of automatic segmentation, albeit subjectively and qualitatively. Where such expertise is scarce, there is need to manually acquire reference data from non-experts. This paper gives preliminary results from a promising approach wherein non-experts are relied upon to manually segment mammograms reliably. The goodness of automatic segmentation could then be quantified by the degree of mismatch between the manually and automatically extracted images.

2 Method

The breast border may not always be apparent; methods to render it visible to the non-expert include interactive image manipulations such as histogram equalization, gamma correction, contrast enhancement or colour display, using a package such as xv

1. The border may then be extracted from the image by tracing it out with a computer mouse, but this task is usually tedious and error-prone. Gimp

2, a freely available, image manipulation package, alleviates this. Its "intelligent scissors" image selection tool is tailor-made for manual segmentation. It offers a mouse tracing function backed by three powerful features: (a) a variable edge detection threshold that controls the sensitivity of the tool to the edges in the image; (b) an elasticity parameter that controls the tendency of the tool to deviate from the hand-traced contour and snap back onto the edge; and (c) variable curve resolution which controls the smoothness of the traced contour. In the case of the breast border, which is a single edge, both (a) and (b) are set to high values to allow for a fairly error-tolerant mouse trace giving an accurate final breast border.

3 Results

Figure 1: (a) Original mammogram in pseudocolour to display breast border; (b) Breast region manually segmented using Gimp; (c) Automatically detected breast border image, for comparison.

4 Conclusions

Manual breast border extraction is a simple object recognition task that non-experts may perform reliably and accurately, aided by suitable image display and manipulation programs like Gimp.