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SEGMENTATION USING WAVELET AND GVF SNAKE

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[1]Foon Dah Way, [2]Mandava Rajeswari, [3]Dhanesh Ramachandram
School of Computer Science
Universiti Sains Malaysia
11800 Minden, Penang
Malaysia
([1]dwfoon, [2]mandava, [3]dhaneshr)@cs.usm.my

ABSTRACT

The Gradient Vector Flow (GVF) snake is a popular technique to segment object in image processing. Its advantages are insensitivity to contour initialization and its ability to deform into highly concave part of the object compared to other deformable contour models. However, the performance of a GVF snake to model any arbitrary shape is heavily dependent upon objects with the highest intensity changes in the edge map and does not take into consideration objects with secondary gradient magnitude. To alleviate this problem, we propose a multi-scale method to obtain a suitable edge map to aid the GVF determination problem. The GVF are thus calculated from the enhanced edge map which focuses on the secondary structures of interest. This paper presents the approach and preliminary results which are encouraging.

KEY WORDS

Gradient vector flow, wavelet, multi scale edge, and segmentation

1. Introduction

In computer vision, segmentation is a fundamental step prior to further processing and analysis operations performed on images. All segmentation approaches, regardless of the type of images they operate on, aim to segment an object of interest from the rest of the image structure. Image segmentation methods may be broadly divided into three categories: region based segmentation, contour based segmentation and morphological based segmentation approach [1]. This work presented in this paper focuses on the contour based segmentation.

The Gradient Vector Flow (GVF) snake [2] is a popular technique to segment object in image processing. Its advantages are insensitivity to contour initialization and its ability to deform into highly concave part of the object compared to other deformable contour models. However, the performance of a GVF snake to model any arbitrary shape is heavily dependent upon objects with the highest intensity changes in the edge map and does not take into consideration objects with secondary gradient magnitude. To alleviate this problem, we propose a multi-scale method to obtain a suitable edge map to aid the GVF determination problem. The GVF are thus calculated from the enhanced edge map which focuses on the secondary structures of interest.

This is the extension work from our previous work on edge clustering using selected feature vector [3]. In that work, we propose an automated method to extract desired structures exclusively. The method focuses on automated scale selection and is based on wavelets. It utilizes wavelet edge detection, multi scale edge linking coupled with a method of classifying relevant edges. Several parameters from the scale evolution of the multi scale edges detected by a discrete wavelet decomposition of an image are used in a clustering algorithm to classify the edges belonging to background, structure(s) of interest, other structure(s) and noise. In this work, the preliminary initial boundary is used as the starting boundary in the well-established GVF snake [2]. The overall flow of the algorithm is illustrated in Figure 1:

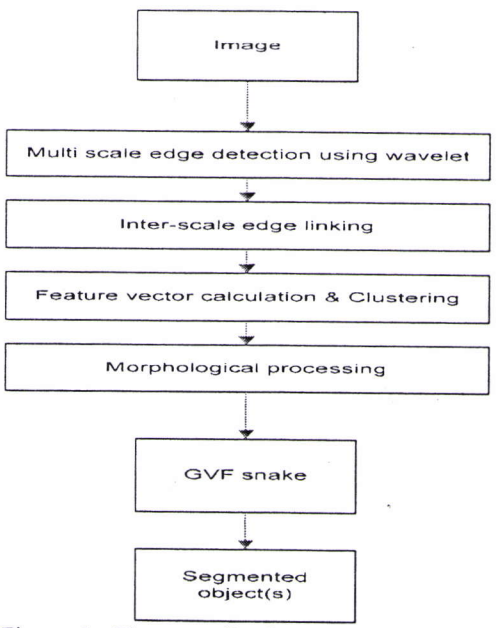

Figure 1: The overall of the flow of the segmentation algorithm.