AN IMPROVED FAST SCANNING ALGORITHM BASED ON DISTANCE MEASURE AND THRESHOLD FUNCTION IN REGION IMAGE SEGMENTATION

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Abstrak

Segmentasi adalah satu proses yang penting dan mampu memisahkan imej ke dalam sektor-sektor yang mempunyai ciri-ciri yang sama. Ini akan mengubah imej tersebut agar lebih sesuai untuk dikaji dan dinilai. Salah satu kepentingan segmentasi ialah pengenalpastian kawasan fokus dalam sesuatu imej. Pelbagai algoritma telah dicadangkan untuk segmentasi imej dan ini termasuklah Algoritma Pengimbasan Cepat *(Fast Scanning)* yang telah diaplikasikan dalam bidang makanan, sukan dan perubatan. Proses penggugusan dalam algoritma Pengimbasan Cepat dilakukan melalui penggabungan antara piksel dengan piksel yang bersempadan dengannya berdasarkan satu ambangsuai dan penggunaan Jarak Euclidean *(Euclidean Distance)* sebagai pengukur jarak. Pendekatan tersebut membawa kepada imej segmentasi yang lemah reliabiliti dan pengecaman corak. Oleh itu, kajian ini mencadangkan Algoritma Pengimbasan Cepat *(Improved Fast Scanning)* yang ditambahbaik berdasarkan pengukur jarak *Sorensen* dan fungsi ambangsuai adaptif. Fungsi ambangsuai adaptif yang dicadangkan adalah berdasarkan kepada nilai kelabu dalam piksel imej dan varians nya. Algoritma Pengimbasan Cepat yang ditambahbaik ini telah direalisasikan ke atas dua koleksi data yang mengandungi imej kereta dan alam semulajadi. Penilaian dibuat dengan mengira *Peak Signal to Noise Ratio* (PSNR) bagi algoritma Pengimbasan Cepat yang ditambahbaik dan algoritma Pengimbasan Cepat yang sedia ada. Keputusan eksperimen menunjukkan bahawa algoritma yang dicadangkan menghasilkan PSNR yang lebih tinggi berbanding algoritma Pengimbasan Cepat sedia ada. Keputusan yang sedemikian memberi indikasi bahawa algoritma Pengimbasan Cepat yang ditambahbaik adalah berguna bagi imej segmentasi dan seterusnya menyumbang kepada pengenalpastian sektor yang menarik dalam bidang pengecaman corak.

Keywords: Segmentasi imej, Algoritma Pengimbasan Cepat, ukuran jarak, fungsi ambangsuai adaptif, Peak Signal to Noise Ratio.

Abstract

Segmentation is an essential and important process that separates an image into regions that have similar characteristics or features. This will transform the image for a better image analysis and evaluation. An important benefit of segmentation is the identification of region of interest in a particular image. Various algorithms have been proposed for image segmentation and this includes the Fast Scanning algorithm which has been employed on food, sport and medical image segmentation. The clustering process in Fast Scanning algorithm is performed by merging pixels with similar neighbor based on an identified threshold and the use of Euclidean Distance as distance measure. Such an approach leads to a weak reliability and shape matching of the produced segments. Hence, this study proposes an Improved Fast Scanning algorithm that is based on Sorensen distance measure and adaptive threshold function. The proposed adaptive threshold function is based on the grey value in an image's pixels and variance. The proposed Improved Fast Scanning algorithm is realized on two datasets which contains images of cars and nature. Evaluation is made by calculating the Peak Signal to Noise Ratio (PSNR) for the Improved Fast Scanning and standard Fast Scanning algorithm. Experimental results showed that proposed algorithm produced higher PSNR compared to the standard Fast Scanning. Such a result indicate that the proposed Improved Fast Scanning algorithm is useful in image segmentation and later contribute in identifying region of interesting in pattern recognition.

Keywords: Image segmentation, Fast Scanning algorithm, Distance measure, Adaptive threshold function, Peak Signal to Noise Ratio.

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List of Abbreviations

URG	Unseeded Region Growing
UUM	Universiti Utara Malaysia
SRG	Seeded Region Growing
SAR	Synthetic Aperture Radar
LOG	Laplacian of Gaussian
1 D	One Dimensions
2 D	Two Dimensions
PC	Personal Computer
OCR	Optical Character Recognition
RGB	Red, Green and Blue
IDE	Integrated Development Environment
ROC	Receiver operating characteristic
SEM	Structural Equation Model
PSNR	Peak Signal to Nosie Ratio
MAE	Mean Absolute Error
GCE	Global Consistency Error
RI	Rand Index
VoI	Variation of Information
PRM	Precision Recall Measure
BDE	Boundary Displacement Error
LCE	Local Consistency Error
PSO	Particle Swarm Optimization
MAP-ML	Maximum and Posteriori Maximum Likelihood
JPEG	Joint Photograph Experts Group

CHAPTER ONE
INTRODUCTION

1.1 Background

There has been a substantial increase in the attention given to the challenges brought by image processing throughout the last twenty years. This attention has generated a growing demand for theoretical approaches as well as application of computer hardware with appropriate software in the design of image processing systems (Wang, 2010).

Image segmentation is one of the basic steps of the image processing and machine vision. It segments images for accurate boundaries that transform the image's representation for detail (Tawfeeq & Tabra, 2014). Its key point is: the image is divided into a number of sets that do not mutual overlapping zones; these zones either have meaning to currently mission or help to explain correspondence between them and the actual object or some parts of object (Lakshmi, 2010). Therefore, it is a process in which divide the image into disjoint regions that are meaningful with feature section and removes that relevant objects.

Image segmentation is a very interesting area in image processing field due to images are one of the most important medium to convey information in the field of computer vision (Wang, Guo, & Zhu, 2007). Yet, verifying the segment boundaries automatically remains a big challenge. Image segmentation have a wide range of applications in practice, such as: industry automation, product online detection, manufacturing and process control, remote sensing image processing, biomedical image analysis, etc (Agrawal, 2014).

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