New algorithm for colour image segmentation using hybrid *k*-means clustering

Abbas H. Hassin Alasadi* and
Moslem Mohsinn Khudhair

Department of Computer Science,
College of Science,
Basra University, Iraq
Email: abbashh2002@yahoo.com
Email: Mos1970@yahoo.com
*Corresponding author

Abstract: The traditional *k*-means algorithm is a classical clustering method which is widely used in variant application such as image processing, computer vision, pattern recognition and machine learning. However, the *k*-means method converges to one of many local minima. It is known that, the final result depends on the initial starting points (means). Generally initial cluster centres are selected randomly, so the algorithm could not lead to the unique result. In this paper, we present a new algorithm which includes three methods to compute initial centres for *k*-means clustering. First one is called geometric method which depends on equal areas of distribution. The second is called block method which segments the image into uniform areas. The last method is called hybrid and it is a combination between first and second methods. The experimental results appeared quite satisfactory.

Keywords: clustering; k-means algorithm; image segmentation; colour model.

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Biographical notes: Abbas H. Hassin Alasadi received his BSc and MSc degrees in Computer Science from Basra University, Iraq in 1990 and 1997 respectively. His PhD degree is obtained from Harbin Institute of Technology, Harbin, China in 2004. Currently, he is an Associate Professor at the Computer Science Department, College of Science, Basra University, Iraq. His research interests are image and video segmentation, Arabic characters recognition, and GIS.

Moslem Mohsinn Khudhair received his BSc degree in Computer Engineering from Basra University, Iraq in 1992. Currently, he is a Lecturer in Computer Science Department, College of Science, Basra University, Iraq. His research interest is colour image segmentation and clustering.

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1 Introduction

Image segmentation is the first step of the most critical tasks of image analysis, as shown in Figure 1. It is used either to distinguish objects from their background or to partition an image onto the related regions (Samma and Salam, 2009).

The process of image segmentation is defined as: "the search of homogenous regions in an image and later the classification of these regions". It also means the partitioning of an image into meaningful regions based on homogeneity or heterogeneity criteria. Image segmentation techniques can be differentiated into the following basic concepts: pixel oriented, contour-oriented, region-oriented, model oriented, colour oriented and hybrid. Colour segmentation of image is a crucial operation in image analysis and in many computer vision, image interpretation, and pattern recognition system, with applications in scientific and industrial field(s) such as medicine, remote sensing, microscopy, content based image and video retrieval, document analysis, industrial automation and quality control. The performance of colour segmentation may significantly affect the quality of an image understanding system. The most common features used in image segmentation include texture, shape, grey level intensity, and colour (Anil and Katiyar, 2010; Zhang, 2006; Anderberg, 1973).

Partitional clustering algorithms such as *k*-means and Exception Maximise (EM) clustering are widely used in many applications such as data mining, compression, image segmentation, and machine learning.