

# Intelligent Approaches towards Fuzzy Segmentation and Fuzzy Edge Detection

Neda Ahmadi<sup>a,\*</sup>

<sup>a</sup> Shahid Chamran University of Ahvaz, Faculty of Engineering, Department of Computer Engineering, Ahvaz, Iran

\* Corresponding author email address: [nahmadidotnet@gmail.com](mailto:nahmadidotnet@gmail.com)

## Abstract

Fuzzy method is one of the most popular methods for image segmentation. In this paper, fuzzy segmentation and fuzzy edge detection methods are presented to segment and detect the edges of the images. The experimental results of our proposed method show that this algorithm performs well and it segments and detects the edges of the image precisely.

Keywords: Fuzzy edge detection, Fuzzy segmentation, Image segmentation; Fuzzy logic

## 1. Introduction

Segmentation (Edalati-rad and Mosleh, 2019) is a standard method which requires when some part of the image has to be recognized and thus, it builds a group of partitioned pixels in regions (Drozdal et al., 2018). In other words, the aim of Image Segmentation (IS) (Wang et al., 2019; Soualmi et al., 2018; Winston and Hemanth, 2018; Wang et al., 2019) is to separate the image into different areas and then, it extracts the favourable objectives. One of the most troublesome subjects in image processing and pattern recognition fields is IS. So far, there have been proposed several segmentation (Ahmadi and Akbarizadeh, 2016; Ahmadi and Nilashi, 2018) methods that are includes clustering (Huang et al., 2019), graph cut (Chen and Pan, 2018), edge detection (Ahmadi and Akbarizadeh, 2015; Ahmadi and Akbarizadeh, 2019), and level set (Zhi and Shen, 2018). The boundaries demarcate the regions; however, these boundaries are not usually clarified. Fuzzy methods (Mahmood et al., 2018) have been producing well-known approaches for segmenting the crisp images as they can model distinguish genre of noisy images effectively (Naidu et al., 2018). A set of pixels which are partitioned into a particular joined region is called a crisp IS (Sarkar et al., 2016). Fuzzy C-means Clustering (FCM) method has been performed extensively to IS among the Clustering Segmentation (CS) approaches (Çetin et al., 2019).

The rest of this paper is organized as follows. In Section 2, we review multiple literature reviews. Our proposed method and experimental results are described in Section 3 and 4, respectively. Finally, this work is concluded in Section 5.

### Table 1

## List of acronyms.

Acronyms	Description
FCM	Fuzzy C-Means Clustering
FCM-S	Fuzzy C-Means Clustering-Special Constraints
	Local Correntropy and FCM-S
LCFCM-S	Image Segmentation
IS	Clustering Segmentation
CS	Fuzzy Image Segmentation
FIS	Multi-Scale Gaussian Kernel FCM
MsGKFCM	Multi-Scale Vector Field Convolution
MsVFC	Region of the Interest
ROI	Ultrasound
US	Speckle Reducing Anisotropic Diffusion
SRAD	Fuzzy Region Competition
FRC	Gaussian Mixture Model
GMM	Machine Learning
ML	

## 2. Related Work

In the past, numerous methods have been surveyed in the literature by the scholars for IS. Fuzzy logic has been an effective technique for complex systems implementation (Nilashi et al., 2019a; Nilashi et al., 2019b; Nilashi et al., 2019c; Nilashi et al., 2019d; Nilashi et al., 2019e; Mardani et al., 2019; Yadegaridehkordi et al., 2018). Fuzzy segmentation is one of the well-known approaches that it has been gained multifarious popularity during the years (Ahmadi and Akbarizadeh, 2017; Hooda et al., 2019; Subashini et al., 2016; Ahmadi and Akbarizadeh, 2018; Ahmadi et al., 2019). Chouhan et al. (2018) presented a novel study based on Fuzzy C-means Clustering (FCM) – Special constraints (FCM-S) for image segmentation. But it is not very useful due to its computational complexity issues, shortage of sufficient power to outliers, and noise. To solve