Chapter 9
A Comprehensive Study of Various Fuzzy C-Means Clustering Algorithms

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ABSTRACT

Digital image processing is becoming another ever-growing yet popular field of demands for daily life, ranging from medicine, room evaluation, security, support, and security of the automotive community, among many others. The proposed framework focuses mostly on fuzzy logic structures somewhere in optical image processing. The main goal of most of this work is to demonstrate how fuzzy logic is implemented in image processing with little more than a quick introduction of fuzzy logic and optical image processing. Fuzzy logic, one of those artificial intelligence decision-making approaches, provides even greater room for use. When everything that would also

DOI: 10.4018/978-1-6684-4405-4.ch009

have been allowed access to declarations at all since birth, particularly concerning in popularity in recent years, fuzzy logic as a whole has been proven to be true in virtually all systemic fields. Furthermore, the implications continue to suggest that the previously presented technique is worthy of attention in image processing software systems with the appropriate expansion.

INTRODUCTION

In 1965 Lotfi A. Zadeh and Dieter Klaus developed Fuzzy sets independently as an enhancement of both the traditional instance of collection. Fuzzy relations are increasingly employed in a range of areas, including language studies, decision-making, and clustering. Fuzzy logic has been extended to a wide range of disciplines ranging from control theory to artificial intelligence. Fuzzy relations were designed to enable the machine to decide the distinctions that are neither right nor wrong between data.

The clustering algorithm separates a data collection into classes/clusters, with related data objects allocated to the same clusters. When the boundary between clusters is ill-defined, resulting in circumstances where the same data object belongs to more than one class, the concept of fuzzy clustering comes into play.

Clustering or cluster analysis have the steps like handing over of data points to clusters such that items in the same cluster are as analogous as possible, otherwise clusters are contradictory as possible.

BACKGROUND

The Fuzzy C-means clustering model (FCM) was first developed by Dunn in 1974(Informa et al., 2008)and was subsequently expanded and understood by Bezdek in 1983. Since then, some discrepancies of this method and models improvements are recommended in the writings by few researchers. In (Pal et al., 2005), Pal and Bezdek introduced a diverse fuzzy-possibilistic clustering, which is primarily an amalgamation of fuzzy and possibilistic clustering models, in disagreement that FPCM elucidates the FCM's noise sensitivity defect and solves the PCM's previous conterminous clusters challenging problem. They also provide first order necessary conditions for the extremes of the PFCM objective function and use them as the foundation for an average interchanging optimization algorithm for locating the confined minima. Here, two of the numerical examples have been mentioned for FCM and PCM. Also, there were a few studies done on the linguistic variables in FCM,

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Frithjof Dau (2013). *International Journal of Conceptual Structures and Smart Applications (pp. 18-38).*
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