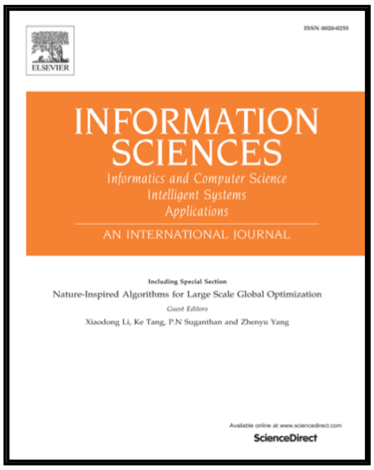
Accepted Manuscript



Fuzzy Geometry: Perpendicular to Fuzzy Line Segment

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PII: S0020-0255(18)30644-3
DOI: https://doi.org/10.1016/j.ins.2018.08.040
Reference: INS 13884

To appear in: *Information Sciences*

Received date: 3 January 2018
Revised date: 11 August 2018
Accepted date: 12 August 2018

Please cite this article as: Debjani Chakraborty, Suman Das, Fuzzy Geometry: Perpendicular to Fuzzy Line Segment, *Information Sciences* (2018), doi: https://doi.org/10.1016/j.ins.2018.08.040

Fuzzy Geometry: Perpendicular to Fuzzy Line Segment

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Abstract

In this study, we define the perpendicular to fuzzy line segment (PFLS) which intersects a given fuzzy line segment (FLS) normally at a specified fuzzy point. In order to construct PFLS, some spatial transformations of fuzzy points, such as Translation, Rotation, Expansion, Contraction and Reflection (TRECoRe) are needed and have also been defined here. The concept of PFLS has been justified and formulated in three different ways with the help of same and inverse point theory of fuzzy points. Their properties and interrelations are also investigated. The area of a fuzzy triangle has been calculated with the proposed methodology.

Keywords: Fuzzy point; Fuzzy angle; Same and Inverse point; Perpendicular fuzzy line segment; Translation; Rotation; Expansion; Contraction; Reflection.

1. Introduction

Since the inception of fuzzy sets in 1965 [18], their geometrical visualization has been of great interest to researchers. An overview on fuzzy geometry and some topological properties have been introduced later in 1984 [13], and modified in [14, 15].

Buckley and Eslami [4, 5] introduced the fuzzy plane geometry in a newer approach by partially conforming to Zadeh's extension principle [17], using sup-min combination of fuzzy sets. This concept was further extended to define fuzzy space geometry by Qiu and Zhang [12]. Apart from defining fuzzy geometry in the Euclidean space, Bloch presented some ideas on the geodesic case and introduced fuzzy geodesic distances between two points in fuzzy sets [2]. More visualization on fuzzy geometry may be found in [11]. As an application, fuzzy geometry has been used by Wang *et al.* for location discovery in passive sensor networks [16]. Several kinds of fuzzy distances were introduced and applied in image processing by Bloch [1].

A thorough study on fuzzy geometry has been done by Ghosh and Chakraborty [9] in 2012. A new concept of same and inverse points has been introduced in this regard. Definitions of Fuzzy line segment (FLS) and the fuzzy line, which is obtained by extending FLS bi-infinitely, are introduced in four different forms by Chakraborty and Ghosh in [6]. Fuzzy circles in two different forms were derived in [10]. The fuzzy geometry proposed by Chakraborty and Ghosh in [9, 6, 10] conforms to the Zadeh's analysis on extended fuzzy logic [19]. The similarities and differences with the Buckley and Eslami's approach [4, 5] were studied in [9, 6, 10].

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