



Applications of Extended Plithogenic Sets in Plithogenic Sociogram

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Abstract

The theory of plithogeny developed by Smarandache is described as a more generalized form of representing sets of different nature such as crisp, fuzzy, intuitionistic and neutrosophic. Plithogenic set comprises degree of appurtenance and contradiction degree with respect only to the dominant attribute. This paper introduces extended plithogenic sets comprising degrees of appurtenance and contradiction with respect to both dominant and recessive attributes. The extension of the 5-tuple Plithogenic sets to a 7-tuple plithogenic sets helps in developing a more comprehensive kind of Plithogenic sociogram. The newly developed plithogenic sets and its implications in Plithogenic sociogram is validated by the decision making problem on food processing industries. The obtained results using extended plithogenic sets are more promising in comparison to the conventional plithogenic sets. The proposed kind of plithogenic sets will benefit the decision makers to make optimal decisions based on both optimistic and pessimistic approaches.

Keywords: Plithogenic Sociogram; Extended Plithogenic Sets; Food Packaging materials; Decision making

1. Introduction

Plithogenic sets introduced by Smarandache in 2018 [1] have generalized the representations of both the conventional crisp sets and contemporary sets such as fuzzy sets, intuitionistic sets and neutrosophic sets. A plithogenic set is a 5-tuple set of the form (P, a, V, d, c) comprising 5 components namely a set P , the attribute a , the attribute values V , the degree of appurtenance d and the contradiction degree c . The classification of plithogenic sets into crisp, fuzzy, intuitionistic and neutrosophic sets is based on the respective crisp, fuzzy, intuitionistic and neutrosophic values of d . Thus the degree of appurtenance serves as the deciding factor of the nature of Plithogenic sets. Smarandache[2,3] have well presented the theoretical framework of Plithogenic sets, Plithogenic logic, Plithogenic probability and also the generalized versions of the above with suitable practical implications.[1-3]

Plithogenic sets are recently applied in several decision making problems especially in multi-criteria decision making problems (MCDM) because of the significant characteristic of Plithogenic sets in handling of attribute and attribute values. Under Plithogenic MCDM, the methods are further extended with Plithogenic arguments. For instance the method of TOPSIS is discussed under Plithogeny in which the plithogenic representations and plithogenic operators are used. Sankar et al [4] have applied Plithogenic TOPSIS (PTOPSIS) to obtain optimal ranking of the alternatives of the decision making problem on COVID-19. Researchers have also integrated Plithogenic TOPSIS with other MCDM methods. To mention a few, PTOPSIS-CRITIC by Basset et al [5] in sustainability risk analysis, SWARA-PTOPSIS by Martin et al [6] in food processing industries. The other MCDM method explored