SUMMARY AND CONCLUSION

In the present work, the concepts of second order bipolar fuzzy set and second order bipolar fuzzy topology are introduced and various second order bipolar fuzzy structures are studied. Moreover, relations between first order bipolar fuzzy and second order bipolar fuzzy topological spaces are analysed. Relations between crisp topological spaces and second order bipolar fuzzy topological spaces are also introduced and studied. Second order bipolar fuzzy continuity is defined and studied. Definitions of first order bipolar fuzzy product topology and second order bipolar fuzzy product topology are introduced and their properties are studied. Different versions of second order bipolar fuzzy Hausdorffness are introduced and their properties are obtained. Using the relations established between first and second order bipolar fuzzy topological spaces, the relation between first order bipolar fuzzy Hausdorffness and second order bipolar fuzzy Hausdorffness are studied. Different versions of second order bipolar fuzzy Hausdorffness are analysed with respect to the relations between crisp and second order bipolar fuzzy topological spaces.

Definition of second order bipolar fuzzy gradation of openness is introduced. Relations between first order bipolar fuzzy gradation of openness, second order bipolar fuzzy gradation of openness and first order gradation of openness are introduced and studied with respect to gradation preserving maps. It is proved that these relations are functorial. Results related to second order bipolar fuzzy topologies induced by second order bipolar fuzzy gradation of openness are obtained. Definitions of different types of second order bipolar fuzzy compactness are introduced and results related to it are obtained.

Definition of second order bipolar fuzzy matrix is introduced, operations such as addition, multiplication and complement of second order bipolar fuzzy matrix are defined. Also, properties such as associative law and distributive law are proved. The working procedure of second order bipolar fuzzy TOPSIS method is given and an optimal solution for a decision-making problem on selecting a best project proposal submitted for project funding is obtained.

Recommendations for Future Study

1. Connectedness may be introduced in second order bipolar fuzzy topological spaces

2. Generalizations of continuity may be defined and studied in second order bipolar fuzzy topological spaces.

3. Separation axioms other than Hausdorff may be defined and studied in second order bipolar fuzzy topological spaces.

4. Techniques such as ELECTRE I, ELECTRE II may be applied instead of TOPSIS method in real world situation for MCDM problems.