PREFACE

Knowledge that describes real world is usually imprecise and vague. The mathematical tool available to represent the real world is regorous and precise. Thus, there is always some difference between reality and it's mathematical model. Recently some attempts have been made to reduce these differences. Fuzzy set theory and rough set theory are two such attempts.

One aspect of vagueness is gradual membership. In mathematics an element either belongs to a set or does not belongs to the set. In real world this membership is gradual. This aspect of reality is mathematized by Zadeh [Z_1] (1965) in his pioneering work. He introduced concept of fuzzy set, to represent the gradual membership of elements of the set, thus describing the fuzzy attributes like beautiful, tall, short, small, big, --- etc.

Another aspect of imprecision is indiscernibility between elements. We initially have information about elements of the universe we are interested in. To some other elements of the universe the same information can be associated. Consequently, the elements are similar or indiscernible in view of available data. This aspect of reality is represented mathimatically by Pawlak [P_1] (1982) by introducing the notion of rough sets.

Since Vagueness and indiscernibility are two different aspects of imprecision, it is interesting to combine both the notions of rough sets and fuzzy sets. Some aspects are already made in this direction [P_3, W_1, N_1, N_2, D_1, D_2, C,K] etc.

This dissertation consist of four chapters. Chapter I consist of two definitions of rough sets, one defined by Pawlak [P_1] (1982) and the other by Chanas and Kuchta [C] (1992). The notion of rough sets defined by Chanas and Kuchta [C] is more general than the rough sets defined by Pawlak [P_1]. A rough set defined by Pawlak [P_1] always have a generator, while a rough set defined by Chanas and Kuchta [C] may not a generator.

In chapter II we discuss the notion of fuzzy rough sets. Fuzzy rough set has been defined by Pawlak [P_3] (1985); Chanas and Kuchta [C] (1992). The algebra of fuzzy rough sets has been discussed by Pawlak [P_3]; Wygralak [W_1] (1989); Chanas and Kuchta [C] in three different ways. The set-theoratic operations on fuzzy rough sets defined by Pawlak lack certain crucial properties. This drawback has been removed by Wygralak by introducing union and intersection in a different way.

However, fuzzy rough sets defined by Chanas and Kuchta [C] does not have such drawbacks.

Chapter III consists of the notion of rough fuzzy sets (roughness of fuzzy sets) introduced by Dubois and Prade [D_1, D_2] (1990, 1993). We have observe that the rough fuzzy sets defined by Dubois and Prade [D_1, D_2] agrees to rough sets defined by Pawlak [P_1] if we replace characteristic function of a crisp set instead of fuzzy set.

Chapter IV consists of another approach of combining rough sets to fuzzy sets introduced by Dubois and Prade [D_1, D_2] (1990, 1993), called fuzzy rough sets. Since we use the term fuzzy rough set for different notion in chapter II, we call this notion as fuzzy rough fuzzy sets. We have shown that this notion of fuzzy rough fuzzy sets agress to rough fuzzy sets introduced by the author, by replacing fuzzy equivalence relation by an equivalence relation.

Rough sets are hardly a decade old. But the concept seems to be promising and useful. As is natural in the formative stage of any discipline the same word is used for different concepts and different words are used for same concepts. This needs proper rearrangements of concepts. In this dissertation we have compiled the available literature spread over 20 papers on this topic and presented it in a more cohesive form.