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Title of the Thesis: **Redundancy Elimination and Integrity Constraints in some Fuzzy Relational Database Models**

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ABSTRACT

In real life situations information is seldom complete. Some times it is vaguely known. There is an imprecision in the information. Thus, there is a problem of representing this imprecise information and if represented then there is a question of how to process this imprecise information. Several researchers have dealt with this issue in relational database model framework.

This relational database model developed are known as fuzzy relational database model. They begin by representing the imprecise information, also known as fuzzy information, in the form of (fuzzy) relation. The fuzzy algebra is developed to process the stored information. When dealing within the framework of fuzzy relational database, most of the problems usually occur in more complex forms. This thesis deals with fuzzy relational database models.

The fuzzy set theory developed by L. A. Zadeh is an invaluable tool to deal with fuzzy information. We use this tool throughout this thesis.
Chapter 1 is the introduction and elaborates the points made above. It presents the problems in fuzzy relational database models and various approaches that deal with fuzzy information. It provides the motivation for the remaining Chapters in the thesis. It also contains a brief description of the classical relational database model. The various concepts describe here are used and generalized in the later Chapters.

Chapter 2 describes the three main representatives of fuzzy relational database models. This is needed in order to have a feeling as to what is at stake and what are the objectives we have for the next generation of Information System. This description is also needed to describe various fuzzy notions in vigorous manner. Once this foundation is laid, we discuss various nations of an integrity constraint known as fuzzy functional dependency in this Chapter.

Chapter 3 builds up the foundation laid in Chapter 2. Here we introduce the notion of a fuzzy functional dependency using fuzzy function. It is shown that a fuzzy functional dependency is basically a partial function. It is also shown that the same inference rules hold in respect of this notion of fuzzy functional dependencies as in the case of classical functional dependencies. These inference rules form a sound and a complete set of inference rules as described in relational database model. This chapter further deals with the problem of lossless join decompositions and dependency preservation.

Chapter 4 deals with level set approach of possibilistic fuzzy relational database models. Some of the algebraic operations are quite expensive, for example, the operation of natural join when performed directly on fuzzy relations. Theoretically, when fuzzy sets are defined on infinite domains, it would be impossible to use the finite computing resources to calculate the Cartesian product of fuzzy sets. For this reason, it is useful to do the algebra on most significant part of fuzzy sets. Secondly, from the information requirement point of view, it is sometimes only necessary to obtain the information from the most significant part of fuzzy sets. These significant part of fuzzy sets are obtained using the concept of a level set of a fuzzy set. In this Chapter we define the level relations of a fuzzy relations. It is shown that the fuzzy relations of Buckles and Petry discussed in Chapter 2 is a kind of level relations.

Chapter 5 deals with similarity based approach of redundancy elimination. This approach was used by Buckles and Petry. In fact, we extend all their results to arbitrary level relations. The kind of redundancy introduced here is called weak redundancy to distinguish it from the notion of redundancy introduced in Chapter 4. The counterpart notion of weak redundancy in fuzzy relations called fuzzy weak redundancy, is introduced and several properties of this notion of fuzzy weak redundancy are discussed.