ABSTRACT

This thesis deals with the application of fuzzy logic in a classical relational database environment with the objective of capturing more meaning of the data. It is shown that with suitable interpretations for the fuzzy membership functions, a fuzzy relational data model can be used to represent ambiguities in data values as well as impreciseness in the association among them. Relational operators for fuzzy relations have been studied and applicability of fuzzy logic in capturing integrity constraints have been investigated. By introducing a fuzzy resemblance measure EQUAL for comparing domain values, the definition of classical functional dependency has been generalized to fuzzy functional dependency (ffd). The implication problem of ffds has been examined and a set of sound and complete inference axioms has been proposed. The problem of lossless join decomposition of fuzzy relations for a given set of fuzzy functional dependencies is also investigated. It is proved that with a suitable restriction on EQUAL, the design theory of a classical relational database with functional dependencies, can be extended to fuzzy relations satisfying fuzzy functional dependencies. A fuzzy query language, FQUEL has been implemented to demonstrate the feasibility of the model. Finally, open questions are discussed and further research is suggested.

Keywords: Functional dependency, fuzzy functional dependency, fuzzy logic, fuzzy measure, fuzzy relation, inference axiom, lossless join, relational database.