ABSTRACT

XML is becoming a dominant standard for storing and exchanging information. With its increasing use in areas such as data warehousing and E-Commerce, there is a rapidly growing need for rule-based technology to support reactive functionality on XML repositories. The extraction of data from XML documents is an important issue for XML research and development. The current state of the art in querying XML data is represented by XPath and XQuery, both of which rely on Boolean conditions. Boolean selection is too restrictive when users do not use or even know the data structure precisely. An XML querying framework, called Fuzzy XQuery based on Fuzzy set theory is proposed in this thesis. The proposed Fuzzy XQuery processing allows the users to use linguistic terms in the XQueries represented by Fuzzy sets. The Fuzzy XQuery processing applies the arithmetic operations of Fuzzy sets. Testing has been carried out to compare the execution time and output of Fuzzy XQuery and Normal XQuery. The testing results show that the flexible Fuzzy XQuery provides better output than normal XQuery language.

Due to the nature of XML data, formulating an XML query using the XQuery requires considerable effort. A user must be familiar with the syntax of the XQuery language, and must be able to express the needs accurately in a syntactically correct form. In many real life applications, it is not realistic to assume that users are proficient in expressing such textual queries. The thesis introduces the automatic generation of GUI based XQuery and Fuzzy XQuery processing by just selecting XML tag names and condition checking. The proposed GUI based Fuzzy XQuery processing allows the users to use linguistic terms in the XQueries represented by Fuzzy sets. A user-friendly visual querying method is proposed for XQuery and Fuzzy XQuery operations. The visual querying method is demonstrated by developing automatic XQuery and Fuzzy XQuery generation system using VB.Net coding and the Exist XML Database.

Integrity constraints have proved fundamentally important in Relational Database management. In order to execute Fuzzy trigger in XML Databases, the integrity constraint management system is essential for XML database. The thesis presents the Fuzzy Logic based constraints using triangular membership function and Trapezium
shape membership functions. A Fuzzy constraint-based framework using XML Schema is demonstrated in the research work. Fuzzy Logic based constraints are able to handle uncertainty in schema matching and data inconsistency in XML Databases. This approach will restrict invalid XML data into XML Database by using Fuzzy domain integrity constraints.

Trigger mechanism is a mature technique in Relational Database Systems for providing active functions. The incorporation of triggers into an XML database can help users to perform many tasks automatically when they manage and exchange XML data. Fuzzy logic reflects human nature to express and evaluate the world in a vague manner. Traditional Event-Condition-Action (ECA) triggers include a Boolean predicate as a trigger condition. An active rule based Fuzzy triggers whereby Fuzzy inference is utilized in the condition evaluation is proposed. Fuzzy expressions can be used within triggers to specify application level constraints. The application level constraints are implemented using Advanced XML Schema. The proposed system provides support to fuzziness over XML databases, while the underlying XML data remains crisp. The research work describes the Fuzzy Logic based approach to handle the temporal events and composite events in the XML Databases. An example is presented to demonstrate the use of Fuzzy Trigger in the case of reacting to temporal events and composite events. An algorithm and the architecture for the Fuzzy Trigger processing system for XML Databases are presented. The testing is carried out to compare the performance and output of Fuzzy XML Triggers and Normal Triggers.