ABSTRACT

Graph theory plays a very important role in the field of computer science. In the field of computer science, there are a lot of graph applications in the graph-based algorithms in software engineering, database management, computer networks, knowledge discovery, distributed computing, including mobile computing and pervasive computing. There are many graph-based algorithms in computer networks like routing management, network security. Distributed systems themselves can be represented as a graph or hypergraph. In distributed computing, there are also a lot of graph-based algorithms in distributed deadlock handling, load distribution, and commit protocols.

The thesis focuses on the study and findings on various graph applications and graph-based algorithms in the area of database technology and knowledge discovery with a special reference to graph databases. The thesis contains 6 chapters and is organized as follows.

Chapter 1 contains the introduction. A brief history of graph theory and the overview of graph databases are presented here.

In Chapter 2, a simple straightforward method to find all the candidate keys of a relational database scheme using a graph is presented. First, the FD graph is drawn from the set of functional dependencies in a relational scheme. Thereafter, by using a few very simple graph transformations, the FDG is reduced to a graph called the Candidate Graph having only the candidate nodes. From this Candidate Graph, all the candidate keys for the relational scheme can be identified. The following transformations have been proposed to obtain the candidate graph from the FDG. The transformation process has two phases—**Augmentation** and **Reduction**.
Chapter-3 explains how the references among the database tables can be easily described by graphs. In the new approach, unlike E-R model, the reference graph model can describe the references occurred among the database tables or among various databases of diverse platforms more precisely and clearly. The reference graphs, unlike the schema diagrams, do not show the details about the attributes of the entities, rather it gives the references available among the entities and the attributes through which these references are made. Reference graphs model, derived from the E-R model or from the intermediate graph, directly developed by analyzing the context system, is used to develop an abstract mathematical model of the database schema, from which we develop the Database Requirements Specifications (DRS). The DRS can be used as a design document in RDBMS and OODBMS paradigm.

In Chapter-4, a method for transforming a relational database to a graph database model is described. In this approach, the dependency graphs for the entities in the system are transformed into star graphs. This star graph model is transformed into a hyper graph model for the relational database, which, in turn, can be used to develop the domain relationship model that can be converted into a graph database model.

Chapter-5 focuses on the recent trends in the research of Graph Databases. The following two probable applications of Graph database in two different contexts are presented here.

a) GRAPH DATABASE MODELS FOR MULTILINGUAL WORD BANK.

b) WORLD POPULATION AS GRAPH DATABASE MODEL.

Chapter-6 includes the concluding remarks and discussion about the future scope.