OPTIMAL DESIGN OF NETWORK AND RELIABILITY EVALUATION

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PREFACE

Many decision problem that arises in the real world can be modeled and solved as combinatorial optimization problem. This is an active research area where new formulation, algorithms, practical application and theortical result often proposed and published current challenge in the field involve modeling of hard problems, development of exact method, and the design and experimental evaluation of approximate and hybrid method.

Optimization is a branch of applied metaheuristics and numerical analysis. Almost every problem in engineering, Science, economics, and the life can be formulated as an optimization or a search problem. While some of the problemcan be simple that can be solved by traditional optimization method based on mathematical analysis, most of the problem are very hard to solve these using analysis-based approachs. Fortunatly, we can solve these hard optimization problems by inspirations from nature. One of the most common metaheristic that is inspired from the nature is ant coloy optimization metaheuristic used to solve the hard optimization problem. In this text, we have formulatedthe problem of optimal design of network and solved using the Ant coloney optimization that is integrated eith soft computing technique such as Fuzzy logic.

Other aspect of this book is to study the reliability evaluation technique and development of various algorithm to enumerate the path set/ cutest for the input of reliability evaluation algorithm. As we know, network reliability analysis consist of determining the probability of correct operation of a system

This book introduced the problem of enumeration of

pathset/cutsets for reliability evaluation and optimization of network design using metaheuristic. It present the most important mrthod, algorithm, and intresting review of the literature.

A roadmap for navigating through the book is given a follows, Except the introductory Chapter, the content of the book can be grossly divided in to five chaptet and an reference.

Chapter 2 provides a general overview of concept of graph theory, optimization theory and fuzzy logic and its operator for multi-objective optimization problem. The chapter starts with the short discussion of application of graph theory and related definition used in this book.

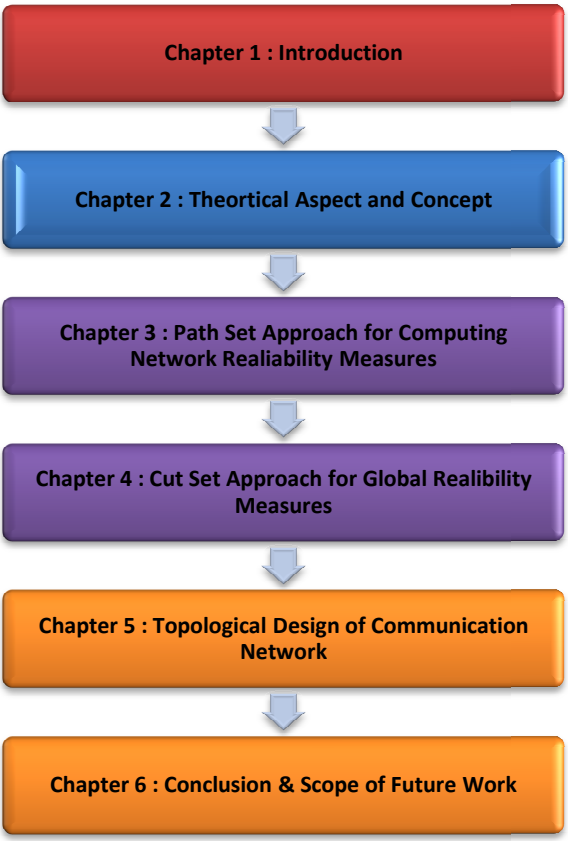
This is followed by elaborate discussion of combinatorial optimization and multi-objective optimization and multi-objective problem formulation technique and its meta-heuristic solving techniques. Another focus of this chapter is the background of fuzzy logic and well known fuzzy operators with respect to its use in multi-objective optimization.

In addition to the above, describes the detail discussion of ant colony optimization technique for optimization problem and its variants like Ant System, Ant Colony System. Furthermore, chapters also discuss the multi-objective optimization nature of ant colony optimization algorithms.

Chapter 3 describes and elaborates proposed two different modified computationally efficient algorithms for enumeration of spanning tree for global reliability evaluation of complex communication network. Furthermore, an algorithm for multi-source and multi-terminal pathsets enumeration has been proposed in this chapter. The algorithm is simple and easily amenable to

computer implementation using the simplest data structure array. The algorithm is able to find all the minimal paths for directed / undirected scenario

In Chapter 4, algorithms have been modified to generate global minimal cut-sets for a given directed and undirected network for global reliability evaluation. The generation of global minimal cut-sets is an important contribution in the process of networks reliability evaluation.



Roadmap of Book

Chapter 5 discussed the topology design problem of networks in sufficient details. This includes a formal description of the problem, notation, assumption, terminology, cost function and computation of objective value. This chapter also proposed the fuzzy integrated ant colony optimization algorithm for topology design of communication network. The details of the implementation are provided and the algorithm empirically analyzed with different parameter of ACO and followed by the comparative discussion with Multi-objective optimization Ant Colony optimization Algorithm.

Chapter 6 highlights the conclusion of this research and provides direction for future research.

✍ *Dr. Mohd. Ashraf*

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Last, and most obviously not the least, we thank our families and friend for their support, many years ago an author describe writing a text as a "Locking yourself in a

room" process. While the authors suffer through the writing process, families and friend suffer through their absence. We can only hope that as they view the final product, they feel that their sacrifices were worth it.

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