ABSTRACT

The First chapter of the Ph. D. thesis entitled “A STUDY OF LINEAR PROGRAMMING TECHNIQUES FOR THE DEVELOPMENT OF SOME METHODS FOR ANALYSIS OF COMMUNICATION SYSTEMS” is devoted to the introductory background of the operations research, linear programming problem and other related topics. The general introduction of communication, communication systems, distributed systems, task allocation and other topics related to the present research work has been included. Task allocation problems for any communication systems are discussed in details.

Task allocation for any communication system is a most computing interesting and demandable research problems. Various methodologies and techniques are available in the literature to solve these problems. As it is the primary duty for researchers to know about related methodology and techniques. The Second Chapter of this thesis is a collection of all such research work, which is available in the literature, and directly-indirectly correlates to our work. The title of the second chapter is review of related literature.

The Third Chapter of the Ph. D. thesis is the important and main, as it include all five research problems. The Motivation for the present research has been written briefly. The Research Problem Statement, Method, Computational Algorithm, Implementation and Conclusion of each problem are mentioned
separately. The research problem wise details of each one of them is as mentioned below:

The title of the research problem – I is the ‘reliability based assignment for the performance enhancement of communication system through exhaustive search method’. The performance analysis of any communication system has an important area of research these days. The task allocation problems in communication systems are one of the major problems to improve the performance of communication systems. The present piece of research suggests an exhaustive search method for the assignment through index optimization. The index is based on the reliability along with cost of the tasks to the processors for the execution of task to various processors and also reliability along with cost of communication amongst the tasks. The research problem contains the computational algorithm of the technique and its implementation. The results are shown in tabular form as well as graphical form. This piece of research is capable to deal all such real life situations, where the tasks, which are to be executed on the processors of the communication systems, are more than the number of processors of that system. The developed algorithm is coded into C++ and several sets of input data have been tested to verify the effectiveness of the algorithm. In order to the suggested algorithm is better than the others available algorithms, we have compared the algorithm with Peng Dar-Tezen et al [PENG 1997], Richard et al [RICH 1982] and Sagar et al [SAGA 1991]. It is found that the present algorithm is better as compared to others.
The title of the research problem – II is ‘A modified reliability based assignment method for the performance enhancement of communication system’. As we know that the role of communication systems has been rapidly increasing in order to share expensive hardware and software resources. The reliability and cost plays the important role to allocate the task to communication system for the evaluation of the performance of the system. A number of desirable services in communication system need be dealt with highly fault tolerant and secured manner. Therefore it is desirable to allocate the tasks optimally amongst the processors of the system. The objective of the research problem is to introduce the concept of optimal index, which is based on the reliability and cost of execution and communication. The developed algorithm is coded into C++. A comparison of complexity of this algorithm with the earlier suggested ones has also been included to show that our suggested algorithm is better than the others. It is also found that the algorithm is suitable for arbitrary number of processor with the random program structure and workable in all the cases.

The title of the research problem – III is the ‘an efficient cost based method for performance enhancement of communication systems’. A communication system utilizes many computers, each accomplishing a portion of an overall task, to achieve a computational result much more quickly than with a single computer. It is seen that the number of tasks, which are to be processed on the communication system, shall be the more as compared to the number of processors in the system. The tasks allocation problem helps us to solve the
problems related tasks and processors. The problem of processing of "m" tasks to "n" processors (m > n) in a communication system is addressed here through a new modified tasks allocation policy for the task processing in a communication system. The research problem is presented here allocates the tasks to the processor to enhance the performance of the system. This algorithm is based on the processing cost. In this problem, the tasks clusters are formed on the bases of communication that is taken in the form of either 0, indicating that there is no communication between the tasks or 1, otherwise. The model addressed here is based on the consideration of processing cost of the tasks to the processors. Keeping in view we have suggested a new modified method to assign all the tasks as per the required availability of processors so that none of the tasks get remains unprocessed. The several sets of input data are considered to test the effectiveness and efficiency of the developed algorithm for the said purpose. It is found that this algorithm is suitable for arbitrary number of processor with the random program structure and workable in all the cases.

The title of the research problem – IV is the ‘improving the performance of the communication systems through modified allocation policy’. Improving the performance of the communication system is a major and challenging problem for the researchers in this wide area of research. It is almost impossible that the communication systems has to execute only as many tasks as the number of processors available in the system. That means the number of tasks, which are to be executed on the communication systems, shall be the more as compared to the
number of processors in the systems. The problem of execution of "m" tasks to "n" processors (m > n) in a communication systems is addressed here through an efficient tasks allocation policy for the task execution in a computing systems. The execution reliabilities of the tasks on different processors have taken into consideration while preparing the algorithm to such a case. The research problem - IV discussed here is based on the consideration of execution and communication costs of the tasks to the processors. Keeping in view we suggested an efficient method to assign all the tasks as per the required availability of processors so that none of the tasks get remains unexecuted and the present approach does not require to adding dummy processors. The several sets of input data are considered to test the effectiveness and efficiency of the algorithm. It is found that the algorithm is suitable for arbitrary number of processor with the random program structure and workable in all the cases.

The title of the research problem – V is the, ‘performance evaluation of communication systems through optimal task allocation’. Linear programming plays a vital role to solve the problem related to science and engineering. Linear programming techniques have been used for designing the pattern for Systematic Allocation of tasks for evaluation of performance of the communication systems. In a communication system, a task is allocated to a processor in such a way that extensive Inter Task Communication is avoided and the capabilities of the processor suit to the execution requirements of the task. The Algorithm discussed in this research problem
provide an optimal solution for assigning a set of “m” tasks of a program to a set of “n” processors (where, m >> n) in a communication system with the goal to maximize the overall throughput of the system and allocated load on all the processors should be evenly balanced. The Execution Cost and The Inter Task Communication Cost have been considered while preparing the algorithm. The present allocation policy involves stepwise modification of Execution Cost Matrix and Inter Task Communication Cost Matrix by making the clusters of tasks, some of the tasks may not involve in any cluster treated as independent tasks. The several sets of input data are considered to test the complexity and efficiency of the algorithm. It is found that the algorithm is suitable for arbitrary number of processor with the random program structure and workable in all the cases.

The future scope, research publication and references are mentioned at the end of this thesis. As the research is always an on going process so there is a scope for further extension of this study. Some of the possible future problems that are to be studied by further researchers are mentioned in the thesis. During the period of this research work some of the research papers have been presented in seminar and conferences and some of research papers have been sent for the publication in journals. A combined list of such papers has been given. During this research work we have gone through large number of research papers, books, monographs, Ph. D. thesis etc. so that in the last of the thesis a list of in alphabetic order of such research material has been given.