AN IMPROVED PRIMAL SOLUTION FOR THE TRANSPORTATION PROBLEMS IN OPERATIONAL RESEARCH

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(148379T)

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DEPARTMENT OF MATHEMATICS

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SRI LANKA

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DECLARATION

I do hereby declare that the work reported in this project report/thesis was exclusively carried out by me under the supervision of Prof. W. B. Daundasekera and Mr. T. M. J. A. Cooray. It describes the results of my own independent research except where due reference has been made in the text. No part of this project report/thesis has been submitted earlier or concurrently for the same or any other degree.

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I declare that the above candidate has carried out this research for master thesis under my supervision.

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ABSTRACT

Organizations providing goods and services are mainly focusing on cost minimization within their organizations as it is a vital factor for their existence. In common, scheduling activities with less conflict within organizations is vital for their survival. In many organizations, transportation scheduling plays a major role in cost minimization. In particular, transporting goods from manufacturing plants to identified destinations with minimum transportation cost is knows as transportation scheduling or transportation problem.

The objective of the transportation problem is to satisfy the destination requirements with minimum cost while satisfying the operating production capacity. Transportation problem is categorized as a Linear Programming problem. Generally, the Simplex method is the widely used method to solve Linear Programming problems. But, Simplex method is not the most efficient method to solve the transportation problem due to its special structure. Therefore, the most of the time effective and numerical efficient way to solve the transportation problem is Transportation Algorithm (TA) designed from the basic principles of Simplex method.

The Transportation Algorithm consists of two major steps: obtaining the Initial Basic Feasible Solution (IBFS) and finding optimal solution using the IBFS. A better IBFS always reduces the number of iterations and computational time in finding the optimum solution. There are existing standard methods which are available to find the IBFS, but have failed to find an effective IBFS for the most of the transportation problems. To overcome this failure, in this research a modified heuristic approach is proposed to find a more promising IBFS.

In the proposed method, the cumulative difference representation is used instead of cost matrix in order to make the assignments. This technique leads to assign most of the assignments at minimum cost. The cumulative difference representation represents the additional excess cumulative costs throughout the row and column for each possible cost of transportation. The IBFS found by the newly proposed method converges to the optimal solution faster than the standard methods considering the time consumed as well as less number of iterations to achieve it. The proposed method has proved to be in finding better IBFS for all the 70 transportation problems discussed in this study. The IBFS of 41 problems of selected 70 transportation problems them self are the optimal solutions. Further, for the rest of the 29 problems, the difference between IBFS and the optimal solution is only less than five percentage. Therefore, it can be concluded that the newly proposed method to find IBFS is robust in providing an improved primal solution compared to the existing standard methods.

Keywords: Transportation problem, Optimal Solution, IBFS, Cumulative Difference.

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