

Assignment 3: Transportation Problem

Background

A typical transportation problem concerns the problem of finding the minimum cost of transporting some commodity from a given number of suppliers to a given number of destinations. Logistics problems of this kind first appeared during the Second World War when the allied commanders tried to determine how to move and distribute troops from the training bases in different parts of USA to Europe and Asia-Pacific.

Modeling

Fig. 1 shows a transportation network with a number I of suppliers and a number J of destinations. The amount of a product that can be produced by supplier i is S_i , $i = 1, 2, \dots, I$. The demand of the product at destination j is D_j , $j = 1, 2, \dots, J$. The cost for transporting one unit of the product from supplier i to destination j is c_{ij} . Let x_{ij} denote the quantity transported from supplier i to destination j .

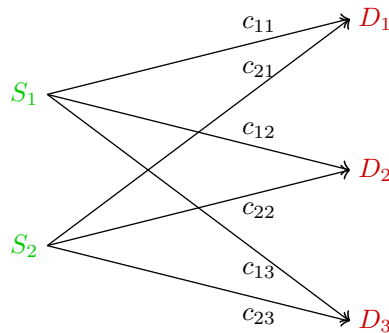


Figure 1: A transportation network.

Tasks

1. As a starting point of this assignment, formulate the transportation problem in the language of a linear programming problem from the course.
2. The problem in this assignment is represented by the following **transportation tableau**. There are three factories F_1 , F_2 and F_3 with supply

capacities $S_1 = 25$, $S_2 = 55$ and $S_3 = 35$, as shown in the table. The four warehouses W_j demand D_j , $j = 1, 2, 3, 4$ of the product in question. The number in cell (i, j) is the cost c_{ij} for transporting one unit of the product from factory i to warehouse j . Minimise the transportation costs by using the linear programming solver `linprog` in Matlab and selecting a suitable algorithm using the `option` parameter.

	W_1	W_2	W_3	W_4	Supply
F_1	10	0	20	11	25
F_2	12	7	9	20	55
F_3	0	14	16	18	35
Demand	15	45	30	25	

3. Compare and explain the differences between the results from the interior point method and the simplex method.
4. Reformulate the problem with $S_2 = 60$ and solve it with the two methods mentioned in task 3. Compare and explain the results.