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Scheduling problem transportation with five indicators

Abstract

In this article, I proposed a model for optimization of freight transport problems with five indicators (TP5I) I proposed the fifth indicator for the period ;because the dates it's a quarterly fruit, and provided a solution to the problem of transfer dates; of national office of the dates in Algeria and transported to the least cost.

In this paper, we studied the transport model, using linear Programs, the objective is to find a solution to give the minimum cost of transport to the transport problem in the fifth indicators (PT5I: supply and demand and type of goods and type of transport). we solved the problem, use the simplex method, the Interior-Point Methods, and we use the MATLAB program

Keywords: Optimization, integer programming, simplex method, modeling.
AMS:90C27, 90C57,80M50,46N10,47N10,90C08,90C29,90C90.

1 Introduction

The linear programming still does not inspire a lot of decision-makers because of its good results in the management and planning. Study one goal such as the status of production scheme aims to maximize profits and minimize costs with the productivity of an organization. In this situation, we resort to the use of linear Programs. Multiple targets linked to restrictions. by which to obtain optimal solutions.

Transportation models play an important role in the field of public services and the management of institutions to reduce costs and improve services. Decisions relating to sales (Marketing): These include those decisions for determining the quality of the item and its specifications. And to identify markets that will be selling the distribution channels and that

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you attach to the market. It also includes decisions regarding. Fill products and marketing research used and provide sales services. Also interested in: site sales offices, the brand used, the extent and type of advertising, ways to reward salesmen, Gyude sales promotion, marketing research and used a range of ... etc.
The transportation problem classic (TP) is a special type of linear programming purpose of the transportation problem TP is the transfer of goods from sources to destinations. TP is also used in inventory control, manpower planning and the allocation of staff, etc....
Kalczynski and Kamburowski [1] presented that a two-machine. ow shop with release times and objective of minimizing the make span is strongly NP-hard
There are several researches that studied multiple part-type production cells with transportation constraints . formulated single and multi-objective transportation models with fuzzy relations under the fuzzy logic. Gupta [2] proved that the two stage hybrid . shop scheduling problem is NP-hard in a strong sense even if there is only one machine on first stage and two machines on the second stage. Knust [3] solved a special case of hybrid flow shop problem with automatic transportation, and showed that different samples with single transportation source are NP-hard. Soukhalet al.[4] investigated two machines . shop scheduling problems with transportation. They proved that the mentioned problem with additional constraints, such as blocking, is also strongly NP-hard. Cheng et al.[5] considered different scheduling problems of manufacturing systems and provided a survey for the investigated algorithms. Inna et al. Knust [6] solved a special case of hybrid. ow shop problem with automatic transportation, and showed that different samples with single transportation source are NP-hard. Soukhal and al. Behnamian and Fatemi Ghomi [7] developed a PSO. Sahybrid meta-heuristic for a new comprehensive regression model to time-series forecasting. D. Lei [8] studied. ow shop scheduling problem with two agents andits feasibility model is considered, in which the goal is to minimize. Seyedeh Sarah Zabihzadeh [9] flexible. ow shop scheduling with unrelated parallel machines at each stage is considered. job-shop scheduling [10], robotics [11], grid scheduling [12-13] etc. An AACO model is proposed to study the effect of interposes communication in optimizing turnaround time with grid scheduling [14]. QGA algorithm has also been applied and compared with GA for GSP in [15], This is by [18]. Outlines of this paper is as follows. In the theoretical section net- work scheduling problem, and in the section right I determined the mathematical model of the problem of distribution [17]. Dates in the last section we offer how to solve the problem is to find a distribution scheme and at the lowest cost.

2 STATE OF THE ART

The first problem of transportation was developed in 1941 by Hitchcock. The first method of resolution the potential presented in 1949 by Kantorovich and Gavourin. Then G.B. Danzig offers another method resolution for the classical transportation problem, based on the simplex method. In 1958 Gleyzal presents a method by using the algorithm of dual simplex and 1963, Kuhn provides a method to solve the problem of employment, a special case transportation problem, developing the idea of a Hungarian mathematician in 1931. Although the method potential or proposed in the mid 20 th century, until now it is still the

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most used Research and Teaching (Ninh, 1980) (Zitouni, 2007) (Gourgand and al, 2011) ... used a rectangle: a stop represents the offers and the other is the applications. Each box represents an arc (ij) in which there is c_{ij} the cost and quantity of goods x_{ij} . After calculating the potential, the test optimality is controlled. If it is not checked, it improves this solution to get a better solution.

3 PROBLEM DEFINITION

3.1 The case of the commercial sector study

we want to know how to distribute dates at a minimum cost, the two-index model, deals with supply and demand. Three indicators the display, the type of goods or the type of trucks; In this study, the constraint of the four indicators imposed on the type of goods and the type of transportation (trucks), based on two traditional indicators of supply and demand and the balance between them. The aim is to propose the allocation of products order to check all restrictions lowest possible cost.

3.2 DECISION VARIABLES

3.2.1 Forming a mathematical model

The problem described can be formulated as a linear programming (LP) model with the following input data:
-I Number the centers.

-J Number of stores
-L Number of trucks of
Eg:
X_{11211} the dates of type 1; transferees from the center 1 to the store 2. In the truck 1 and period 1
- C_{ijklt} the cost of transporting dates of type k. Transferred from the center I to the store j. In the truck l(Cost per unit).
-K Number of Dates Type
- i: index for center (i = 1; ... ;m),
-j index for stores (j = 1; ... ;n),
-k index for Dates Type (k = 1; ... ;q),
-l index for The truck type (l = 1; ... ;p),
-t index for The period (t = 1; ... ;r)
- $\boldsymbol{x_{ijklt}}$the quantity of the dates of type k; Transferred from the center i to the store j In the truck l and the period t

$$minZ = min \sum_{i=1}^{m} \sum_{j=1}^{n} \sum_{k=1}^{q} \sum_{l=1}^{p} \sum_{t=1}^{r} C_{ijklt} x_{ijklt} \qquad \triangleright\triangleright\triangleright\triangleright\triangleright\triangleright\triangleright\ 1$$

and check contraints:

$$\sum_{j=1}^{n} \sum_{k=1}^{q} \sum_{l=1}^{p} \sum_{t=1}^{r} x_{ijklt} = \alpha_i \text{ ,i=1.....m} \qquad \ldots\ldots\ldots\ldots \qquad 2$$

$$\sum_{i=1}^{m} \sum_{k=1}^{q} \sum_{l=1}^{p} \sum_{t=1}^{r} x_{ijklt} = \beta_j \text{,j=1.....n} \qquad \ldots\ldots\ldots\ldots \qquad 3$$

$$\sum_{i=1}^{m} \sum_{j=1}^{n} \sum_{l=1}^{p} \sum_{t=1}^{r} x_{ijklt} = \gamma_k \text{, k=1.....q} \qquad \ldots\ldots\ldots\ldots \qquad 4$$

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$\sum_{i=1}^{m}\sum_{j=1}^{n}\sum_{k=1}^{q}\sum_{t=1}^{r} x_{ijklt}=\delta_l$, l=1….p 5

$\sum_{i=1}^{m}\sum_{j=1}^{n}\sum_{k=1}^{q}\sum_{t=1}^{r} x_{ijklt}=\varepsilon_t$, t=1….r 6

3.3 The mathematical model of transportation problem with extra cost (five indicators)

l=4, J=3,K=2,L=2,T=2.
i=1;...;4, j=1;...;3,k=1;...;2, l=1;...;2,t=1...2
the centers ouargla, Biskra Msila, El aalma are Numbered respectively 1,2,3,4, respectively.
The stores, Msila, El aalma , Skikda are Numbered respectively 1,2,3 , respectively.
The trucks (15t),(5,5t), are the following1,2, respectively
Number of quality a dates. Good and average as follows 1,2, respectively Suppose there is. store Numbered 0 and neglected cost chart (1) this chart shows the amounts transferred between stores and the store next door (measured in tons).

	M'sila	M'sila	El ea lma	El ea lma
Period	Period t1	Period t2	Period t1	Period t2
Ou argla Type (Good quality t1) (Medium quality t2)	30.000 100.000	10.000 55.000	30.000 100.000	10.000 55.000
BiskraType (Good quality t1) (Medium quality t2)	200.000 200.000	50.000 50.000	200.000 200.000	50.000 50.000
M'silaType (Good quality t1) (Medium quality t2)	…….	……..	……..	…….
El ea lmaType (Good quality t1) (Medium quality t2)	…….	…….	…….	…….

	Skikda	Skikda
Period	Period Period t1	Period Period t2
Ouargla Type (Good quality t1) (Medium quality t2)	…….	……
BiskraType (Good quality t1) (Medium quality t2)	……	……

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M'silaType (Good quality t1) (Medium quality t2)	100.000 40.000	50.000 10.000
El ealmaType (Good quality t1) (Medium quality t2)	100.000 40.000	50.000 10.000

chart (2) this table shows transportation costs measured in dinars per tone.

	M'sila	El ea lma	Skikda
Ou argla Cost Truck N0 1(15.t) c1 Cost Truck N0 2(15.t) c2	33600 11200	34800 11600	
Biskra Cost Truck N0 1(15.t) c1 Cost Truck N0 2(15.t) c2	11200 3740	14700 4900	
M'sila Cost Truck N0 1(15.t) c1 Cost Truck N0 2(15.t) c2	.....	.....	10860 3620
El ealma Cost Truck N0 1(15.t) c1 Cost Truck N0 2(15.t) c2	.....	.....	19620 6540

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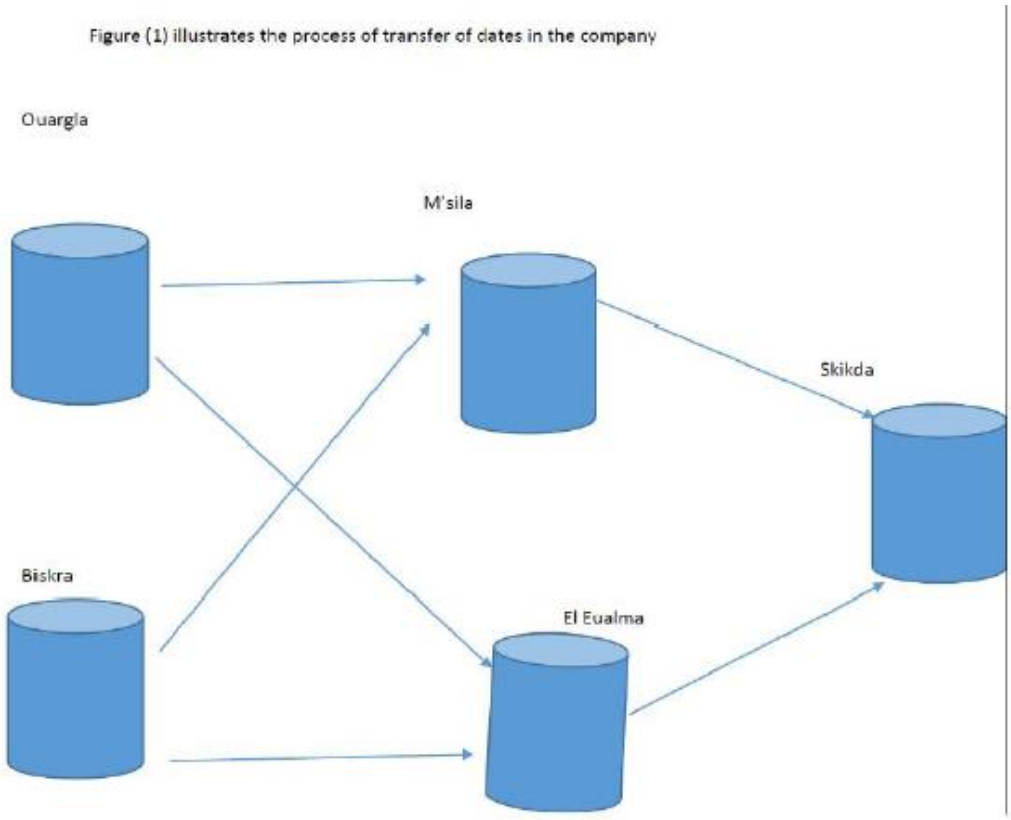

3.4 definition the variables

x_{ijklt} the quantity of the dates of type k. Transferred from the center i to the store j. In the truck l at Period t
for example
x_{12121} the quantity of the dates of type 1. Transferred from the center 2 to the store 2. In the truck 2 in the Period 1
-c_{ijklt} the cost of transporting dates of type k. Transferred from the center
i to the store j. In the truck l at the Period t (Cost per unit).
Minimization Problem: Find the minimum value of
$Z=33600x_{11111}+33600x_{11112}+33600x_{11211}+33600x_{11212}+11200x_{11121}+11200x_{11122}+11200x_{11221}+1200x_{11222}+11220x_{21111}+11220x_{21112}+11220x_{21211}+11220x_{21212}+11220x_{21121}+11220x_{21122}+3740x_{21221}+3740x_{21222}+34800x_{12111}+34800x_{12112}+34800x_{12211}+34800x_{12212}+11600x_{12121}+11600x_{12122}+11600x_{12221}+11600x_{12222}+14700x_{22111}+14700x_{22112}+14700x_{22211}+14700x_{22212}+4900x_{22121}+4900x_{22122}+4900x_{22221}+4900x_{22222}+10860x_{33111}+10860x_{33112}+10860x_{33211}+10860x_{33212}+3620x_{33121}+3620x_{33122}+3620x_{33221}+3620x_{33222}+19620x_{43111}+19620x_{43112}+19620x_{43211}+19620x_{43212}+6540x_{43121}+6540x_{43122}+6540x_{43221}+ 6540x_{43222}.$

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$Z=33600x_{11111}+33600x_{11112}+33600x_{11211}+33600x_{11212}+11200x_{11121}+11200x_{11122}+11200x_{11221}+1200x_{11222}+11220x_{21111}+11220x_{21112}+11220x_{21211}+11220x_{21212}+11220x_{21121}+11220x_{21122}+3740x_{21221}+3740x_{21222}+34800x_{12111}+34800x_{12112}+34800x_{12211}+34800x_{12212}+11600x_{12121}+11600x_{12122}+11600x_{12221}+11600x_{12222}+14700x_{22111}+14700x_{22112}+14700x_{22211}+14700x_{22212}+4900x_{22121}+4900x_{22122}+4900x_{22221}+4900x_{22222}+10860x_{33111}+10860x_{33112}+10860x_{33211}+10860x_{33212}.+3620x_{33121}+3620x_{33122}+3620x_{33221}+3620x_{33222}+19620x_{43111}+19620x_{43112}+19620x_{43211}+19620x_{43212}+6540x_{43121}+6540x_{43122}+6540x_{43221}+6540x_{43222}.$

$x_{11111}+x_{11121}+x_{12111}+x_{12221}=130.000,$

$x_{11112}+x_{11122}+x_{12112}+x_{12122}=55.000$

$x_{21111}+x_{21211}+x_{22111}+x_{22121}=400.000,$

$x_{21112}+x_{21212}+x_{22112}+x_{22122}=100.000$

$x_{11111}+x_{12111}=30.000, x_{11112}+x_{12112}=10.000$

$x_{12111}+x_{12121}=30.000, x_{12112}+x_{12122}=10.000$

$x_{33111}+x_{43111}=100.000, x_{33112}+x_{43112}=50.000$

$x_{21111}+x_{21111}=200.000, x_{21112}+x_{21112}=50.000$

$x_{21121}+x_{21221}=200.000, x_{21122}+x_{21222}=50.000$

$x_{11111}+x_{11121}+x_{21111}+x_{21121}-x_{33111}\ x_{33121}=260.000,$

$x_{11112}+x_{11122}+x_{21112}+x_{21122}-x_{33112}-x_{33122}=40.000$

$x_{11121}+x_{21121}-x_{43121}=130.000, x_{11122}+x_{21122}-x_{34122}=10.000$

$x_{11111}+x_{21111}-x_{33111}=130.000, x_{11112}+x_{21112}\ x_{33112}=10.000$

$x_{11211}+x_{21211}-x_{33211}=260.000, x_{11212}+x_{21212}-x_{33212}=95.000$

$x_{11221}+x_{21221}-x_{33221}=260.000, x_{11222}+x_{21222}-x_{33222}=95.000$

$x_{12111}+x_{22111}-x_{43111}=130.000, x_{12112}+x_{22112}-x_{43112}=10.000$

$x_{12121}+x_{22121}-x_{43121}=130.000, x_{12122}+x_{22122}-x_{43122}=10.000$

$x_{11211}+x_{11121}+x_{21211}+x_{21121}-x_{33211}-x_{33221}=205.000$

$x_{12111}+x_{12121}+x_{22111}+x_{22121}-x_{43111}-x_{43121}=130.000,$

$x_{12112}+x_{12122}+x_{22112}+x_{22122}-x_{43112}-x_{43122}=10.000$

$x_{11111}+x_{11211}+x_{11211}+x_{11221}=130.000, x_{11112}+x_{11212}+x_{11212}+x_{11222}=65.000$

$x_{11111}+x_{11121}=30.000, x_{11112}+x_{11122}=10.000$

$x_{11211}+x_{11221}=100.000, x_{11212}+x_{11222}=55.000$

$x_{21111}+x_{21121}=200.000, x_{21112}+x_{21122}=50.000$

$x_{21211}+x_{21221}=200.000, x_{21212}+x_{21222}=50.000$

$x_{21111}+x_{21121}+x_{21211}+x_{21221}=400, x_{21112}+x_{21122}+x_{21212}+x_{21222}=100$

$x_{22211}+x_{22221}=200.000, x_{22212}+x_{22222}=50.000$

$x_{22111}+x_{22121}=200.000, x_{22112}+x_{22122}=50.000$

$x_{43111}+x_{43121}=100.000, x_{43112}+x_{43122}=50.000$

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$x_{43211} + x_{43221} = 40.000, x_{43212} + x_{43222} = 10.000$
$x_{33111} + x_{33121} = 100.000,\ x_{33112} + x_{33122} = 50.000$
$x_{33211} + x_{33221} = 40.000,\ x_{33212} + x_{33222} = 10.000$
$x_{33111} + x_{33121} + x_{33211} + x_{33221} + x_{43111} + x_{43121} + x_{43211} + x_{43221} = 140.000$
$x_{33112} + x_{33122} + x_{33212} + x_{33222} + x_{43112} + x_{43122} + x_{43212} + x_{43222} = 60.000$

Restrictions. Améliorer le service en temps opportun

$0 \leq x_{11111} \leq 300.000,\ 0 \leq x_{11112} \leq 10.000$
$0 \leq x_{11211} \leq 100.000,\ 0 \leq x_{11212} \leq 55.000$
$0 \leq x_{11121} \leq 30.000,\ 0 \leq x_{11122} \leq 10.000$
$0 \leq x_{11221} \leq 100.000, 0 \leq x_{11222} \leq 55.000$
$0 \leq x_{21111} \leq 200.000, 0 \leq x_{21112} \leq 50.000$
$0 \leq x_{21211} \leq 200.000, 0 \leq x_{21212} \leq 50.000$
$0 \leq x_{21121} \leq 200.000, 0 \leq x_{21122} \leq 5.000$
$0 \leq x_{21221} \leq 200.000, 0 \leq x_{21222} \leq 50.000$
$0 \leq x_{12111} \leq 30.000, 0 \leq x_{12112} \leq 10.000$
$0 \leq x_{12211} \leq 100.000, 0 \leq x_{12212} \leq 55.000$
$0 \leq x_{12121} \leq 300.000, 0 \leq x_{12122} \leq 10.000$
$0 \leq x_{12221} \leq 100.000, 0 \leq x_{12222} \leq 55.000$
$0 \leq x_{22111} \leq 200.000,\ 0 \leq x_{22112} \leq 50.000$
$0 \leq x_{22211} \leq 200.000, 0 \leq x_{22212} \leq 50.000$
$0 \leq x_{22121} \leq 200.000, 0 \leq x_{22122} \leq 50.000$
$0 \leq x_{22221} \leq 200.000, 0 \leq x_{22221} \leq 50.000$
$0 \leq x_{33111} \leq 100.000, 0 \leq x_{33112} \leq 50.000$
$0 \leq x_{33121} \leq 100.000, 0 \leq x_{33122} \leq 50.00$
$0 \leq x_{33221} \leq 40.000, 0 \leq x_{33222} \leq 10.000$
$0 \leq x_{33211} \leq 40.000, 0 \leq x_{33212} \leq 10.000$
$0 \leq x_{43111} \leq 40.000, 0 \leq x_{43112} \leq 10.000$
$0 \vee \leq x_{43211} \leq 40.000, 0 \leq x_{43212} \leq 10.000$

$0 \leq x_{43121} \leq 100.000, 0 \leq x_{43122} \leq 50.000$
$0 \leq x_{43221} \leq 40.000, 0 \leq x_{43222} \leq 10.000$

4 RESOLUTION METHOD

Way solution in two phases

The first phase

Appoint the truck type apply the necessary condition

$$\begin{cases} \boldsymbol{l = 1\ si} \sum_{i=1}^{m} \sum_{j=1}^{n} \sum_{k=1}^{q} \sum_{l=1}^{p} \boldsymbol{x_{ijkl} \leq 3b_j/4} \\ \text{l = 2 if does not} \end{cases}$$

The second phase

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In this section I will demonstrate the optimum transportation cost, Using MATLAB to Solver the problem. The first step is to organize the spreadsheet to represent the model. Next step is to use the Solver to find the solution. In the Solver, we need to identify the locations (cells) of objective function, decision variables, nature of the objective function (maximize/ minimize) and constraints. We apply all the steps Simplex method to find out that the best. We apply all the steps Simplex method to find out that the best solution. Using MATLAB software. (Use linprog to co put the solution.) The command (linprog) from the optimization toolbox implements the simplex algorithm to solve a linear programing problem in the General shape. MATLAB desktop keyboard shortcuts, such as Ctrl+S, are now customizable. In addition, many keyboard shortcuts have changed for improved consistency across the desktop. To customize keyboard shortcuts, use Preferences. From there, you can also restore previous default settings by selecting "R2009a Windows Default Set" from the "Active settings" drop down list. For more information, see Help. Click here if you do not want to see this message again.

```
>> a=[1 0 1 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0;
0 1 0 1 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0;
0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 0;
1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0;

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1;
1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0;
0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0;
0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0;
0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0;
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0;
0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0;
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0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0;
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b=[0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
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```
0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 1 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 1 1 0 0 0;
0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0;
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0 1 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1;
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0];
c=[ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
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```
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 -1 0 -1 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 -1 0 -1 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -1 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -1 0 0 0 0;
0 0 0 0 0 0 0 0 -1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 -1 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 -1 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 -1 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 -1 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 -1 0 0 0 0 0 0 0 0 0 0];
d=[0 0 0 0 0 0 0 0 0 0 0 0 0 0 -1 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -1 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -1 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -1 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 -1 0 -1 0 0 0 0 0 0 0 0 0;
1 0 1 0 0 0 0 0 -1 0 -1 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 1 0 1 0 0 0 0 0 -1 0 -1 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1;
0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0;
```


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```
0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0;

0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0;
0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1];
A=[a c;b d];
k=1000*[130 55 400 100 30 10 30 10 100 50 200 50 200 50 260 40 130 10 130
10];
h=[260 95 260 95 130 10 130 10 205 130 10 130 65 30 10 100 55 200 50 200
50];
s=[400 100 200 50 200 50 100 50 40 10 100 50 40 10 140 60];
B=[k,h,s];
v=10*[3360 3360 33600 3360 1120 1120 1120 1120 1122 1122 1122 1122 374
374 374 374];
w=10*[348 348 348 348 1160 1160 1160 1160 1470 1470 1470 1470 490 490
490 490];
y=10*[1086 1086 1086 1086 362 362 362 362 1962 1962 1962 1962 654 654
654 654];
f=[v,w,y];
l=zeros(1,48);
m=1000*[300 10 30 10 100 55 100 55 30 10 300 10 100 55 100 55 200 10 200
50 200 50 200 50 ];
n=1000*[200 50 200 50 200 50 200 50 100 50 100 50 40 10 40 10 40 10 100
50 40 10 100 50 ];
u=[m,n];
o=[0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0];
p=[0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0];
Aeq=[o,p];
beq=[0 0 0 0 0 0];
[x,fmin ] = linprog (f , A, B, Aeq, beq, l, u)
Optimization terminated.
```


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x =
1.0e-014 *
x_{11111} =0.0335
x_{11112}=0.0328
x_{11211}=0.0034
x_{11212}=0.0329
x_{11121}=0.1000
x_{11122}=0.0998
x_{11221}=0.0995
x_{11222}=0.0997
x_{21111}=0.1004

x_{21112}=0.1220
x_{21211}=0.1001
x_{21212}=0.1124
x_{21121}=0.3013
x_{21122}=0
x_{21221}=0.3032
x_{21222}=0
x_{12111}=0.3219
x_{12112}=0.3311
x_{12211}=0.3218
x_{12212}=0.3073
x_{12121}=0.0971
x_{12122}=0.0963
x_{12221}=0.0974
x_{12222}=0.0964
x_{22111}=0.0767
x_{22112}=0.0771
x_{22211} = 0.0767
x_{22212}=0.0764
x_{22121}=0.2283
x_{22122}=0.2259
x_{22221}=0.2298
x_{22222}=0
x_{33111}=0.1028
x_{33112}=0.1075
x_{33211}=0.1029
x_{33212}=0.1092
x_{33121}=0.2847
x_{33122}=0.5303
x_{33221}=0.2746

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x_{33222}=0.2271
x_{43111}=0.0573
x_{43112}=0.0575
x_{43211}=0.0572
x_{43212}=0.0560
x_{43121}=0.1688
x_{43122}=0.2041
x_{43221} =0.1688
x_{43222}=0.2052
fmin =
5.1602e-010

	Type	Truck	Period	M'sila $N_{0}1$
Biskra $N^{o}1$	$\begin{cases} type: 1- \ good\ quality \\ 2- \ medium\ quality \end{cases}$	$\begin{cases} truck\ N1(15t) \\ truk\ N2\ (5.5t) \end{cases}$	$\begin{cases} p(1) \\ p(2) \end{cases}$	x_{11111} =0.0335 x_{11112}=0.0328 x_{11211}=0.0034 x_{11212}=0.0329 x_{11121}=0.1000 x_{11122}=0.0998 x_{11221}=0.0995 x_{11222}=0.0997
ourgla $N^{o}2$	$type: -good\ quality$ $-medium\ quality$	$\begin{cases} truck\ N1(15t) \\ truk\ N2\ (5.5t) \end{cases}$	$\begin{cases} p(1) \\ p(2) \end{cases}$	x_{21111}=0.1004 x_{21112}=0.1220 x_{21211}=0.1001 x_{21212}=0.1124 x_{21121}=0.3013 x_{21122}=0 x_{21221}=0.3032 x_{21222}=0
M.sila $N^{o}3$	$type: -good\ quality$ $-medium\ quality$	$\begin{cases} truck\ N1(15t) \\ truk\ N2\ (5.5t) \end{cases}$	$\begin{cases} p(1) \\ p(2) \end{cases}$	
El ealma $N^{o}4$	$type: -good\ quality$ $-medium\ quality$	$\begin{cases} truck\ N1(15t) \\ truk\ N2\ (5.5t) \end{cases}$	$\begin{cases} p(1) \\ p(2) \end{cases}$	

	El ealma N^{02}	Skikda N^{o3}
Biskra N^{01}	x_{12111}=0.3219 x_{12112}=0.3311 x_{12211}=0.3218 x_{12212}=0.3073 x_{12121}=0.0971 x_{12122}=0.0963 x_{12221}=0.0974 x_{12222}=0.0964	
ourgla N^{02}	x_{22111}=0.0767	

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	x_{22112}=0.0771 x_{22211} =0.0767 x_{22212}=0.0764 x_{22121}=0.2283 x_{22122}=0.2259 x_{22221}=0.2298 x_{22222}=0	
M'sila N°3		x_{33111}=0.1028 x_{33112}=0.1075 x_{33211}=0.1029 x_{33212}=0.1092 x_{33121}=0.2847 x_{33122}=0.5303 x_{33221}=0.2746 x_{33222}=0.2271
El ealma N°4		x_{43111}=0.0573 x_{43112}=0.0575 x_{43211}=0.0572 x_{43212}=0.0560 x_{43121}=0.1688 x_{43122}=0.2041 x_{43221} =0.1688 x_{43222}=0.2052

4.1 Interpretation the results

We program the method in MATLAB for the resolution of the PT5ICF in the case of a balanced transport model. It will extract profit clarification to put a timetable on with the hypothesis Products in large quantities, based on a simple data Prototype system with four stations (Biskra, ourgla,Msila, El ealma), stores 3 (El ealmaEl ealma, Msila, Skikda) and one exhibition 2 main types of products (the good, the medium), and two types of trucks (15T, 5.5T)

x_{11111} =0.0335
x_{11112}=0.0328
x_{11211}=0.0034
x_{11212}=0.0329
x_{11121}=0.1000
x_{11122}=0.0998
x_{11221}=0.0995
x_{11222}=0.0997
x_{21111}=0.1004
x_{21112}=0.1220

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x_{21211}=0.1001
x_{21212}=0.1124
x_{21121}=0.3013
x_{21122}=0
x_{21221}=0.3032
x_{21222}=0
x_{12111}=0.3219
x_{12112}=0.3311
x_{12211}=0.3218
x_{12212}=0.3073
x_{12121}=0.0971
x_{12122}=0.0963
x_{12221}=0.0974
x_{12222}=0.0964
x_{22111}=0.0767
x_{22112}=0.0771
x_{22211} =0.0767
x_{22212}=0.0764
x_{22121}=0.2283
x_{22122}=0.2259
x_{22221}=0.2298
x_{22222}=0
x_{33111}=0.1028
x_{33112}=0.1075
x_{33211}=0.1029
x_{33212}=0.1092
x_{33121}=0.2847
x_{33122}=0.5303
x_{33221}=0.2746
x_{33222}=0.2271
x_{43111}=0.0573
x_{43112}=0.0575
x_{43211}=0.0572
x_{43212}=0.0560
x_{43121}=0.1688
x_{43122}=0.2041
x_{43221} =0.1688
x_{43222}=0.2052

4.2 Conclusions and recommendations

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Scheduling problem transportation with five indicators

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We have provided a solution to the problem of transfer dates of national office of the dates in Algeria and transported to the least cost. And an additional cost to improve the services. Without treatment earlier in the angle Applied Mathematics PT5ICF Minutes of Proceedings. Thus, we proposed a model for Optimization of freight transport problems. For the implementation of this model in the business process, we used the MATLAB program; time management is fairly fast to medium. The big sizes. However, in this model and variables Is one of the continuous and deterministic parameters. following This expansion we plan to study the problems.

In this proposed model. We added the fifth indicator for the period of time, because the process of distribution of the commodity according to the conditions of demand and production. And reduce the stack of the commodity, It provides additional income for the company.

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