Implementation of Optimization Algorithms for Transportation Problem of Drum Seeder in Delta Region -A Yardstick Approach

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Abstract:
This paper mainly deals with finding an optimal solution for the transportation problem which is an important task in operation research. The Transportation Problem is concerned to minimize the transportation cost of the product from several sources to different destinations. In this paper a comparative analysis is carried out with different optimization methods to obtain a good optimal solution of transportation problem.
Keywords: Transportation Problem, Initial basic feasible solution (IBFS), new methods, optimal solution, Genetic Algorithm, Comparison.

1. Introduction:

Transportation problem is a special case of linear programming problem (LPP) in Operation Research and logistics that deals with finding the most efficient way to transport goods from suppliers to destinations. While minimizing transportation costs, it's a fundamental issue faced by business and organizations involved in distribution and supply chain management. The basic transportation problem was originally developed by Hitchcock in 1941.Efficient methods for finding solution was developed. Basically, the solution procedure for transportation problem is mathematical formulation of the transportation problem., the transportation problem involves determining the optimal allocation of goods from multiple suppliers to multiple destinations, considering factors such as distance, capacity, and cost. Finding an initial basic feasible solution. Optimize the initial basic feasible solution.In this project, the optimization algorithms are used to find an initial basic feasible solution of the transportation problem and optimize the initial basic feasible solution of the transportation problem. Such methods are statistical method, ATM (Allocation Table Method), Direct Analytical method, Mzos (Modern Zero Suffix method), Modified Vogel's Approximation method, NOOR1method, Summation and Ratio method, Stepping Stone method and Genetic Algorithm.The transportation problem has numerous real-world applications across various industries, including manufacturing, retail, and logistics. Solving this problem can lead to significant cost savings, improved resource utilization, and better customer satisfaction through timely deliveries.

2. Literature review:

In this project, the implementation of optimization algorithms are focused to solve the transportation problem that cover the period from 2012 till 2024.In 2012, Abdullah Hlayel presents the solving transportation problems using the best candidate's method to find the initial basic feasible solution of the transportation problem. In 2016, MollahMesbahuddinahmed, Aminur Rahman khan, Md.sharifuddin, Faruque Ahmed, who are all present ATM (Allocation Table Method) to find the initial basic feasible solution of the transportation problem. And Rijwanakawser present the new analytical method in the same year for finding optimal solution of transportation problem. This is entitled "New Analytical Methods for Finding Optimal solution of Transportation Problem". In that she used proposed ''Direct Analytical method "and "Modified Vogel's Approximation Method". In 2017, Prof. Urvashikumari D, Prof. Dhavalkumar H. Patel, Prof. Ravi C. Bhavsar presented "Stepping Stone" method to find the optimal solution of TP.After one year, in 2018 Javad Sadeghi (2018), presents a method to solve for transportation problem. In 2019, Alina Babos present some statistical methods for finding the initial basic feasible solution. In that she used arithmetic mean and median. In 2021, D. Stephen Dinagar and R. Keerthivasan they introduced a new procedure namely Modern Zero Suffix (MOZES) method is proposed to find the IBFS for the transportation problem. And Nopiyana Affandi and A S Lestia presents a method to solve a transportation problem namely "solving transportation problem using modified ASM method. In 2022, Mohammed S M Zabiba and NOOR haider Ali ALKhafaji used a new technique to solve both type of balanced and unbalanced TP with minimize objective function. Ilnur Akhmetov found a method for solving a transportation problem with detection in time and conditions for minimizing risk. In 2023, Ahmed AtallahAlsaraireh introduced a new method to find the optimality solution of transportation problem namely "Summation and Ratio" method.AndProf.Manishkumar Jaiswal presents a new proposed method for solving transportation problem. And Nwanya, Julius chignozie, Njoku, KevinNdubusiChikezie presents the Middle Cell Method. Recently in 2024, Mohamed H.Abdelati found a new approach for finding an initial basic feasible solution of the transportation problem.

3.1 Introduction of Transportation Problem:

Transportation Problem is a Special type of Linear Programming Problem (LPP). The objective is to minimize the cost of distributing a product from multiple sources (or) origins to multiple destinations.

3.2 Mathematical Statement of the Transportation Problem:

The classical transportation problem can be stated mathematically as follows.

Transportation means the transfer of product from different sources to different destinations. Suppose that a company has production units at S_1, S_2... S_m. the demand to produce merchandise is at n various destinations D1, D2...D_n. The problem is to transport products from m different production units to n different demand destinations with minimum cost. The cost of shipping a product from production unit S_i to the demand destination D_j is C_{ij}, X_{ij} unit is shipped from S_i to D_j. Then the cost is C_{ij} X_{ij}

Mathematical model formulation **optimizeZ** $= \sum_{i=1}^{m} \sum_{j=1}^{n} C_{ij} X_{ij}$

$$\sum_{j=1}^{n} X_{ij} = a_i, i = 1, 2, 3 \ldots m \text{ (capacity constraints)}$$

$$\sum_{i=1}^{m} X_{ij} = b_j, j=1, 2, 3 \ldots n \text{ (Demand constraints)}$$

$x_{ij} \geq 0$, for all i and j

Here,

- a_i = Quantity of commodity available at source i
- b_j=Quantity of commodity needed at destination j
- c_{ij}=cost of transporting one unit of commodity from source i to destination j
- x_{ij}=Quantity transported from source i to destination j.

3.3 Optimization Algorithms for Solving Transportation problem:

Statistical Methods, ATM Method, Algorithm of Proposed Direct Analytical Method, odern Zero Suffix Method, Modified Vogel's approximation method, Noor1 method, Summation and ratio method, Stepping stone method, Genetic algorithm.

3.4 Transportation Table:

Thiruvarur district is being the major partner of 'Rice Granary' region of Tamil Nadu. Nearly 35,000 Hectares area is being under Kurvai season rice cultivation. Of late, this region is facing several problems viz., uncertainty in availability of canal water, paucity of labor availability coupled with hike in labor wages leads to rice cropping becomes lack luster and less profitable. By considering the above prevailing problems this KVK introduced popularized TNAU improved drum seeder in Thiruvarur district. To step up the profitability in rice cultivation cost cutting technology is the only way despite of the productivity aspects. Hence several on-campus and off-campus training and demonstration programmes were organized by the KVK to make horizontal spread of the same to the end users. Off-campus training cum demonstration has been organized pulavarnatham and poonthalagudi on 10.8.07 and 8.10.07 respectively to make easy reach of the technology to the outreach peoples. Apart on-campus training programme were organized on 23.6.2007 on 'Need Farm mechanization in rice cultivation'. More than 6 FLD'S were conducted during kuravai-07 season. In consequent more than 300 farmers contacted this Kendra to know the technology and its limitation to different situations. Due to the concerted effort the different ways and means drum seeded rice cultivation is being in more than 1000 Acres in the district due to Rs.1500 to 10000 saving in this technologies since, it doesn't need nursery, seedling pulling out, transplanting. Moreover, farmer's can take up sowing with family labor/ limited labor in event of peak. The transportation table is listed below:

Source/destination	Needamangalam (D_1)	Thirumarugal (D_2)	Andipandhal (D_3)	Pulivalam (D_4)	Nannilam (D_5)	Supply
Thiruvarur (S_1)	46	74	9	28	99	461
Sendamangalam (S_2)	12	75	6	36	48	277
Velamal (S_3)	35	199	4	5	71	356
Vijayapuram (S_4)	61	81	44	88	9	488
Perallam (S_5)	85	60	14	25	79	393
Demand	278	60	461	116	1060	

4. Numerical Calculations:4.1 Statistical Method

4.1.1 Arithmetic Mean:

Arithmetic mean is defined as being equal to the sum of the numeric values of each observation and divided by the total number of observation.

4.1.2 Median: The median is the middle number in a sequence of numbers. To finds the median need to arrange the numbers either ascending order or descending order and the number in the middle is the median.If there is an odd number of numbers, the middle one is picked, and if there is an even number of numbers, then there is no single middle value, the median is than usually defined to be the arithmetic mean of the two middle values.

This algorithm is to find the initial basic feasible solution of the transportation problem by using statistical methods.

Step1: Find the statistical tool (arithmetic mean, median) for each as well as column and find the one with maximum value (if there is a tie, choose any one arbitrarily).
Step2: Identify the row or column having maximum statistical tool and identify the boxes with minimum transportation cost in the corresponding row or column.
Step3: Make maximum allotment to the box having minimum cost of transportation in that row (or column).
Step4: Delete the row (or column) whose supply (or demand) is fulfilled.
Step5: Calculate new statistical tool and proceed until the demands and supplies are fulfilled.
Step6: Calculate total transportation cost for the allocated cells using cost matrix.

Final transportation table:

SOUR/DES	D_1	D_2	D_3	D_4	D_5	SUPPLY
S_1	46 [217]	74	9 [128]	28 [116]	99	461
S_2	12	75	6	36	48 [277]	277
S_3	35 [61]	199	4	5	71 [295]	356
S_4	61	81	44	88	9 [488]	488
S_5	85	60 [60]	14 [333]	25	79	393
DEMAND	278	60	461	116	1060	

Total Transportation Cost =(217*46)+(128*9)+(116*28)+(277*48)+ (61*35)+(295*71)+ (488*9) + (60*60)+(333*14) =Rs. 63,412.

4.1.2 Median Method:

In this method, find the median for each row and columns, then choose the maximum value of the median and select the cell which has the minimum cost in that corresponding row or column and remaining cells in the corresponding row or column is deleted. Repeat the process until demand and supply is fulfilled. The median values for each row and column are R1=46, R2=36, R3=35, R4=61, R5=60, C1=46, C2=75, C3=9, C4=28, C5=71. C2=75is the maximum value and the cell allocated with minimum cost is (S_5, D_2).

SOURCE/DES	D_1	D_2	D_3	D_4	D_5	SUPPLY
S_1	46 [217]	74	9 [244]	28	99	461
S_2	12	75	6	36	48 [277]	277
S_3	35 [61]	199	4	5	71 [295]	356
S_4	61	81	44	88	9 [488]	488
S_5	85	60 [60]	14 [217]	25 [116]	79	333
DEMAND	278	60	461	116	1060	

Total Transportation Cost = (60*60)+(9*488)+(277*48)+(295*71)+(61*35)+(217*46) +(244*9) +(217*14)+(116*25) = Rs. 62,484

4.2 Allocation Table Method (ATM) Method

In this method, an allocation table is formed to find the solution for the transportation problem. That's why this method is named as ALLOCATION TABLE METHOD (ATM).

Step1: Create a transportation table (TT).
Step 2: Check whether the TP is balanced; if not, adjust it.
Step 3: From each of the TT's cost cells, choose the least odd cost (MOC). Continue dividing each cost cell by 2 (two) until at least one odd value is obtained in the cost cells if there isn't an odd cost in the TT's cost cells.
Step 4: Create a new table called the allocation table (AT) by subtracting only the chosen MOC from each of the odd-valued cells of the TT while maintaining the MOC in the corresponding cost cell or cells as it was. At this point, all cell values must be called as allocation cell value (ACV) in AT.
Step 5: Begin the allocation process with the lowest possible supply and demand. In the AT created in step 4, assign this minimum of supply/demand initially in the odd-valued ACVs. If the demand is met, the column should be removed. If the answer is yes, remove the row.
Step 6: Determine the lowest ACV now and assign the lowest amount of supply or demand to the location of the chosen ACV in the AT. Choose the ACV where the least amount of allocation is possible if the ACVs are the same. Once more, if the ACVs are allocated in the same way, select the lowest cost cell that matches the TT's cost cells

created in Step 1 (i.e., this minimal cost cell must be determined from the TT that is generated in step 1). Once more, if the cost cells and the allocations are equal, select the cell that is closest to the minimal amount of supply or demand that must be assigned. At this point, remove the row if supply exceeds demand and remove the column if demand is met.

Step 7: Repeat step-6 until both the supply and demand are depleted.
Step 8: Transfer this allocation to the original TT.
Step 9: At last, figure up how much the TT will cost for transportation overall. This computation is the total of the product of the TT's allocated value and cost.

SOURCE/DES	D_1	D_2	D_3	D_4	D_5	SUPPLY
S_1	46 [1]	76	4 [221]	28	94 [239]	461
S_2	12 [277]	70	6	36	48	277
S_3	30	194	4 [240]	5 [116]	66	356
S_4	56	76	44	88	4 [488]	488
S_5	80	60 [60]	14	20	74 [333]	393
DEMAND	278	60	461	116	1060	

Total Transportation Cost = (1*46)+(221*4)+(94*239)+(277*12) +(240*4)+(116*5)+(488*4) +(60*60)+(333*74) = Rs. 58,454.

4.3 Direct Analytical Method

Step 1: Look for the row (source) with the lowest unit cost in the first column, which is the destination. Put that location in column 1 and the related source in column 2.Repeat these steps for every location. Nevertheless, list all these sources in column 2 if any destination has more than one source with the same minimum value.
Step 2: Choose the destinations with unique sources under column -1. For instance, the destinations D1, D2, and D3 under column-1 each have a minimum unit cost that corresponds to the sources K1, K1, and K3 listed under column-2, respectively. Since K3 is unique in this case, the minimum supply and demand are allocated to cell (K3, D3).
As an illustration, assign a value of 6 to that cell if the associated supply is 8 and the corresponding demand is 6. But proceed to step 3 if the destinations are not distinct.

After that, remove the row or column where demand or supply is zero. **Step 3:** Choose the destinations where the sources are same if the source shown in Column 2 is not unique. Next, determine the difference between the lowest and subsequent lowest unit costs for each destination if the sources are the same. **Step 4:** Verify the location with the biggest discrepancy. After deciding on that location, assign the associated cell with the lowest unit cost a minimum of supply and demand. Remove the row or column where there is no more supply or demand.

Determine the difference between the minimum and next-to-next minimum unit costs for those locations if the maximum difference for two or more destinations seems to be the same, then choose the destination with the largest difference. Give that cell a minimal amount of both supply and demand. After that, remove the row or column where demand or supply is zero. **Step 5:** Steps 1 through 4 should be repeated until there is no more supply or demand. . **Step 6:** The total cost is computed by multiplying the cost of a unit by the number of units of supply or demand that correspond to it.

SOURCE/DES	D_1	D_2	D_3	D_4	D_5	SUPPLY
S_1	46	74	9 [461]	28	99	461
S_2	12 [277]	75	6	36	48	277
S_3	35 [1]	199	4	5 [116]	71 [239]	356
S_4	61	81	44	88	9 [488]	488
S_5	85	60 [60]	14	25	79 [333]	393
DEMAND	278	60	461	116	1060	

Total Transportation Cos = (9*488)+(12*277) + (60*60)+(5*116)+(35*1) +(9*461) +(71*239)+(79*333) = Rs. 59,356.

4.4 Modern Zero Suffix Method

Step 1: Create the transportation table. Check whether the transportation table is balanced. If yes, move on to step 2. Introduce a dummy column or row if not. **Step 2:** Subtract each row in a cost matrix by its lowest element. Subtract the least element in each column from the concentrated matrix. Every row and every column in the concentrated matrix have at least one zero.

Step 3: Pick one zero, figure out how many zeros are there in the row and column that correspond to it, save for the selected zero, and note the total number of zeros in the suffix.
Step 4: Pick each zero and indicate the suffix in the same manner as in Step 3.
Step 5: Assign the conforming cell and choose the lowest suffix. The sequence of each allocation is increasing sufficiency.
Step 6: Choose the lowest cost cell among the complying suffix values if the suffix values are the same in some cases.
Step 7: Repeat steps 2 through 6 until the allocation ensures fewer than m+n-1 cells.
Step 8: Continue until all requirements for the rim are met.

SOURCE/DES	D_1	D_2	D_3	D_4	D_5	SUPPLY
S_1	46	74	9 [128]	28	99 [333]	461
S_2	12 [277]	75	6	36	48	277
S_3	35 [1]	199	4	5 [116]	71 [239]	356
S_4	61	81	44	88	9 [488]	488
S_5	85	60 [60]	14 [333]	25	79	393
DEMAND	278	60	461	116	1060	

Total Transportation Cost = (9*128)+(99*333)+(12*277) +(35*1)+(5*116)+(71*239) +(9*488) +(60*60)+(14*333)= Rs. 67,681

4.5 Modified Vogel's Approximation Method

Step 1: In each row of the transportation table, take the largest entry out of each element and put it on top of the matching element on the left.
Step 2: On the left-bottom of the relevant element, subtract the biggest transportation cost from each entry in each column of the transportation table.
Step 3: Create a reduced matrix whose elements are the total of the first and second steps' left-top and left-bottom elements.
Step 4: Subtract the largest and next-to-largest elements from each row and each column of the reduced matrix to calculate the distribution indicators. Write the results immediately after and below the supply and demand amounts, respectively.

Step 5: Find the highest distribution indicator. If there are two or more, select the one that shows the presence of the largest element in addition to the highest indicator. Select any one of the largest elements at random if there are two or more of them.
Step 6: In the (i,j)th cell of the reduced matrix, allocate $x_{ij}=\min(a_i, b_j), i=1,2,\ldots m, j=1,2,\ldots n$ on the left bottom of the largest element. A, I, and bj stand for the supply and demand at each source and destination, respectively.
Step 7: If $a_i<b_j$, exit the ith row and update bj to reflect $b_j'=b_j-a_i$; if $a_i>b_j$, exit the jth column and update ai to reflect $a_i'=a_i-b_j$. Leave the ith row and jth column if $a_i=b_j$.
Step 8: Steps 4 to 7 should be repeated until the rim requirement is satisfied.
Step 9: Move the positive allocated cells from the reduced matrix to the original transportation table, and compute the TTC.

SOU/DES	D_1	D_2	D_3	D_4	D_5	SUPPLY
S_1	46 [278]	74	9	28	99 [183]	461
S_2	12	75	6	36	48 [277]	277
S_3	35	199	4 [240]	5 [116]	71	356
S_4	61	81	44	88	9 [488]	488
S_5	85	60 [60]	14 [221]	25	79 [112]	393
DEMAND	278	60	461	116	1060	

Total Transportation Cost = (278*46)+(183*99)+(277*48)+(240*4)+ (116*5) +(488*9) +(60*60) +(221*14)+(79*112) = Rs. 65,675.

4.6 NOOR1 Method

Step 1: Create the cost matrix for the transportation issue. The issue of transportation needs to be balanced.
Step 2: Using the degeneracy condition m+n-1, determine the number of specializations needed for the best solution.
Step 3: Find the lowest cost among the many expenses discovered in the transportation problem (m+n-1).
Step 4: Connect the values found in Step 3 to potential allocations (assign min $\{a_i, b_j\}$ so that b_j is demand at the jth destination and a_i is available supply at the ith source).

Step 5: Allocate the cell from step 4 that has the least amount of allocation.
Step 6: Continue the previous stages two, three, and four until the sources and demand are met.
Step 7: compute the cost of transportation.

SOURCE/DES	D_1	D_2	D_3	D_4	D_5	SUPPLY
S_1	46 [1]	74	9 [221]	28	99 [239]	461
S_2	12 [277]	75	6	36	48	277
S_3	35	199	4 [240]	5 [116]	71	356
S_4	61	81	44	88	9 [488]	488
S_5	85	60 [60]	14	25	79 [333]	393
DEMAND	278	60	461	116	1060	

Total Transportation Cost = (46*1)+(9*221)+(99*239)+(12*277)+(4*240) +(5*116)+(9*488) +(60*60)+(79*333) = Rs. 64,859/-

4.7 Summation and Ratio Method

Step 1: Determine whether the problem is balanced or not. Add a dummy row or column if the it is unbalanced so that all of the cells in it will have a zero cost.
Step 2: Find the total cost of all cells.
Step 3: Determine the total cost of each row and column.
Step 4: Divide each row's total cost by the total number of cells, rRi $=\sum^{m}_{i=1} c_{ij}/TC$, where j=1, 2,...m.
Step 5: Divide each column's total cost by the total number of cells, rci = $\sum^{n}_{j=1} c_{ji}/TC$, where i = 1, 2,...
Step 6: Find the cell that results from connecting the biggest percentage in the columns with the smallest proportion in the rows
Step 7: We must choose the lowest amount of supply or demand to fill the cell based on the chosen row and column.

Step 8: To finish solving every cell, repeat steps 2 through 7 once again.

SOURCE/DES	D_1	D_2	D_3	D_4	D_5	SUPPLY
S_1	46 [278]	74	9 [67]	28 [116]	99	461
S_2	12	75 [60]	6	36	48 [217]	277
S_3	35	199	4	5	71 [356]	356
S_4	61	81	44 [394]	88	9 [94]	488
S_5	85	60	14	25	79 [393]	393
DEMAND	278	60	461	116	1060	

Total Transportation Cost = (278*46)+(67*9)+(28*116) +(60*75)+(217*48)+(71*356) +(394*44) +(94*9)+(393*79)
= Rs. 1, 06,060

4.8 Stepping Stone Method

Step 1: Use any one of the following to come up with a simple, workable solution.North-West Corner Rule, Matrix minima Method, Vogel's approximation method.

Step 2: Verify that the number of occupied cells, where m and n are the number of rows and columns, respectively, exactly equals m+n-1.

Step 3: Involves choosing an empty cell and starting at it. Next, draw a closed route from the chosen cell to the empty cell and back again.

Step 4: Assign plus and negative signs in turn to each corner cell of the just traced closed path, starting with the unoccupied cell that has to be evaluated with the plus sign.

Step 5: Total the unit transportation expenses for every traced cell in the closed path. The cost will remain unchanged as a result.

Step6: Continue from steps 3 through 5 until every empty cell has been assessed.

Step 7: Verify the net change in unit transportation costs and note its sign. An ideal solution has been found if all the computed net changes are higher than or equal to zero. Proceed to step 8 if the current solution cannot be improved upon to lower the overall cost of transportation.

Step8: Determine the maximum number of units that can be assigned to the vacant cell with the largest negative net cost change. The number of units that can be transported to the entering cell is indicated by the smallest value that has a negative position on the closed path. To the empty cell and every other cell on the path indicated by a plus sign, add this number. This amount is deducted from the cells on the closed path that have a minus sign next to it.

SOU/DES	D_1	D_2	D_3	D_4	D_5	SUPPLY
S_1	46 [1]	74 [60]	9 [68]	28	99 [332]	461
S_2	12 [277]	75	6	36	48	277
S_3	35	199	4	5 [116]	71 [240]	356
S_4	61	81	44	88	9 [488]	488
S_5	85	60	14 [393]	25	79	393
DEMAND	278	60	461	116	1060	

Total Transportation Cost =(1*46)+(60*74)+(68*9)+(332*99)+(277*12)+(116*5) +(240*71) +(488*9)+(393*14) = Rs. 68, 804.

Resolving Degeneracy we get the optimal solution.

SOU/DES	D_1	D_2	D_3	D_4	D_5	SUPPLY
S_1	46 [1]	74 [60]	9 [68]	28 [116]	99 [216]	461
S_2	12 [277]	75	6	36	48	277
S_3	35	199	4	5	71 [356]	356
S_4	61	81	44	88	9 [488]	488
S_5	85	60	14 [393]	25	79	393
DEMAND	278	60	461	116	1060	

Total Transportation Cost = (46*1)+(14*60)+(9*68)+(28*116)+(99*216)+(12*277)+(71*356) +(9*488)+(14*393) = Rs.64, 624.

4.9 Genetic Algorithm

Genetic Algorithm (GA) is inspired by the principles of genetic and evolution. It mimics the reproduction behaviour in living beings. Every species starts with an initial population and passes their traits to the next generation via reproduction and mutation. Each chromosome represents a feasible route for the TSP. In this project, the initial population is created randomly and the fitness value of each chromosome is the total distance of the route. In the reproduction process, the selection operator used is tournament selection and the mutation operator used is swap mutation. Set a maximum number of iterations as the termination condition.

Step 1: The algorithm creates a random initial population at beginning.

Step 2: Then to create new population, the algorithm scores each member of the current population by computing its fitness value and converts them into a more usable range of values.

Step 3: Then based on these new values the algorithm selects members, called as parents.

Step 4: Then algorithm produces children from the parents. Children are produced either by making random changes to a single parents which is mutation or by combining the vector entries of a pairs of parents which is crossover.

Step 5: In this way the algorithm replaces the current population with the children to form the next generation.**Step 6:** The algorithm stops when it reaches any one of the specified factors such as **time limit, fitness limit, generations, function tolerance,**

constraint tolerance, etc.

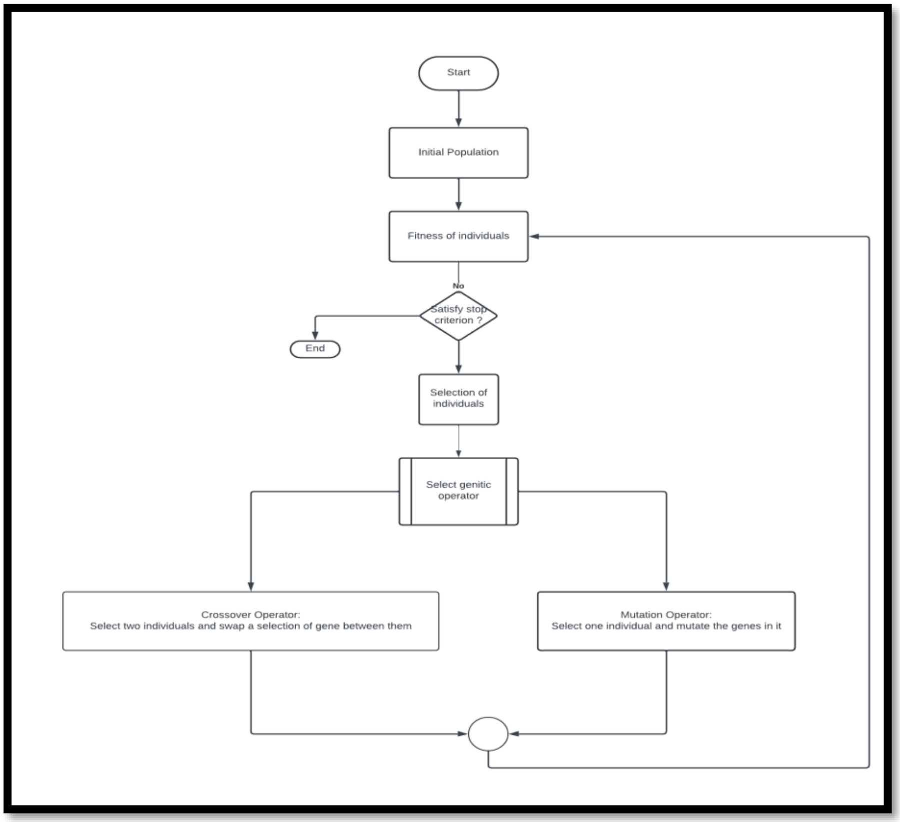

Fig 1: flow chart of genetic algorithm

5. Comparative analysis of Optimization Algorithms

Methods	**Total Transportation Cost**
Statistical methods I. Arithmetic mean	Rs. 63,412
II. Median method	Rs. 62,484
ATM method	**Rs. 58,454**
Direct analytical method	Rs. 59,356
Modern zero suffix method	Rs. 67,681
Modified Vogel 's approximation method	Rs. 65,675
NOOR1 method	Rs. 64,859

Summation and ratio method	Rs. 1,06,060
Stepping stone method	Rs. 64,624
Genetic algorithm	Rs. 3,80,902

6. Conclusion:

Apart from classical methods many optimization algorithms are useful to optimize the better solution for transportation problem. This project mainly dealt with all optimization algorithms for solving the transportation problems. An optimal solution is obtained and A Comparative analysis is carried out it is found that the cost of transporting a goods or product from several sources to different destinations is minimized by using ATM (Allocation Table Method) method.

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