**IM 39003**

**Assignment 3: Tabu Search**

**Due Date: 3rd Feb, 2022 Time: 5:30 PM**

*Instructions:*

*1. Submit this assignment via MS teams by 5:30 PM by turn- in/hand-in*

*2. You need to submit your .m file zip file format.*

*3. In case of copying you will get a 0 grade for this assignment.*

**Tabu Search- Pseudocode**

|  |
| --- |
| sBest ← s0  bestCandidate ← s0  tabuList ← []  tabuList.push(s0)  while (not stoppingCondition())  sNeighborhood ← getNeighbors(bestCandidate)  bestCandidate ← sNeighborhood[0]  for (sCandidate in sNeighborhood)  if ( (not tabuList.contains(sCandidate)) and (fitness(sCandidate) > fitness(bestCandidate)) )  bestCandidate ← sCandidate  end  end  if (fitness(bestCandidate) > fitness(sBest))  sBest ← bestCandidate  end  tabuList.push(bestCandidate)  if (tabuList.size > maxTabuSize)  tabuList.removeFirst()  end  end  return sBest |

1. **SWAP** Selecting two random positions in permutation encoding representation solution and swapping elements of these positions is the easiest and most widely used way of generating of neighbour solutions. In order to help to understand, in the Figure 1 we introduce the swap method. For example, if the third and fifth element be selected then their position will be replace by each other.



1. **REVERSION** Selecting two random positions in permutation encoding representation solution and reversing the direction between two randomly chosen elements. In order to help to understand, in the Figure 2 we introduce the reversion method. For example, if the second and fifth element be selected then reversing the direction between their position.



1. **INSERTION** Selecting two random positions in permutation encoding representation solution and with due attention to number of chosen elements, reversing the direction between two randomly chosen elements. In order to help to understand, in the Figure 3.



**Activity 1:** Understanding Tabu Search method for TSP

***Activity 1.1:*** Understanding the attached code

***Activity 1.2:*** Understand the effect on optimal solution of selecting different tabu length.

***Activity 1.3:*** Add a piece of code to plot the best solution at every iteration.

***Activity 1.4:*** Write a code for reversion strategy and use it in place of swap. Check whether it has improved solution.

***Activity 1.5:*** Write a code for insertion strategy and use it in place of swap. Check whether it has improved solution.

***Activity 1.6:*** In the function file DoAction.m write a switch statement and make 3 cases swap, insertion and reversion. Check whether it has improved solution.

***Activity 2:***  Solve the following symmetric TSP problem using tabu search method **[Code submission required]**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | C1 | C2 | C3 | C4 | C5 |
| C1 | 0 | 132 | 217 | 164 | 158 |
| C2 |  | 0 | 290 | 201 | 79 |
| C3 |  |  | 0 | 113 | 303 |
| C4 |  |  |  | 0 | 196 |
| C5 |  |  |  |  | 0 |

***Activity 2.1:*** Your code should have following pieces:

1. In the function file DoAction.m a switch statement with 3 cases swap, insertion and reversion.
2. A plot showing best solution at every iteration.

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