

Dijkstra Sequence

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Chapter 1: Introduction

In this project aims at providing us an example to show that the great power of greedy algorithms when we apply them to some certain complicated problems. In this project, our job is simply checking whether the sequences are built in Dijkstra order.

Chapter 2: Algorithm Specification

1) Sketch of Main Program

The whole program is constructed with the following parts:

- Input and Output.
- Initialize the array `vert`, which is used as the min distance from the source.
- check update function, used to update the min distance.
- check min function, used to check if the sequence sort is in Dijkstra sort.
- **Data Structure:** We use array to store the minimum distance and whether the node is visited. And we store the graph in a adjacent matrix, which is easier to update the distance.

2) Algorithm Pseudo-Code

Algorithm 1: Check Update Algorithm

Data: `index`, `Nv`, `vert`[MAXN][2], `graph`[MAXN][MAXN]

Result: Used to update minimum distance of every node besides `index`

```
1 initialization;
2 for  $i \leftarrow 1$  to  $Nv$  do
3   if index and i is connected then
4     if the distance from index to i is smaller the original distance of
       i then
5       | change the minimum distance of i
6     end
7   end
8 end
```

Algorithm 2: Check Minimum Algorithm

Data: check-point, N_v , $\text{vert}[\text{MAXN}][2]$, $\text{graph}[\text{MAXN}][\text{MAXN}]$

Result: used to check whether the check-point is in Dijkstra Order

```
1 initialization;
2  $\min \leftarrow \infty$ 
3 for  $i \leftarrow 1$  to  $N_v$  do
4   if we have never been to node  $i$  and the distance from source to node
       $i$  is smaller than  $\min$  then
5      $\min \leftarrow$  the distance from source to node  $i$ 
6   end
7 end
8 if the distance from source to check-point equals  $\min$  and check-point is
   never visited then
9   mark that check-point is visited check-update the nodes besides
   check-point
10  return 1
11 end
12 return 0
```

3) Description of Algorithms

- input and input-seq function are used to scan the data in a more elegant way
- check_update function is used to form the minimum distance, based on the nodes that you have visited.
- check_min function is the main function to check if the sequence is the Dijkstra sequence. The method is to check is the node every time the smallest and never visited before, which is from Dijkstra algorithm.
- In a word, this program is kind of test program, for the data has pointed the node you need to visit, and your task is to find whether the point is wrong.

Chapter 3: Testing Results

Chapter 4: Analysis and Comments

1) Space Complexity

Space Complexity is

Listing 1: Source Code

Appendix: Source Code

Declaration

I hereby declare that all the work done in this project titled " Performance Measurement" is of my independent effort.