Integrated Exercise for Software I

Mid-term Presentations

Development environment

Team: SpaceA

Member: Sinchhean Phea(s1250250), Yusaku Numajiri(s1250078),

Taize Sun(s1242009)

Platfrom: Github

Language: C

Tool: VScode

Development status

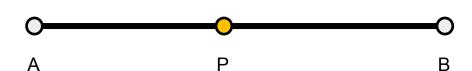
task 1 ~ 7 finished

task 8 now working

testgenerator is also still in progress

Make Graph algorithm

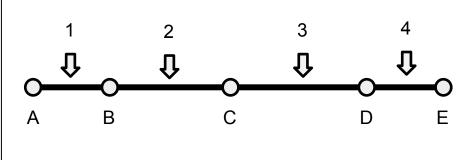
For all lines



For all points and intersections

$$AP + PB = AB$$

$$\rightarrow$$
 AP + PB $-$ AB = 0



Edge 1: AB

Edge 2: BC

Edge 3: CD

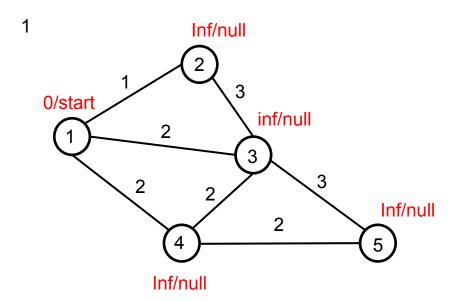
Edge 4: DE

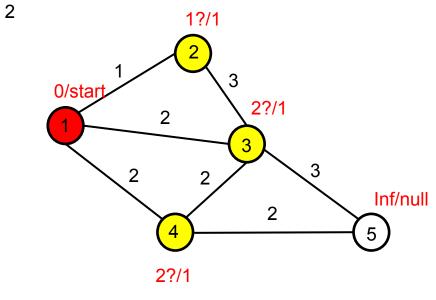
pseudocode

```
make array A (to use for saving points)
for i = 1 to number of lines
    for j = 1 to (number of points +number of
intersections)
         if(p is on the line)
              add p to A
for i = 1 to (A.size - 1)
    edge[i] = (A[i], A[i+1])
```

2. Dijkstra'salgorithm

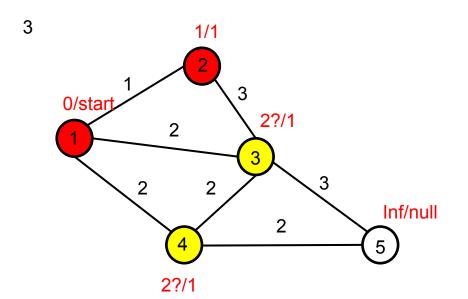
Example: from 1 to 5

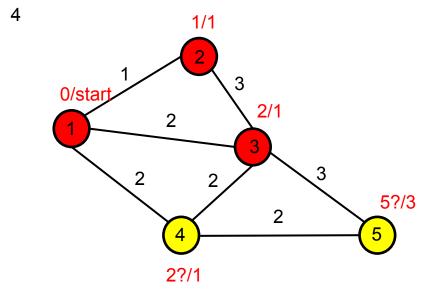




2. Dijkstra'salgorithm

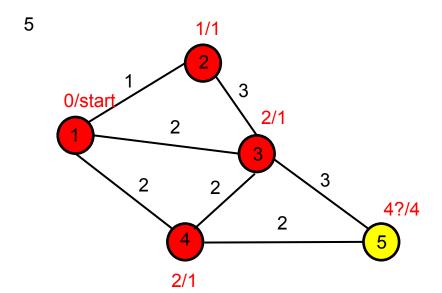
Example: from 1 to 5

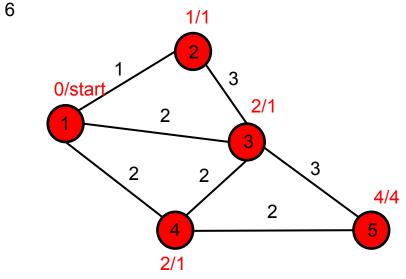




2. Dijkstra'salgorithm

Example: from 1 to 5





Distance = 4, Route = 1 - 4 - 5

```
pseudocode
 start.distance = 0
 push(start)
 while(queue.size != 0)
       fromnode = pop()
       for(i = 1 to number of nodes)
            if node[i] connects fromnode
                  if( node[i].distance > fromnode.distance + edge.length)
                        node[i].distance = fromnode.distance + edge.length
                        node[i].from = fromnode
                        push(node[i])
 while(goal.form != start)
       add goal to route
       goal = goal.from
 add start to route
```

Yen's algorithm

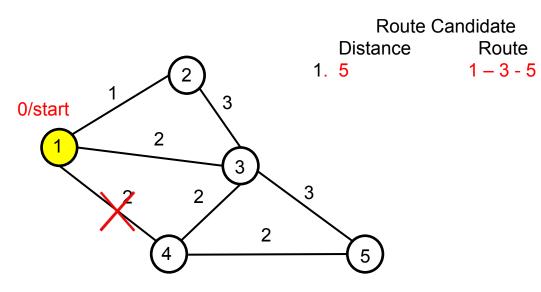
Example: from 1 to 5

1

Delete Edge 1-4 temporarily and search shortest path from 1 to 5.

Shortest Route

1. Distance 4 Route = 1 - 4 - 5





Distance = 5, Route = 1 - 3 - 5

Yen's algorithm

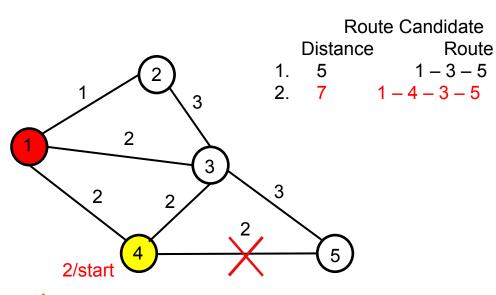
Example: from 1 to 5

2

Delete Edge 4-5 temporarily and search shortest path from 4 to 5.

Shortest Route

1. Distance 4 Route 1 – 4 - 5





Distance = 7, Route = 1 - 4 - 3 - 5

Yen's algorithm

Example: from 1 to 5

3

Choose the shortest route from candidate

Route Candidate

Distance

Route

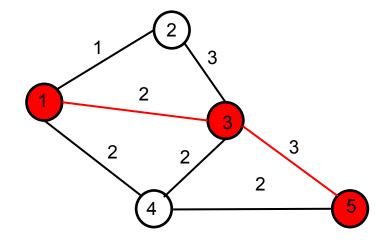
$$1 - 4 - 3 - 5$$



Shortest Route

Distance 4 Route 1-4-5

Distance 5 Route 1-3-5



Yen's algorithm

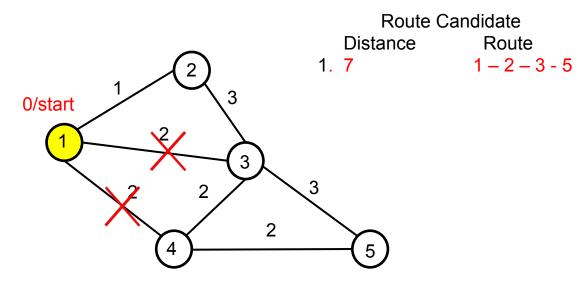
Example: from 1 to 5

4

Delete Edges 1-4, 1-3 temporarily and search shortest path from 1 to 5.

Shortest Route

- 1. Distance 4 Route 1-4-5
- 2. Distance 5 Route 1-3-5





Distance = 7, Route = 1 - 2 - 3 - 5

Yen's algorithm

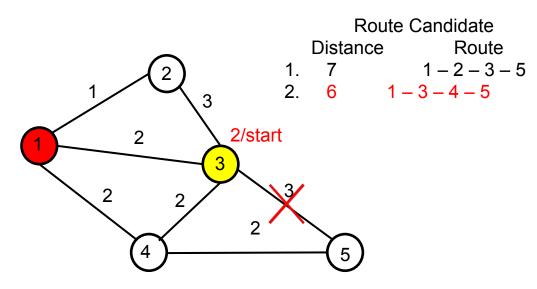
Example: from 1 to 5

5

Delete Edge 3-5 temporarily and search shortest path from 3 to 5.

Shortest Route

- 1. Distance 4 Route 1-4-5
- 2. Distance 5 Route 1 3 5





Distance = 6, Route = 1 - 3 - 4 - 5

Yen's algorithm

Example: from 1 to 5

6

Choose the shortest route from candidate

Route Candidate

Distance

Route

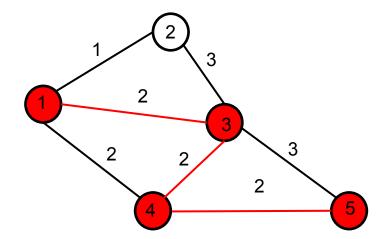
1.
$$7 1-2-3-5$$

$$1 - 3 - 4 - 5$$



Shortest Route

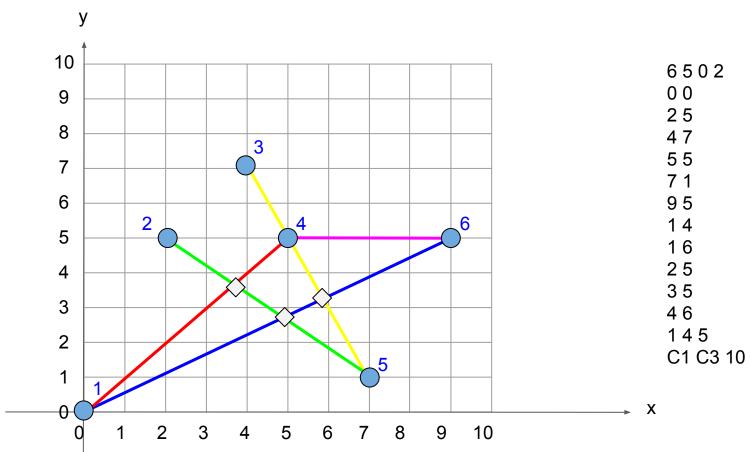
- Distance 4 Route 1-4-5
- Distance 5 Route 1-3-5
- 3. Distance 6 Route 1-3-4-5

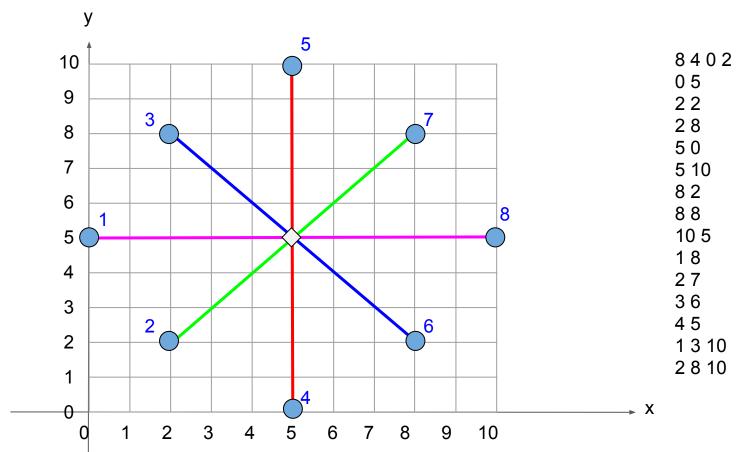


pseudocode

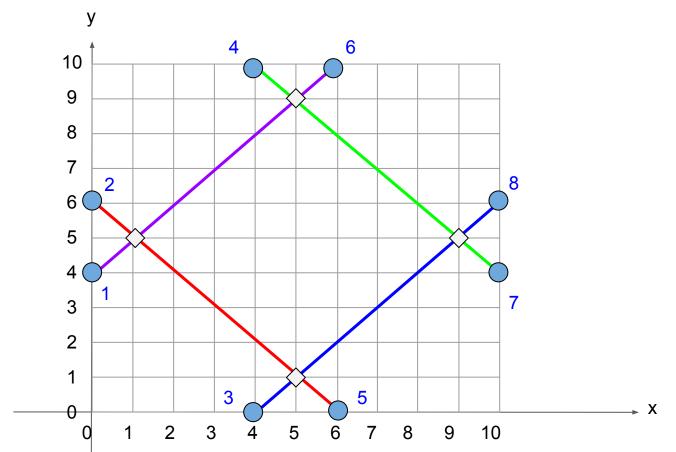
```
k route[1] = shortest(from, to)
for (i = 2 \text{ to } k)
     temproute[1] = start
     for(j = 1 \text{ to } i - 1)
          if (k route[1] == temproute)
               edge delete temporarily
          Candidate[j] = shortest(start ,goal)
          update temproute and start
```

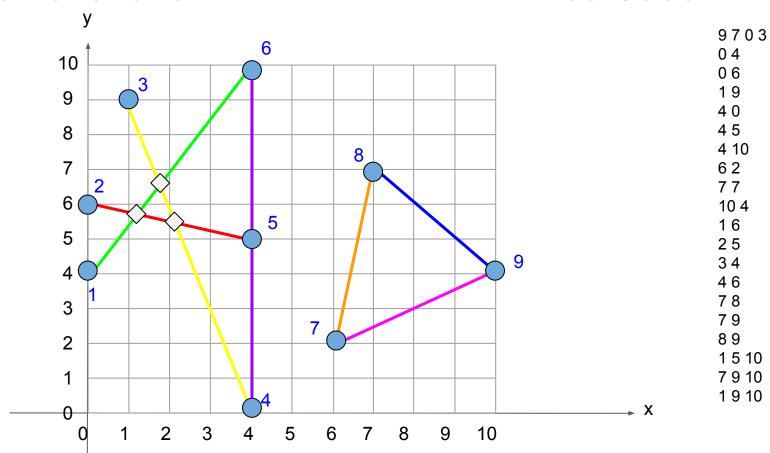
choose shortest route from Candidate





TestCase3



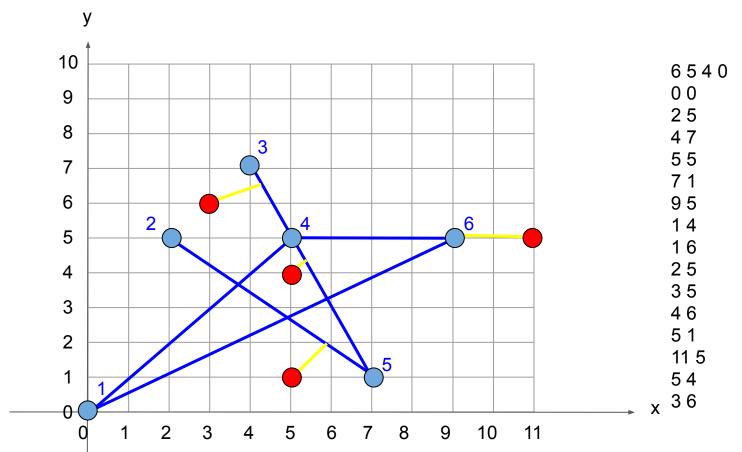


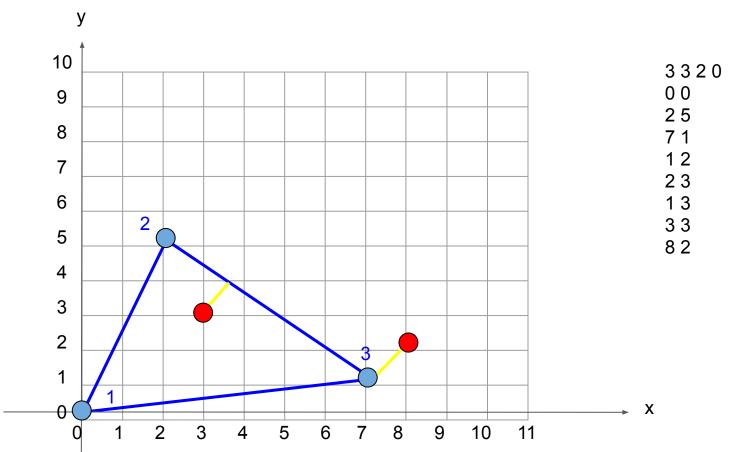
Task 7

Loop to compare the point to every segment

- a. Find the determinant between the segment and the point
- b. Find $t = [determinant]/[length of determinant]^2$
- c. If $0 \le t \le 1$: (line: xp1, yp1, xq1, yq1; point: p_x, p_y)
 - i. yes: $d = |(xq1-xp1)^*(yp1-p_y)-(yq1-yp1)^*(xp1-p_x)| / ((xq1-xp1)^2+(yq1-yp1)^2)^{1/2}$
 - ii. no: shortest distance is from the point to one end of the line

https://math.stackexchange.com/questions/2248617/shortest-distance-between-a-point-and-a-line-segment





Contribution of each member

Team work: Discussion about:

- making points on lines (to make graph)
- process of making graph

Sinchhean Phea(s1250250)
Shortest distance from a point to given segments (Task 7)

Yusaku Numajiri(s1250078) Graph implementation and shortest path(Task 3-6) Making test generator

Taize Sun(s1242009) slides and helping parts of tasks

Thank you for you attention