Programación III

TRABAJO PRÁCTICO OBLIGATORIO

Grafos

Curso: 424608	Aula: P107 – Sede Pinamar	Turno: MRI
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Fecha: 2/3/2023	Cuatrimestre:	MRI Verano

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Consideraciones

Usted va a recibir la Clase Grafo en Java y deberá implementar 3 (tres) de los siguientes algoritmos:

- Algoritmo Breadth-First Search (BFS)
- Algoritmo Depth-First Search (DFS)
- Algoritmo de Prim
- Algoritmo de Kruskal
- Algoritmo de Dijsktra
- Algoritmo de Floyd

Introducción

Hemos decidido implementar los siguientes algoritmos en base a los conceptos investigados por nuestra parte y complementando con la información obtenida durante la cursada.

1. Depth-First Search (DFS)
2. Breadth-First Search (BFS)
3. Floyd

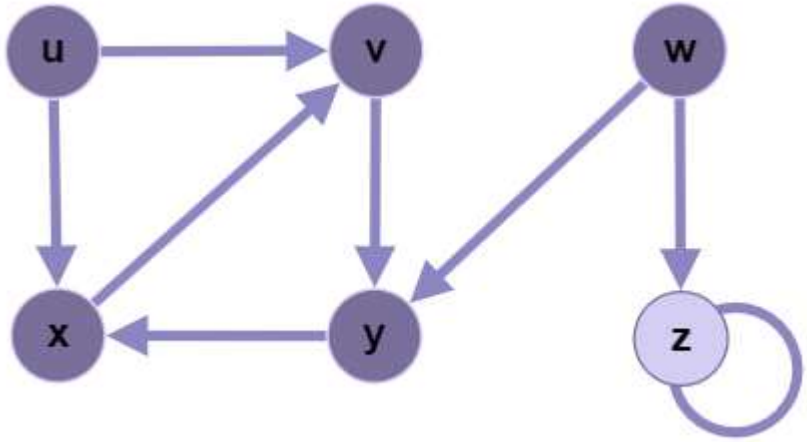
Repositorio GitHub

https://github.com/marifortu45/TPO-PROGRAMACION-III--PINAMAR-2023

Desarrollo

DFS

Grafo de referencia:



Matrices:

Adjacency Matrix

Setup adjacency ma

```
0, 1, 1, 0, 0, 0,
0, 0, 0, 1, 0, 0,
0, 1, 0, 0, 0, 0,
0, 0, 1, 0, 0, 0,
0, 0, 0, 1, 0, 1,
0, 0, 0, 0, 0, 1,
```

Incidence matrix

Set up incidence matrix.

```
1, 1, 0, 0, 0, 0, 0, 0
-1, 0, -1, 0, 1, 0, 0, 0
0, -1, 1, -1, 0, 0, 0, 0
0, 0, 0, 1, -1, -1, 0, 0
0, 0, 0, 0, 0, 1, 1, 0
0, 0, 0, 0, 0, 0, -1, 1
```

Distance matrix

Matrix of minimal distances

```
0, 1, 1, 2, ∞, ∞
∞, 0, 2, 1, ∞, ∞
∞, 1, 0, 2, ∞, ∞
∞, 2, 1, 0, ∞, ∞
∞, 3, 2, 1, 0, 1
∞, ∞, ∞, ∞, ∞, 0
```

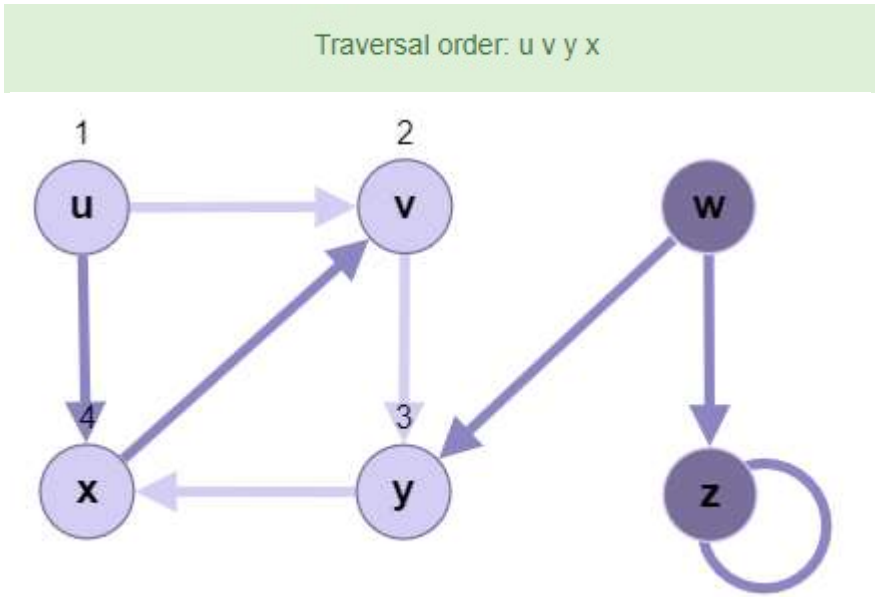
Fuente: http://graphonline.ru/en/?graph=vAMWxnUNldVxbhtfZZcst

Grafo con DFS aplicado:

Salida de nuestra implementación:

```
~ DFS ~
u -> v -> y -> x
```

Validación adicional con recurso online:



Matrices asociadas:

Adjacency Matrix

Setup adjacency matrix.

```
0, 1, 1, 0, 0, 0,
0, 0, 0, 1, 0, 0,
0, 1, 0, 0, 0, 0,
0, 0, 1, 0, 0, 0,
0, 0, 0, 1, 0, 1,
0, 0, 0, 0, 0, 1,
```

Incidence matrix

Set up incidence matrix.

```
1, 1, 0, 0, 0, 0, 0, 0
-1, 0, -1, 0, 1, 0, 0, 0
0, -1, 1, -1, 0, 0, 0, 0
0, 0, 0, 1, -1, -1, 0, 0
0, 0, 0, 0, 0, 1, 1, 0
0, 0, 0, 0, 0, 0, -1, 1
```

Distance matrix

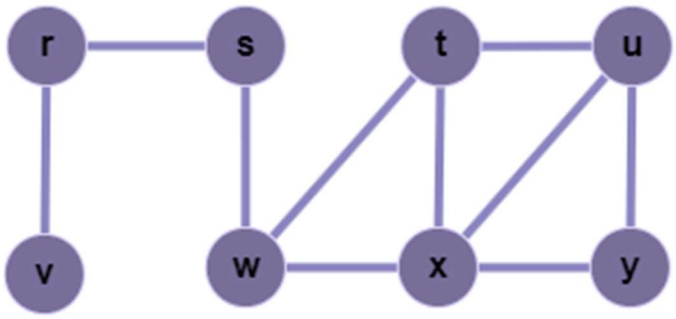
Matrix of minimal distances

```
0, 1, 1, 2, ∞, ∞
∞, 0, 2, 1, ∞, ∞
∞, 1, 0, 2, ∞, ∞
∞, 2, 1, 0, ∞, ∞
∞, 3, 2, 1, 0, 1
∞, ∞, ∞, ∞, ∞, 0
```

Fuente: http://graphonline.ru/en/?graph=vAMWxnUNldVxbhtfZZcst

BFS

Grafo de referencia:



Matrices:

Adjacency Matrix

Setup adjacency matrix.

0,	1,	0,	0,	1,	0,	0,	0,
1,	0,	0,	0,	0,	1,	0,	0,
0,	0,	0,	1,	0,	1,	1,	0,
0,	0,	1,	0,	0,	0,	1,	1,
1,	0,	0,	0,	0,	0,	0,	0,
0,	1,	1,	0,	0,	0,	1,	0,
0,	0,	1,	1,	0,	1,	0,	1,
0,	0,	0,	1,	0,	0,	1,	0,

Incidence matrix

Set up incidence matrix. Use

1,	1,	0,	0,	0,	0,	0,	0,	0,	0
1,	0,	1,	0,	0,	0,	0,	0,	0,	0
0,	0,	0,	0,	1,	0,	0,	0,	1,	1
0,	0,	0,	0,	0,	1,	0,	1,	1,	0
0,	1,	0,	0,	0,	0,	0,	0,	0,	0
0,	0,	1,	1,	1,	0,	0,	0,	0,	0
0,	0,	0,	1,	0,	1,	1,	0,	0,	1
0,	0,	0,	0,	0,	0,	1,	1,	0,	0

Distance matrix

Matrix of minimal distances

0,	1,	3,	4,	1,	2,	3,	4
1,	0,	2,	3,	2,	1,	2,	3
3,	2,	0,	1,	4,	1,	1,	2
4,	3,	1,	0,	5,	2,	1,	1
1,	2,	4,	5,	0,	3,	4,	5
2,	1,	1,	2,	3,	0,	1,	2
3,	2,	1,	1,	4,	1,	0,	1
4,	3,	2,	1,	5,	2,	1,	0

Fuente: http://graphonline.ru/en/?graph=wSWoURROiaxLUjkJZZcst

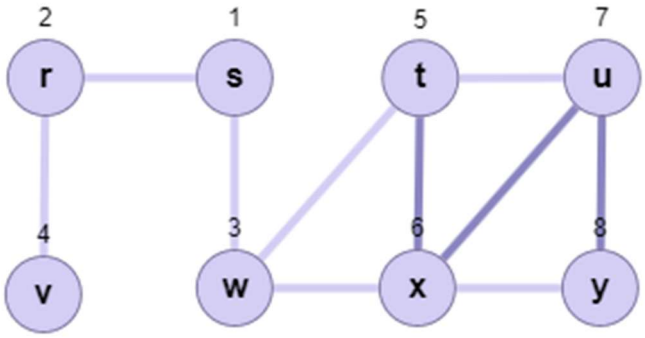
Grafo con BFS aplicado:

Salida de nuestra implementación:

```
~ BFS ~
Nodo  |  Padre
------|------
r     |  s
s     |  None
t     |  w
u     |  t
v     |  r
w     |  s
x     |  w
y     |  x
```

Validación adicional con recurso online:

Traversal order: s r w v t x u y



Matrices:

Adjacency Matrix

Setup adjacency matrix.

```
0, 1, 0, 0, 1, 0, 0, 0,
1, 0, 0, 0, 0, 1, 0, 0,
0, 0, 0, 1, 0, 1, 1, 0,
0, 0, 1, 0, 0, 0, 1, 1,
1, 0, 0, 0, 0, 0, 0, 0,
0, 1, 1, 0, 0, 0, 1, 0,
0, 0, 1, 1, 0, 1, 0, 1,
0, 0, 0, 1, 0, 0, 1, 0,
```

Incidence matrix

Set up incidence matrix. Use

```
1, 1, 0, 0, 0, 0, 0, 0, 0, 0
1, 0, 1, 0, 0, 0, 0, 0, 0, 0
0, 0, 0, 0, 1, 0, 0, 0, 1, 1
0, 0, 0, 0, 0, 1, 0, 1, 1, 0
0, 1, 0, 0, 0, 0, 0, 0, 0, 0
0, 0, 1, 1, 1, 0, 0, 0, 0, 0
0, 0, 0, 1, 0, 1, 1, 0, 0, 1
0, 0, 0, 0, 0, 0, 1, 1, 0, 0
```

Distance matrix

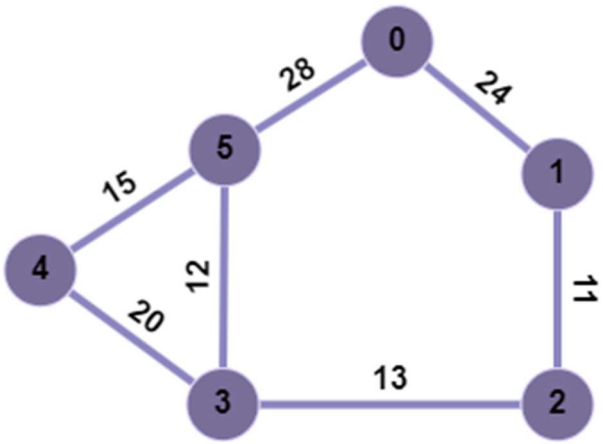
Matrix of minimal distances

```
0, 1, 3, 4, 1, 2, 3, 4
1, 0, 2, 3, 2, 1, 2, 3
3, 2, 0, 1, 4, 1, 1, 2
4, 3, 1, 0, 5, 2, 1, 1
1, 2, 4, 5, 0, 3, 4, 5
2, 1, 1, 2, 3, 0, 1, 2
3, 2, 1, 1, 4, 1, 0, 1
4, 3, 2, 1, 5, 2, 1, 0
```

Fuente: http://graphonline.ru/en/?graph=yCuHAcQcfIJliYZCZZcst

Floyd

Grafo de referencia:



Matrices:

Adjacency Matrix

Setup adjacency matrix.

```
0, 24, 0, 0, 0, 28,
24, 0, 11, 0, 0, 0,
0, 11, 0, 13, 0, 0,
0, 0, 13, 0, 20, 12,
0, 0, 0, 20, 0, 15,
28, 0, 0, 12, 15, 0,
```

Incidence matrix

Set up incidence matrix.

```
24, 0, 0, 0, 0, 28, 0
24, 11, 0, 0, 0, 0, 0
0, 11, 13, 0, 0, 0, 0
0, 0, 13, 20, 0, 0, 12
0, 0, 0, 20, 15, 0, 0
0, 0, 0, 0, 15, 28, 12
```

Distance matrix

Matrix of minimal distances

```
0, 24, 35, 40, 43, 28
24, 0, 11, 24, 44, 36
35, 11, 0, 13, 33, 25
40, 24, 13, 0, 20, 12
43, 44, 33, 20, 0, 15
28, 36, 25, 12, 15, 0
```

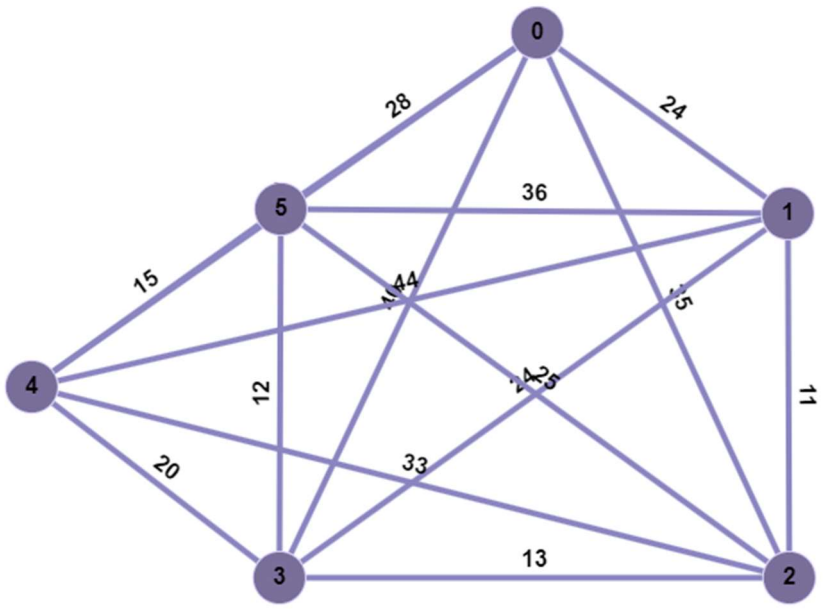
Fuente: http://graphonline.ru/en/?graph=OojKceMCLxkOiUqCZZcst

Grafo con Floyd aplicado:

Salida de nuestra implementación:

```
~ Floyd ~
[[0, None], [24, '0'], [35, '1'], [40, '5'], [43, '5'], [28, '0']]
[[24, '1'], [0, None], [11, '1'], [24, '2'], [44, '3'], [36, '3']]
[[35, '1'], [11, '2'], [0, None], [13, '2'], [33, '3'], [25, '3']]
[[40, '5'], [24, '2'], [13, '3'], [0, None], [20, '3'], [12, '3']]
[[43, '5'], [44, '3'], [33, '3'], [20, '4'], [0, None], [15, '4']]
[[28, '5'], [36, '3'], [25, '3'], [12, '5'], [15, '5'], [0, None]]
```

Validación adicional con recurso online:



Matrices:

Adjacency Matrix

Setup adjacency matrix.

```
0, 24, 35, 40, 43, 28,
24, 0, 11, 24, 44, 36,
35, 11, 0, 13, 33, 25,
40, 24, 13, 0, 20, 12,
43, 44, 33, 20, 0, 15,
28, 36, 25, 12, 15, 0,
```

Incidence matrix

Set up incidence matrix. Use comma "," as separat

```
24, 35, 40, 43, 28, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
24, 0, 0, 0, 0, 11, 24, 44, 36, 0, 0, 0, 0, 0, 0
0, 35, 0, 0, 0, 11, 0, 0, 0, 13, 33, 25, 0, 0, 0
0, 0, 40, 0, 0, 0, 24, 0, 0, 13, 0, 0, 20, 12, 0
0, 0, 0, 43, 0, 0, 0, 44, 0, 0, 33, 0, 20, 0, 15
0, 0, 0, 0, 28, 0, 0, 0, 36, 0, 0, 25, 0, 12, 15
```

Distance matrix

Matrix of minimal distances

```
0, 24, 35, 40, 43, 28,
24, 0, 11, 24, 44, 36,
35, 11, 0, 13, 33, 25,
40, 24, 13, 0, 20, 12,
43, 44, 33, 20, 0, 15,
28, 36, 25, 12, 15, 0,
```

Fuente: http://graphonline.ru/en/?graph=YAcKumzAWSKnWOGGZZcst