Repaso Final 1

CS3102 EDA

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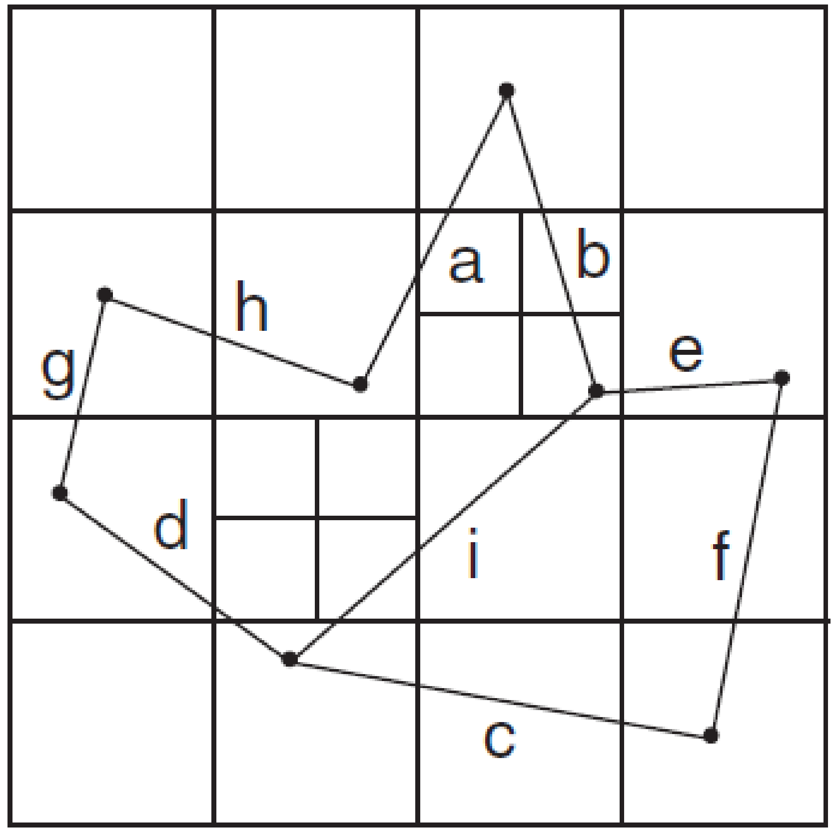
Índice

1. PM_1-QuadTree
2. PM_2-QuadTree
3. PM_3-QuadTree
4. Hamming
5. Levenshtein
6. Overlap
7. Weighted Overlap
8. SS-Tree
9. Well-Separated Pair Decomposition (WSPD)
10. M-Tree
11. Hull of Foci

1. PM_1-QuadTree

PM_1-*QuadTree*



PM_1 Quadtree

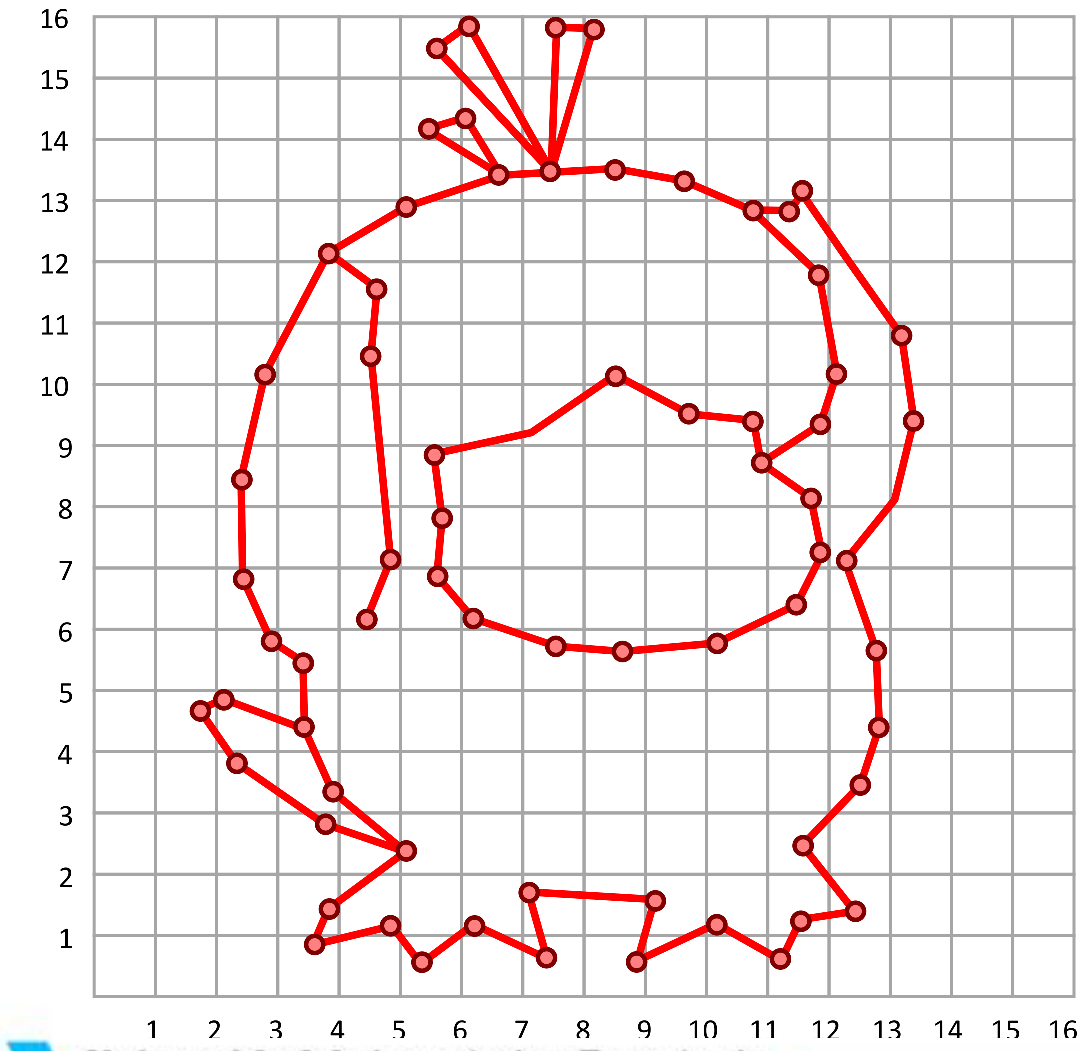
Regla de partición

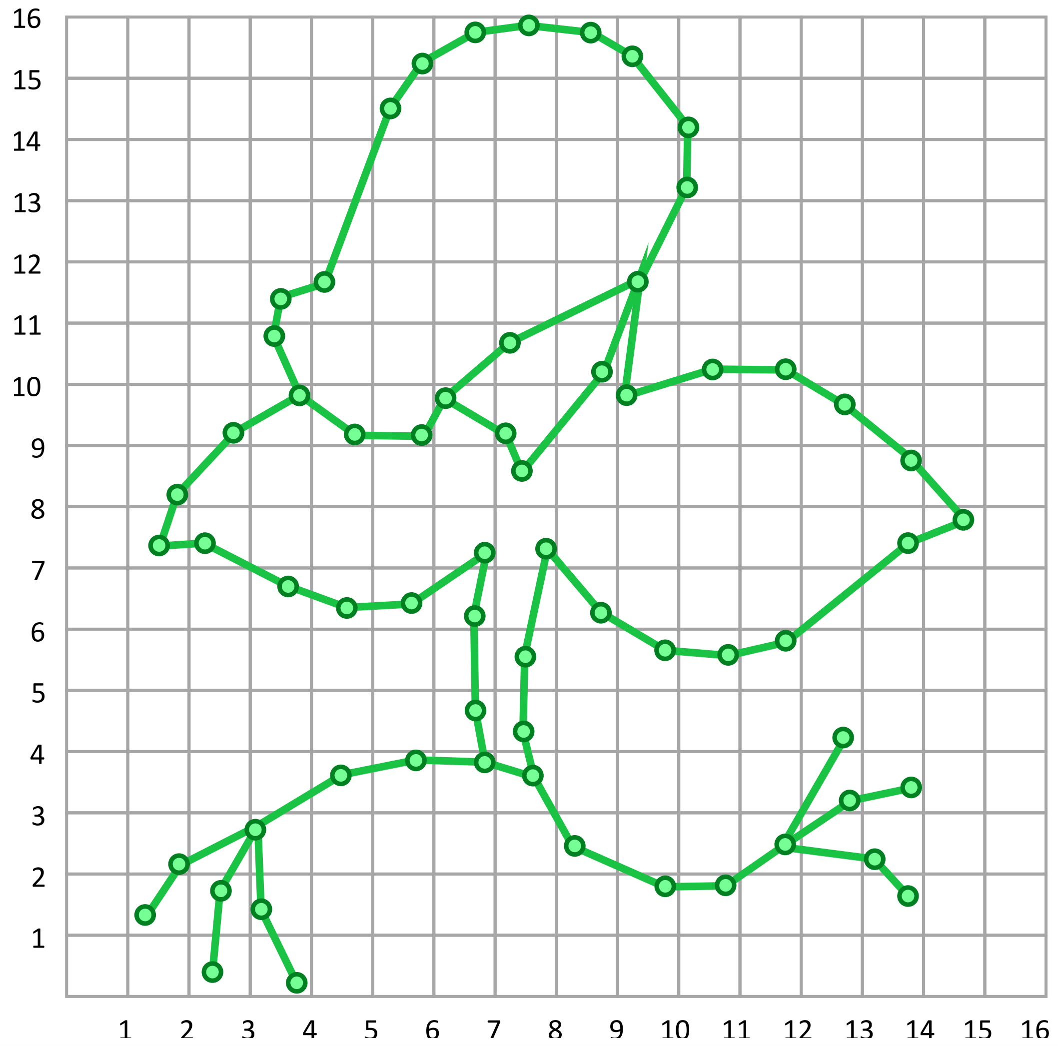
La partición se produce siempre que un bloque contenga más de un segmento de línea, a menos que los segmentos de línea incidan todos en el mismo vértice, que también se encuentra en el mismo bloque.

PM$_1$-*QuadTree*

1	2	3

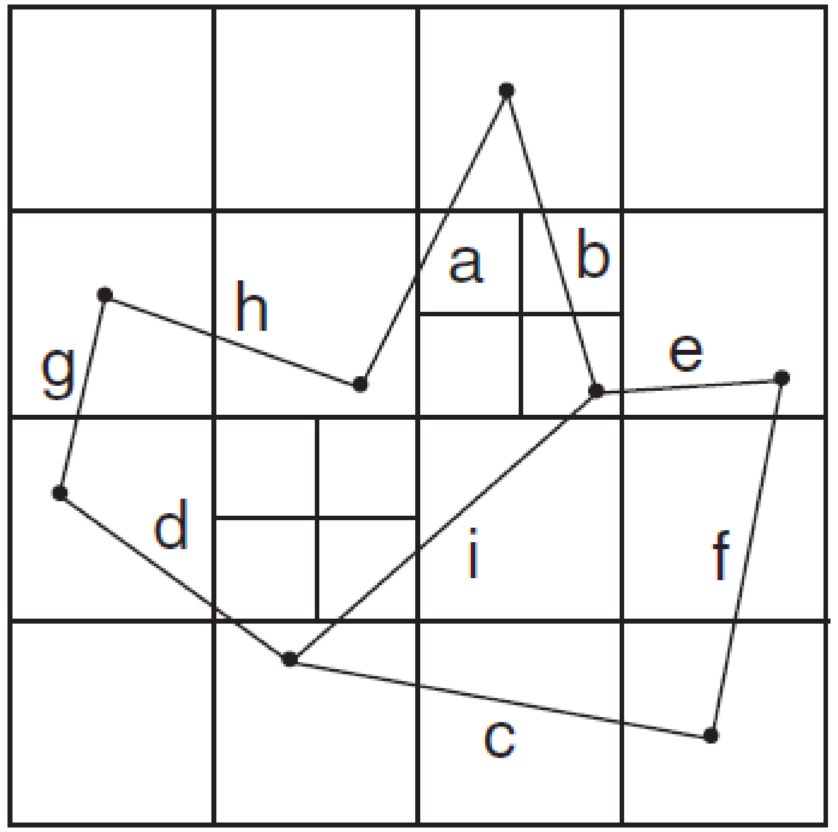
PM$_1$-*QuadTree*





2. PM_2-QuadTree

PM_2-*QuadTree*



PM_2 Quadtree

Regla de partición

La partición se produce siempre que un bloque contenga más de un segmento de línea, a menos que los segmentos de línea incidan todos en el mismo vértice, independientemente de su ubicación.

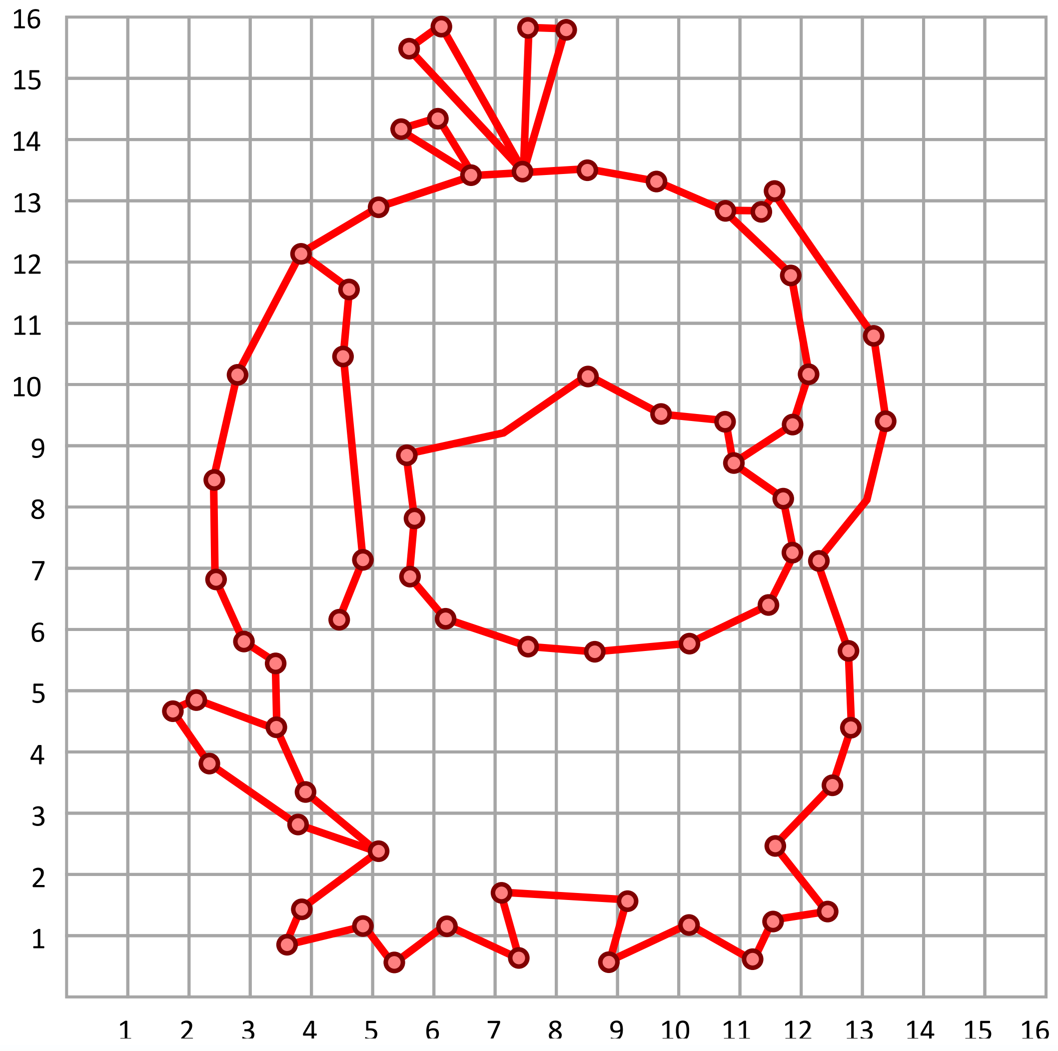
PM_2-*QuadTree*

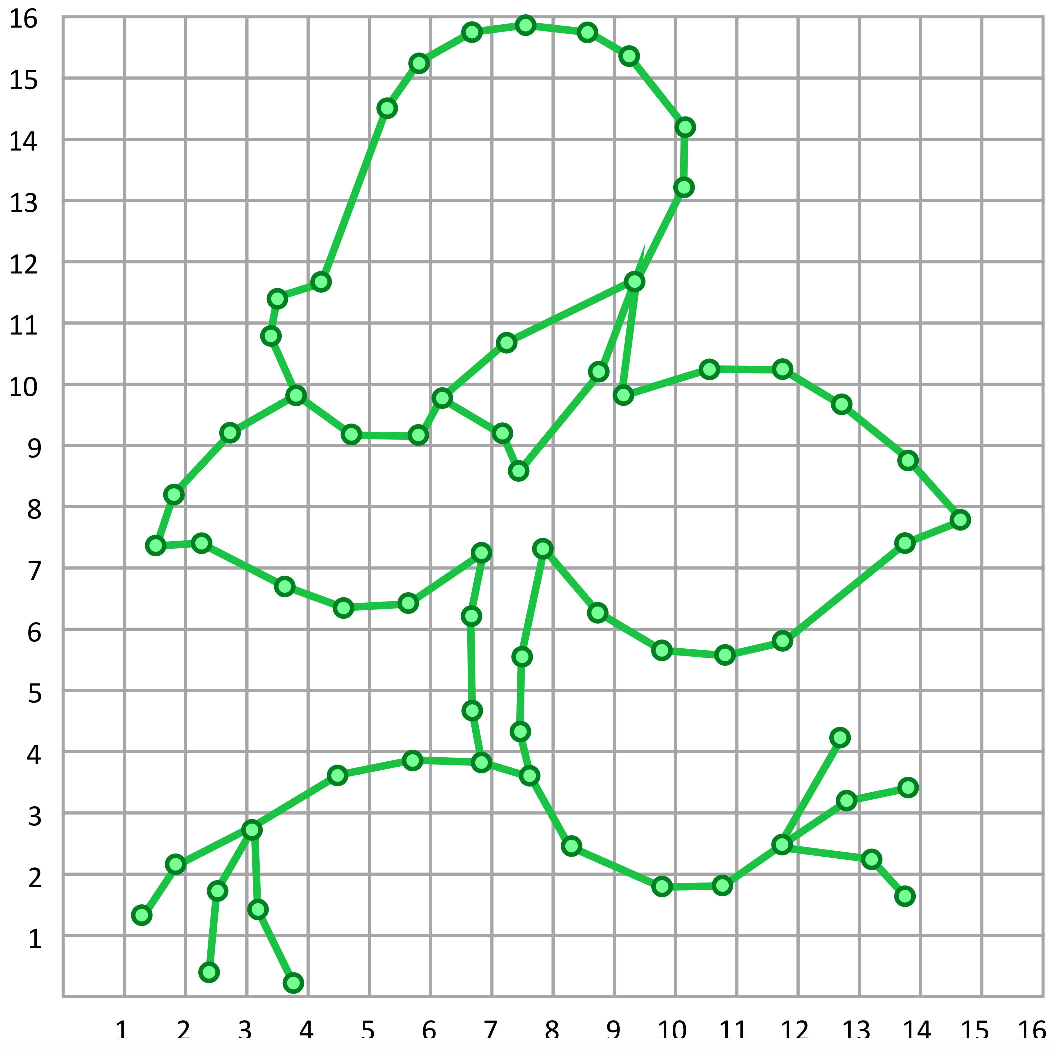
1

2

3

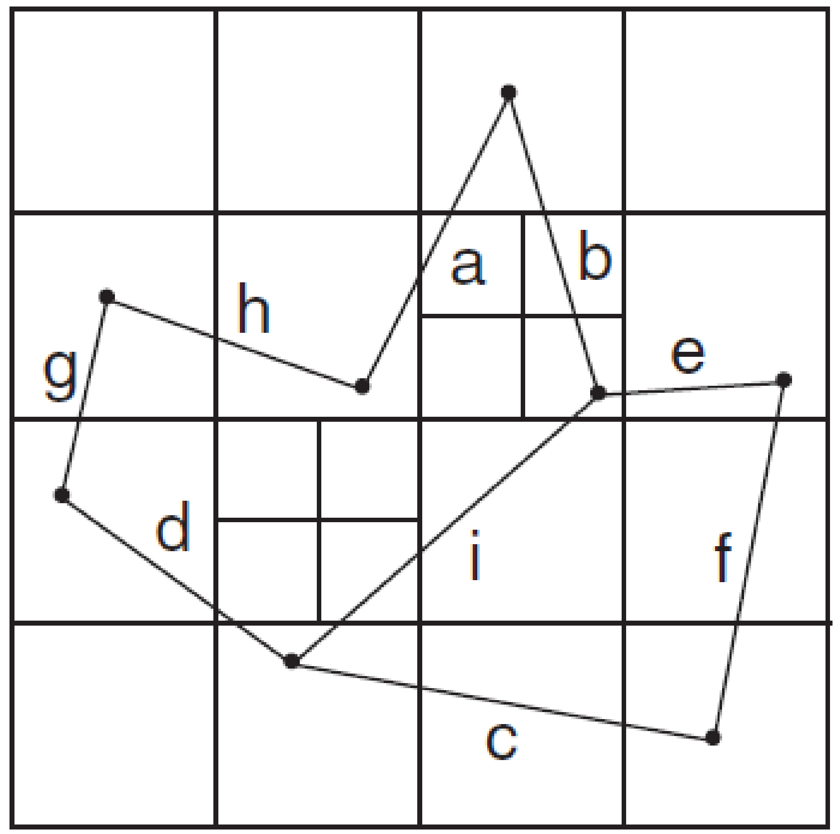
PM$_2$-*QuadTree*





3. PM_3-QuadTree

PM_3-*QuadTree*



PM$_3$ Quadtree

Regla de partición

La partición se produce cuando un bloque contiene más de un vértice.

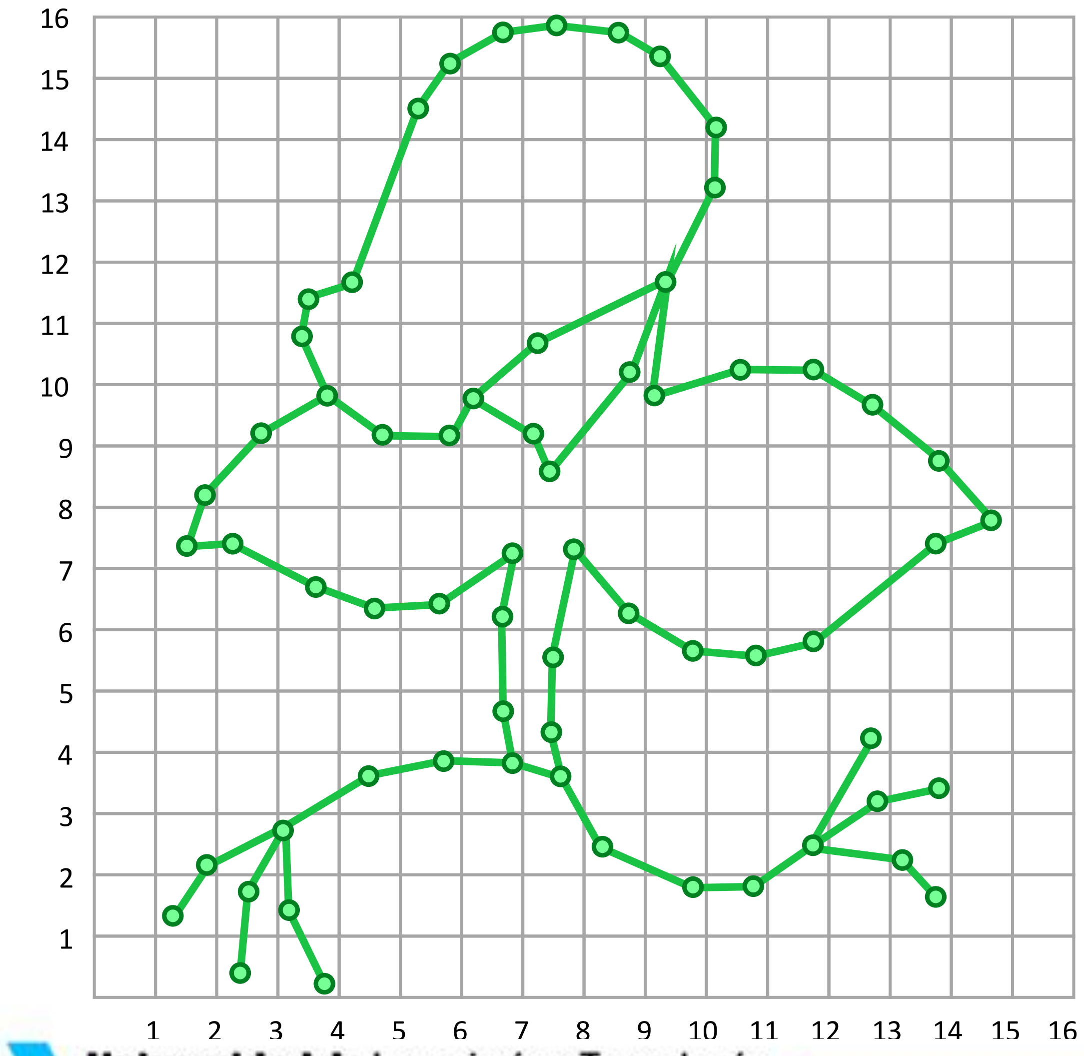
PM$_3$-*QuadTree*

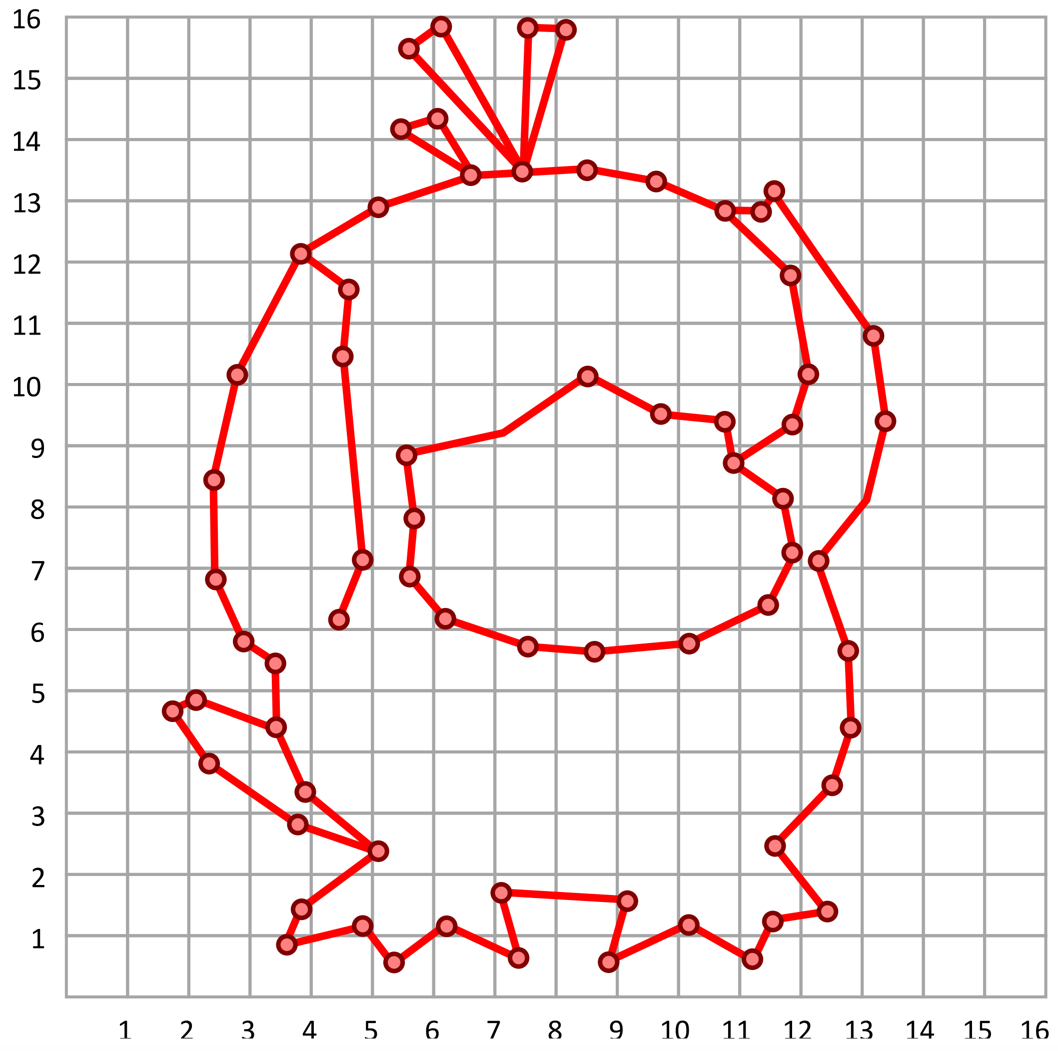
1

2

3

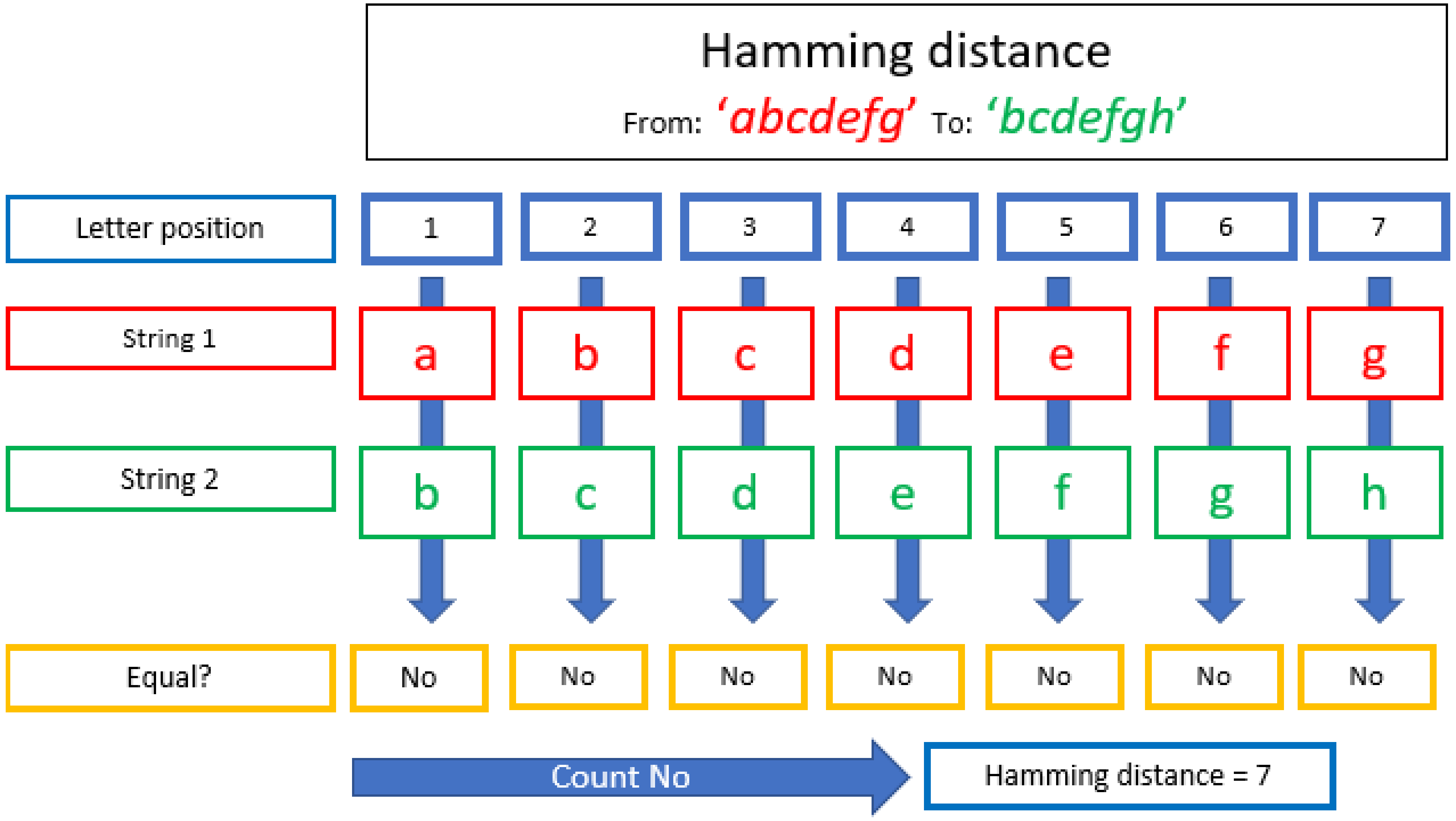
$\mathbf{PM_3}$-*QuadTree*





4. Hamming

Hamming



Hamming distance
From: 'abcdefg' To: 'bcdefgh'
Letter position
1
2
3
4
5
6
7
String 1
a
b
c
d
e
f
g
String 2
b
c
d
e
f
g
h
Equal?
No
No
No
No
No
No
No
Count No
Hamming distance = 7

Ham*ming*

1

2

3

Ham*ming*

Madagascar; Montenegro

Bangladesh; Mauritania

Micronesia; Mozambique


5. Levenshtein

Leven*shtein*

$$\operatorname{lev}(a,b)=\begin{cases} |a| & \text{if } |b|=0,\\ |b| & \text{if } |a|=0,\\ \operatorname{lev}\big(\operatorname{tail}(a),\operatorname{tail}(b)\big) & \text{if } a[0]=b[0],\\ 1+\min\begin{cases}\operatorname{lev}\big(\operatorname{tail}(a),b\big)\\ \operatorname{lev}\big(a,\operatorname{tail}(b)\big)\\ \operatorname{lev}\big(\operatorname{tail}(a),\operatorname{tail}(b)\big)\end{cases} & \text{otherwise,}\end{cases}$$

		h	e	l	l	o
	0	1	2	3	4	5
k	1	1	2	3	4	5
e	2	2	1	2	3	4
l	3	3	2	1	2	2
m	4	4	3	2	2	3

Leven_shtein_

1	2	3

Leven*shtein*

	B	R	A	S	I	L
E						
S						
P						
A						
Ñ						
A						

	C	A	N	A	D	A
C						
H						
I						
P						
R						
E						

	E	G	I	P	T	O
G						
R						
E						
C						
I						
A						

6. Overlap

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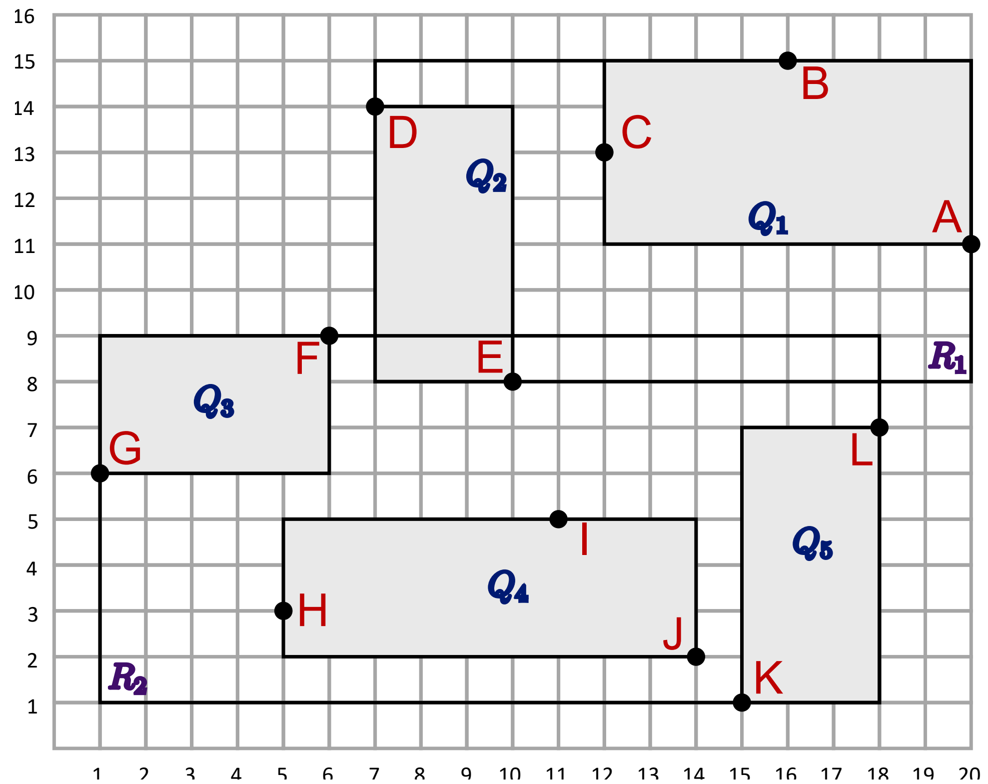
Over*lap*

$$O = \frac{\bigcup_{i \neq j} R_i \cap R_j}{\bigcup_i R_i}$$



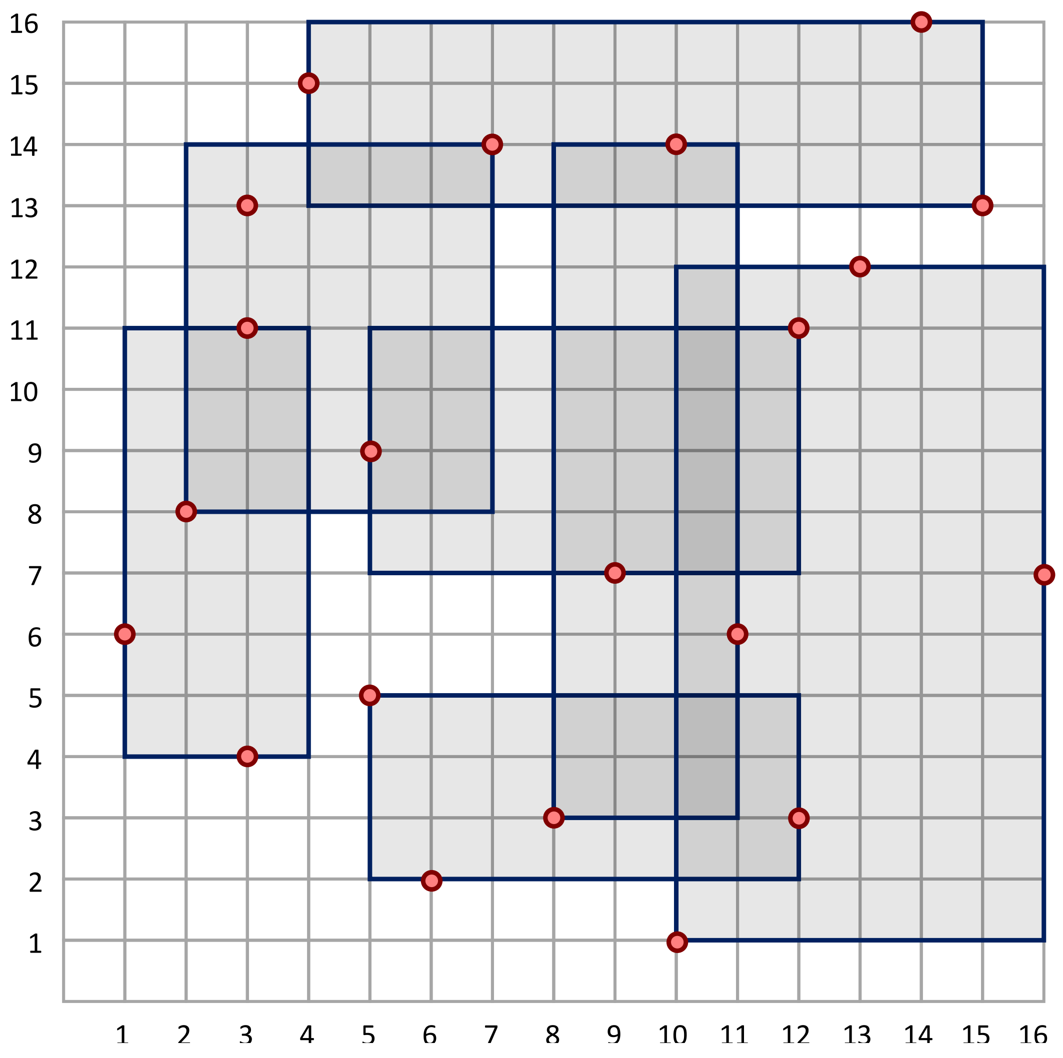
Over_lap_

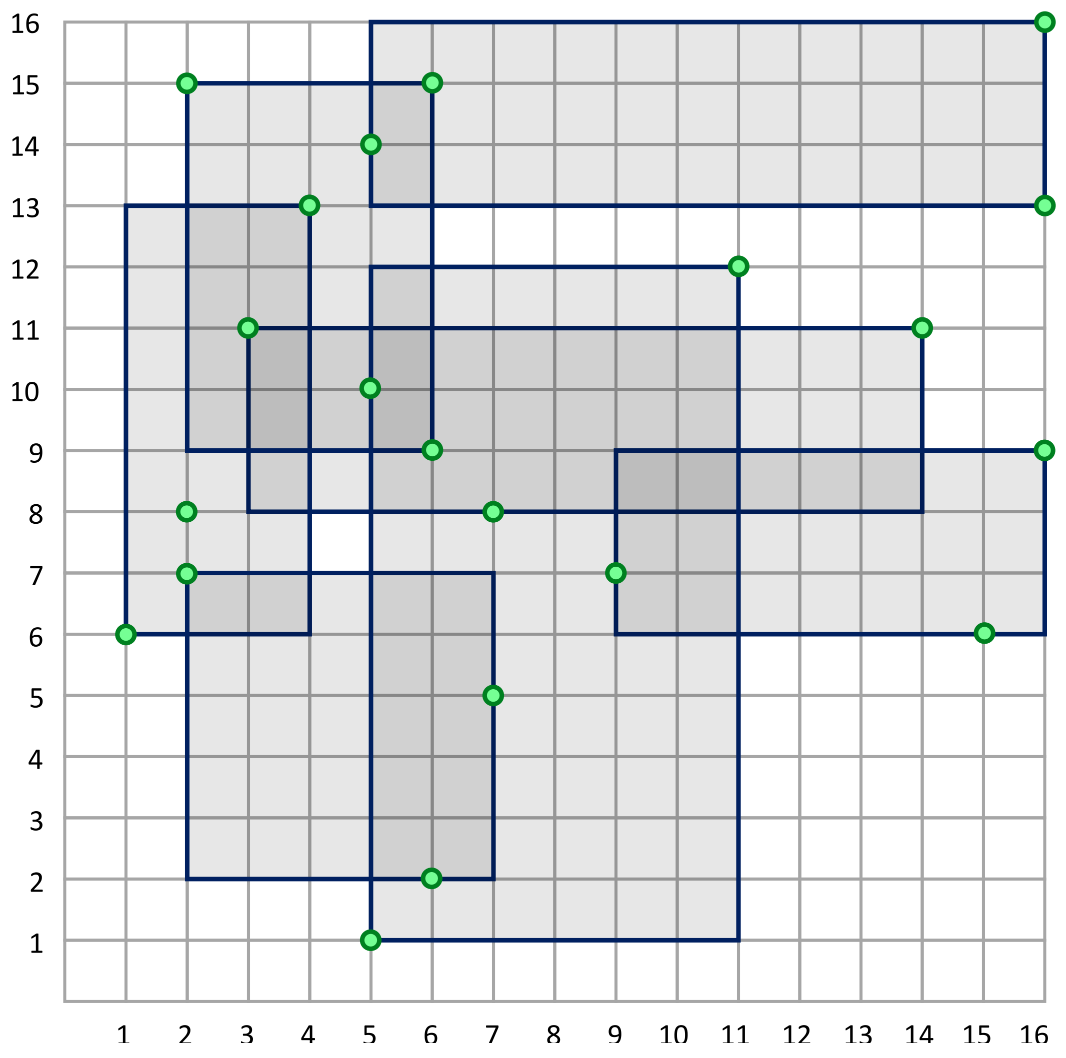
1

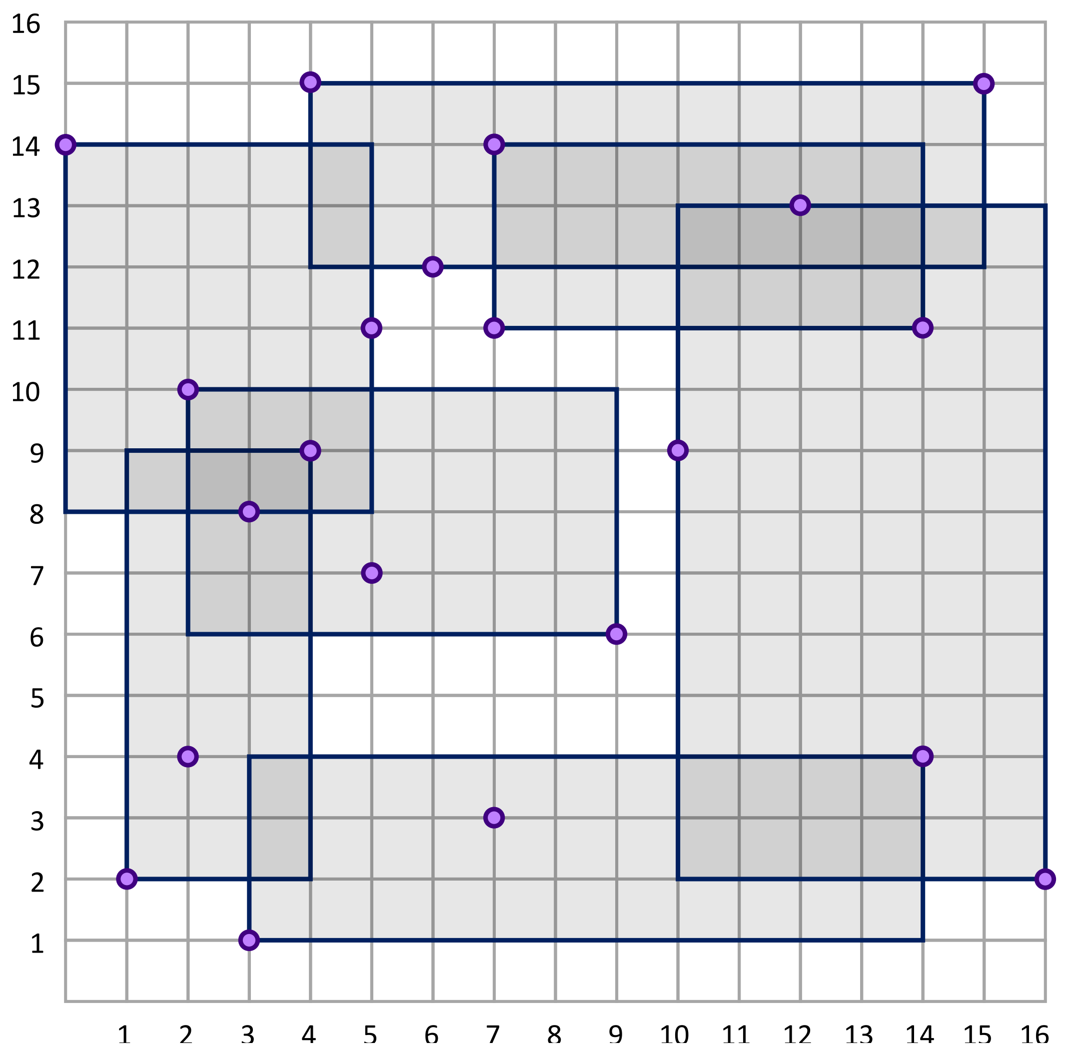
2

3

Over*lap*

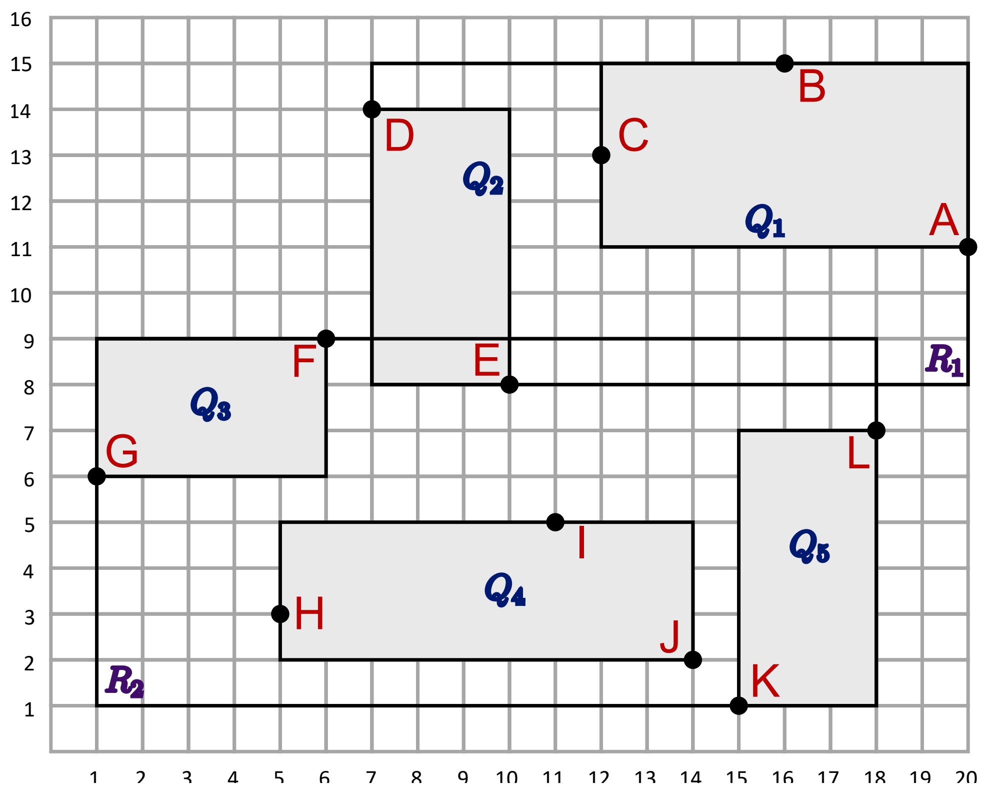






7. Weighted Overlap

Weighted *Overlap*

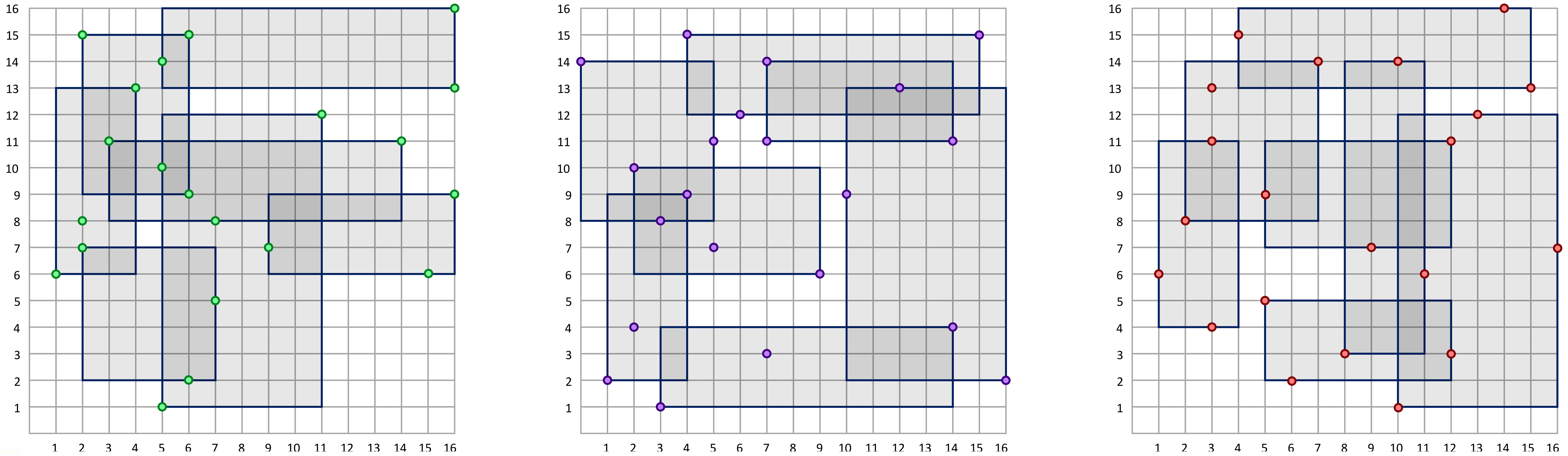


$$\mathrm{WO} = \frac{\{p | p \in \bigcup_{i \neq j} R_i \cap R_j\}}{\{p | p \in \bigcup_i R_i\}}$$

Weighted *Overlap*

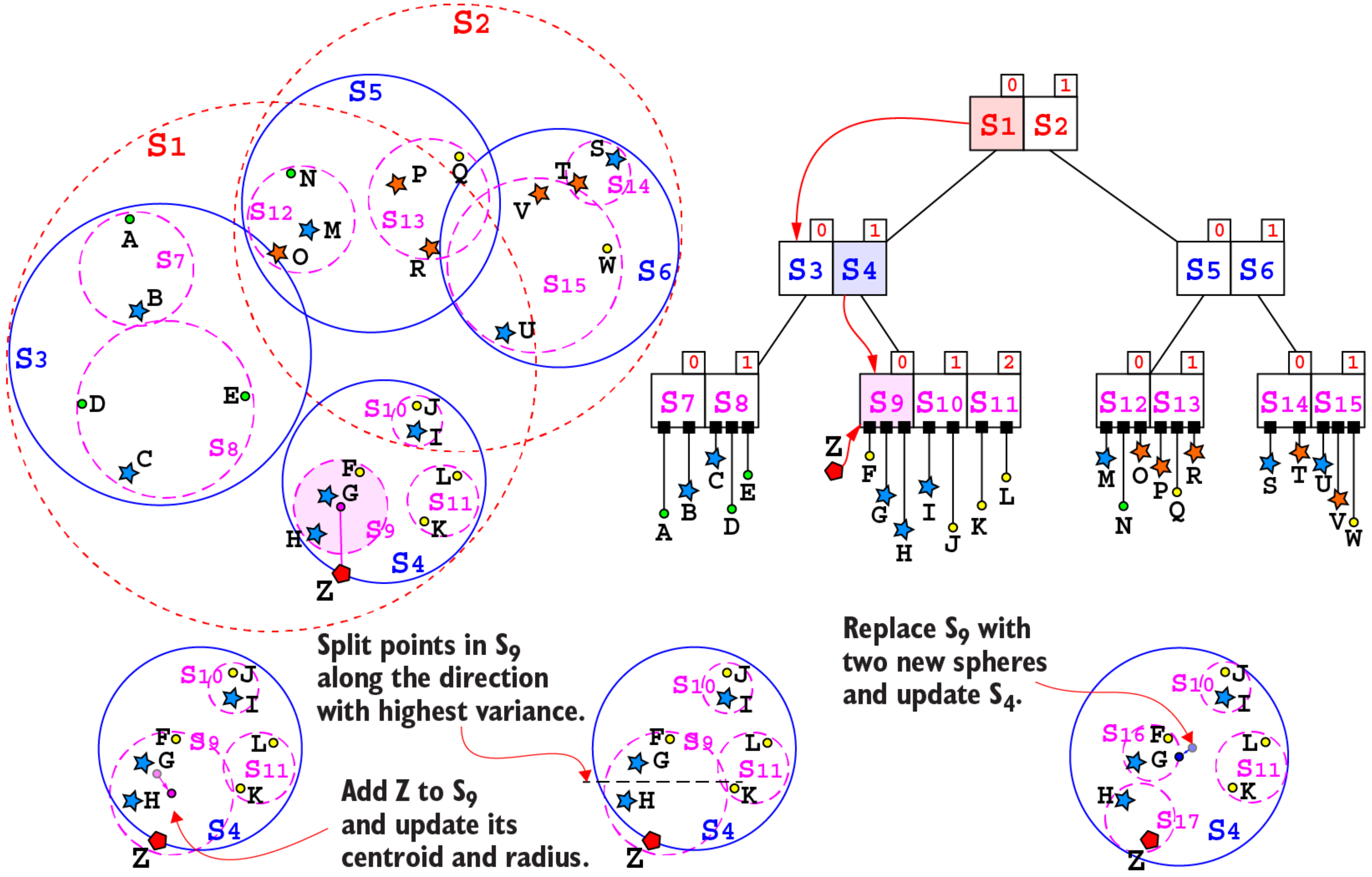
1	2	3

Weighted *Overlap*



8. ss-Tree

SS-*Tree*


Split points in S_9
along the direction
with highest variance.
Add Z to S_9
and update its
centroid and radius.
Replace S_9 with
two new spheres
and update S_4.

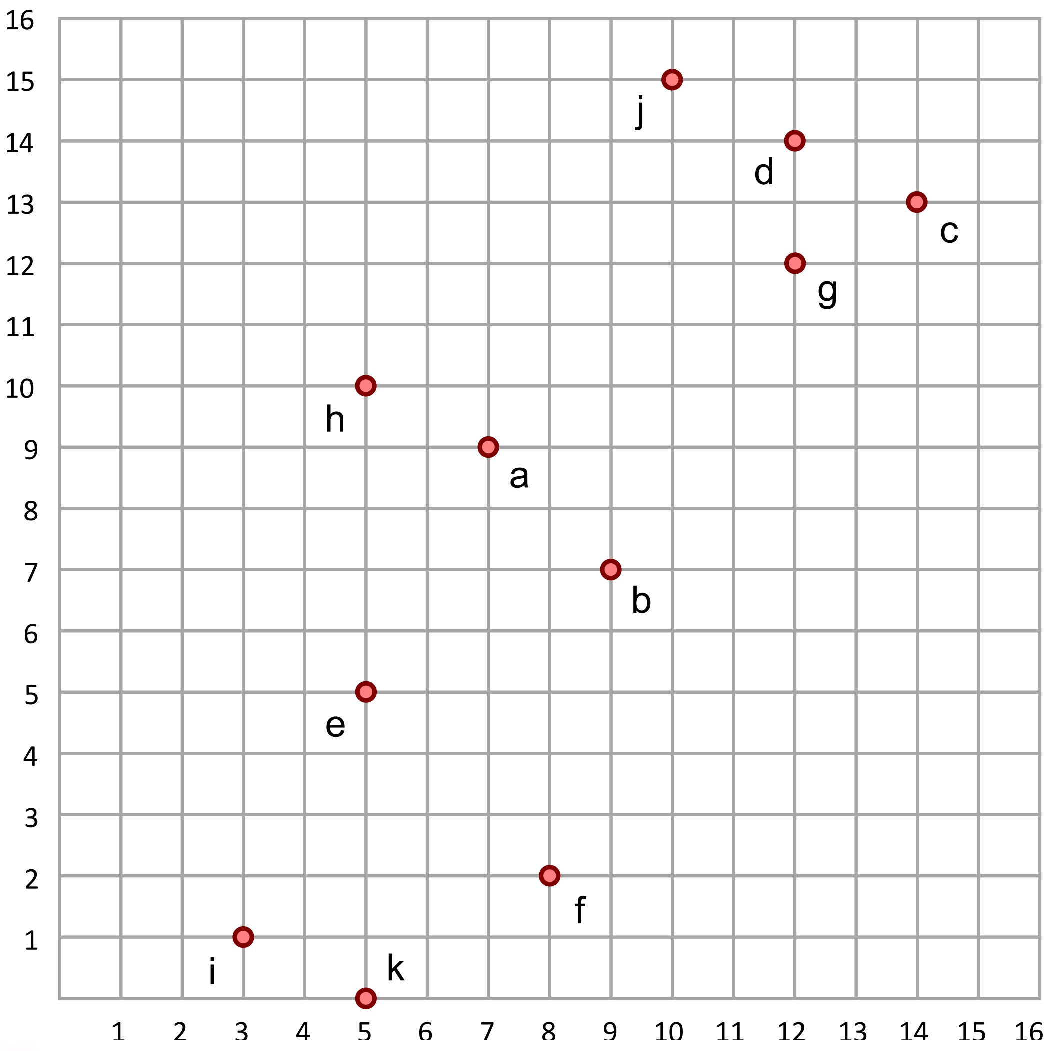
SS-*Tree*

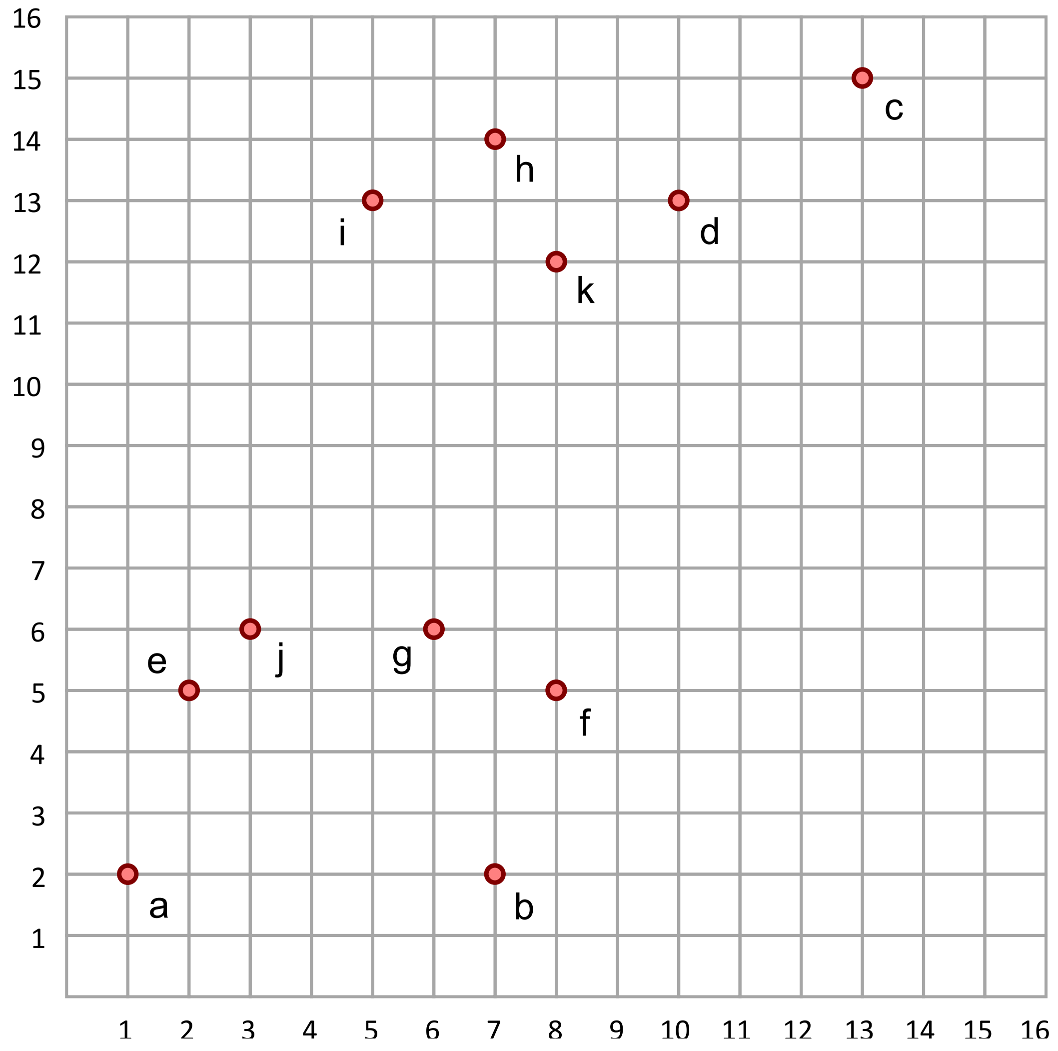
1

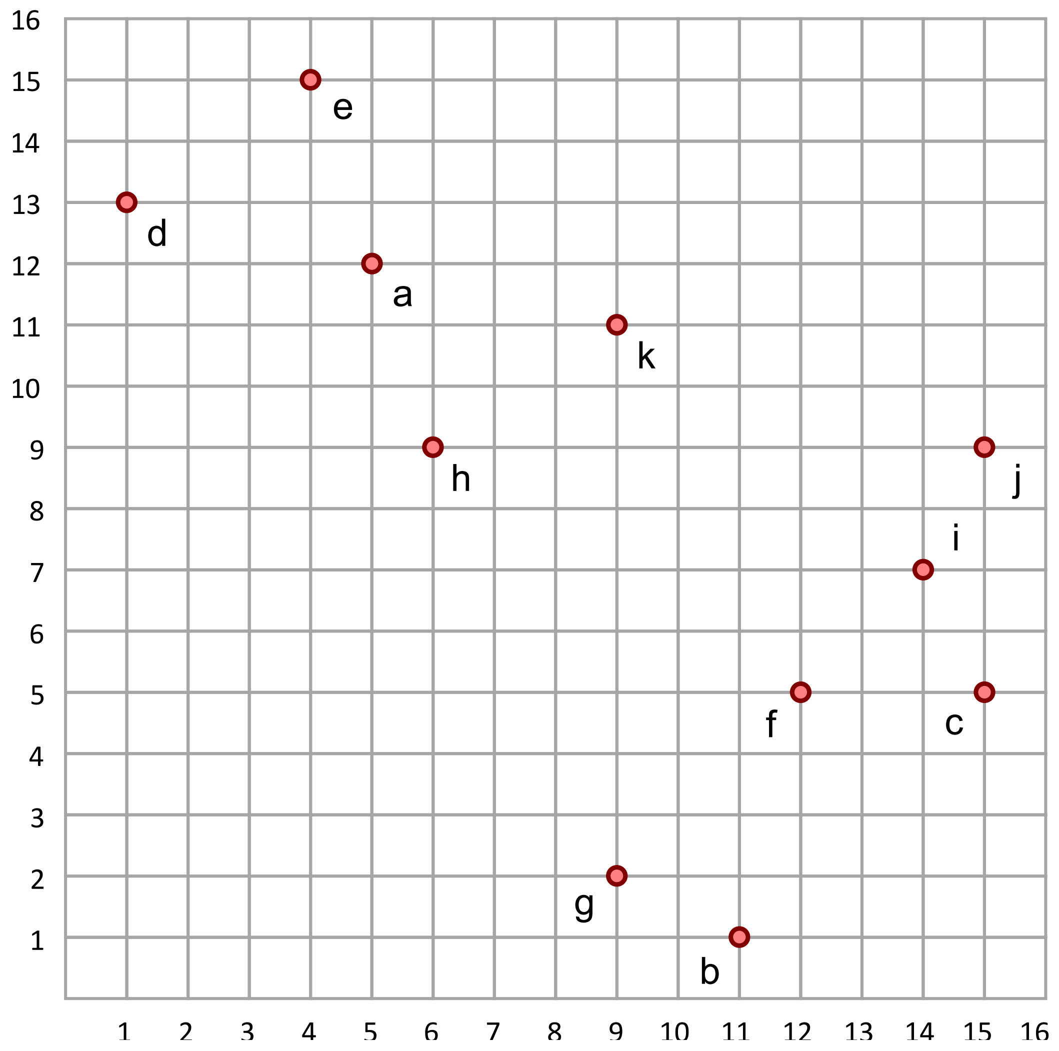
2

3

SS-Tree

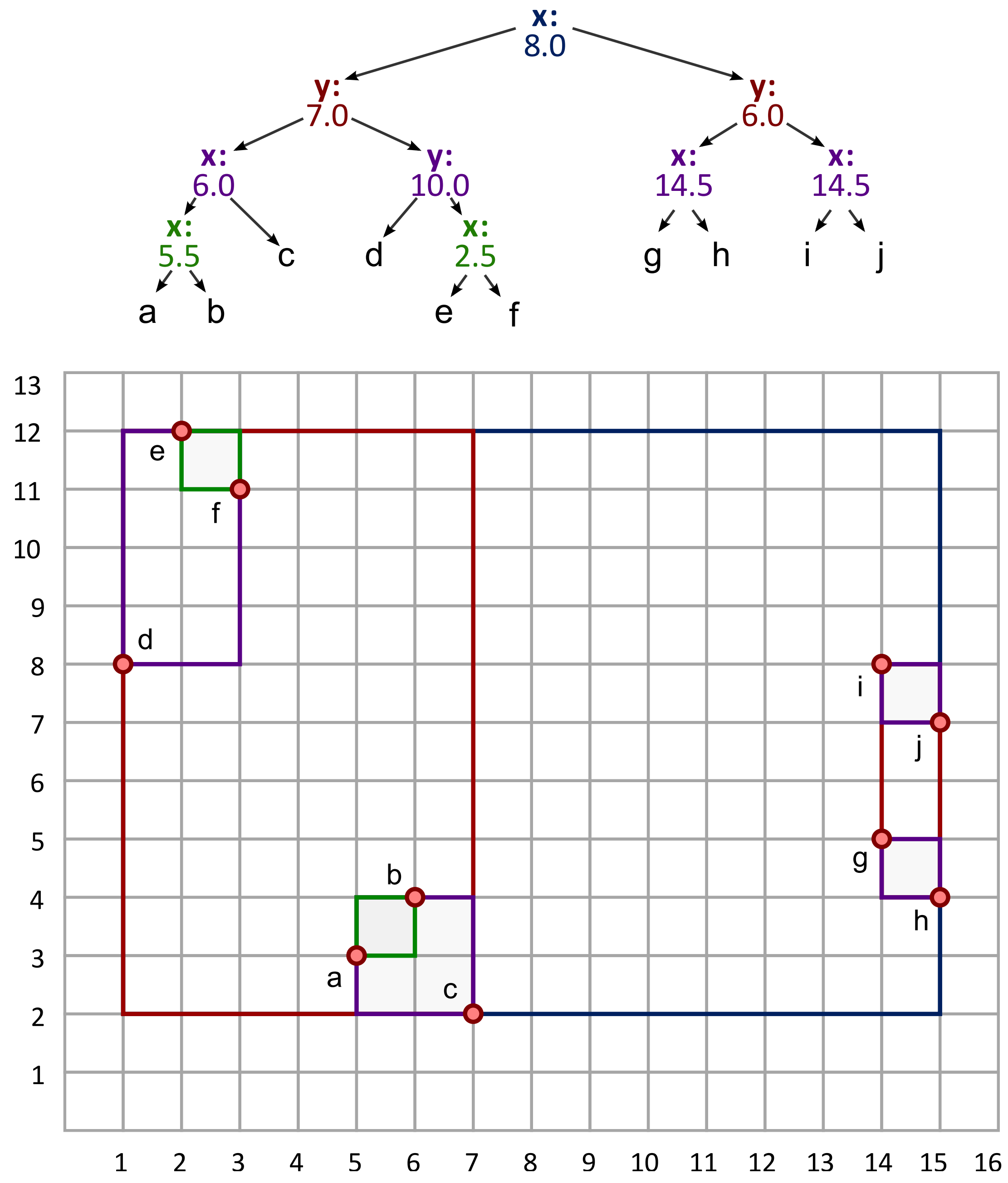






9. **Well-Separated Pair** Decomposition (WSPD)

Well-Separated Pair *Decomposition (WSPD)*



Revisar los hijos de todos los nodos internos

Verificar si son WSP

$$\{a, b, c\}, \{g, h, i, j\}$$
$$\{d, e, f\}, \{g, h, i, j\}$$
$$\{a, b, c\}, \{d, e, f\}$$
$$\{a, b\}, \{c\}$$

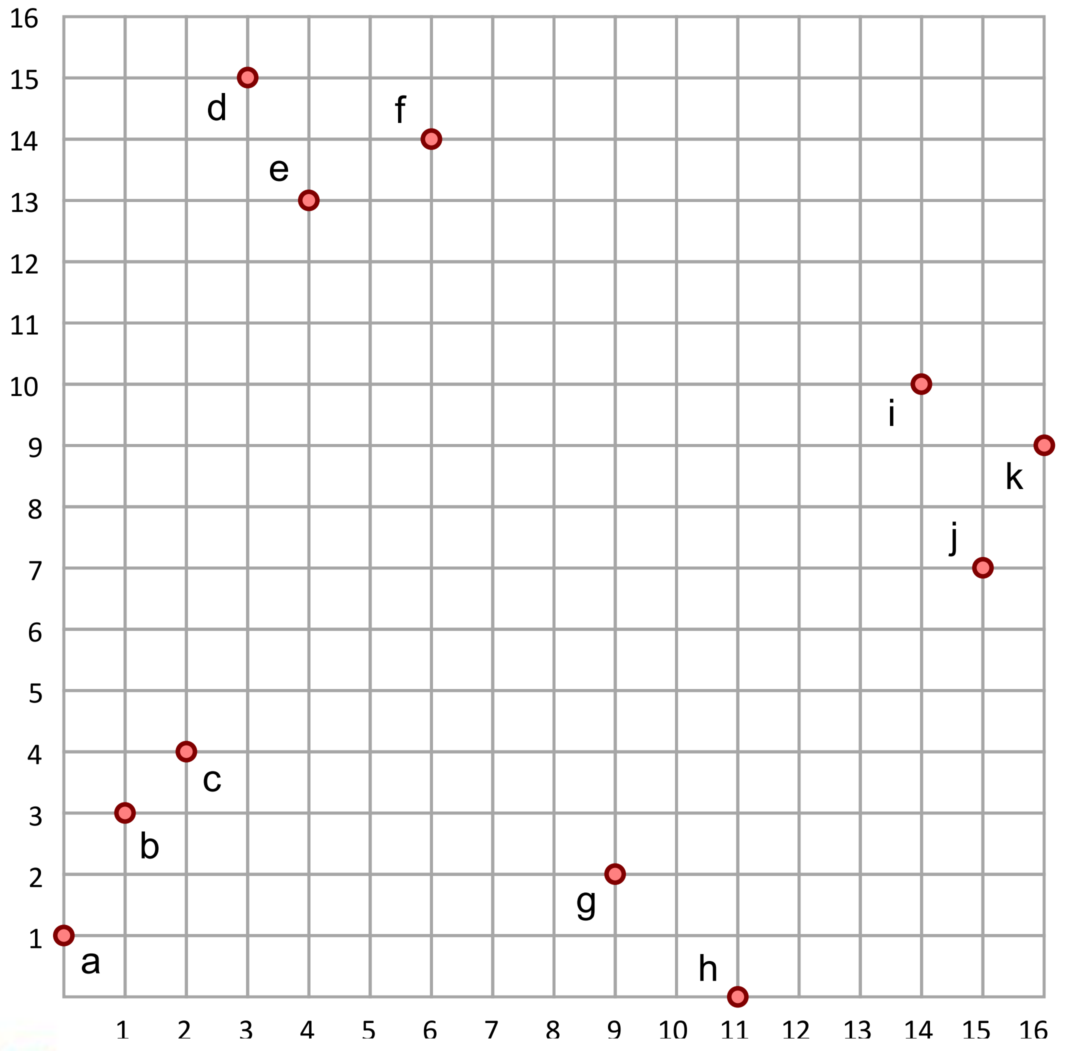
Well-Separated Pair *Decomposition (WSPD)*

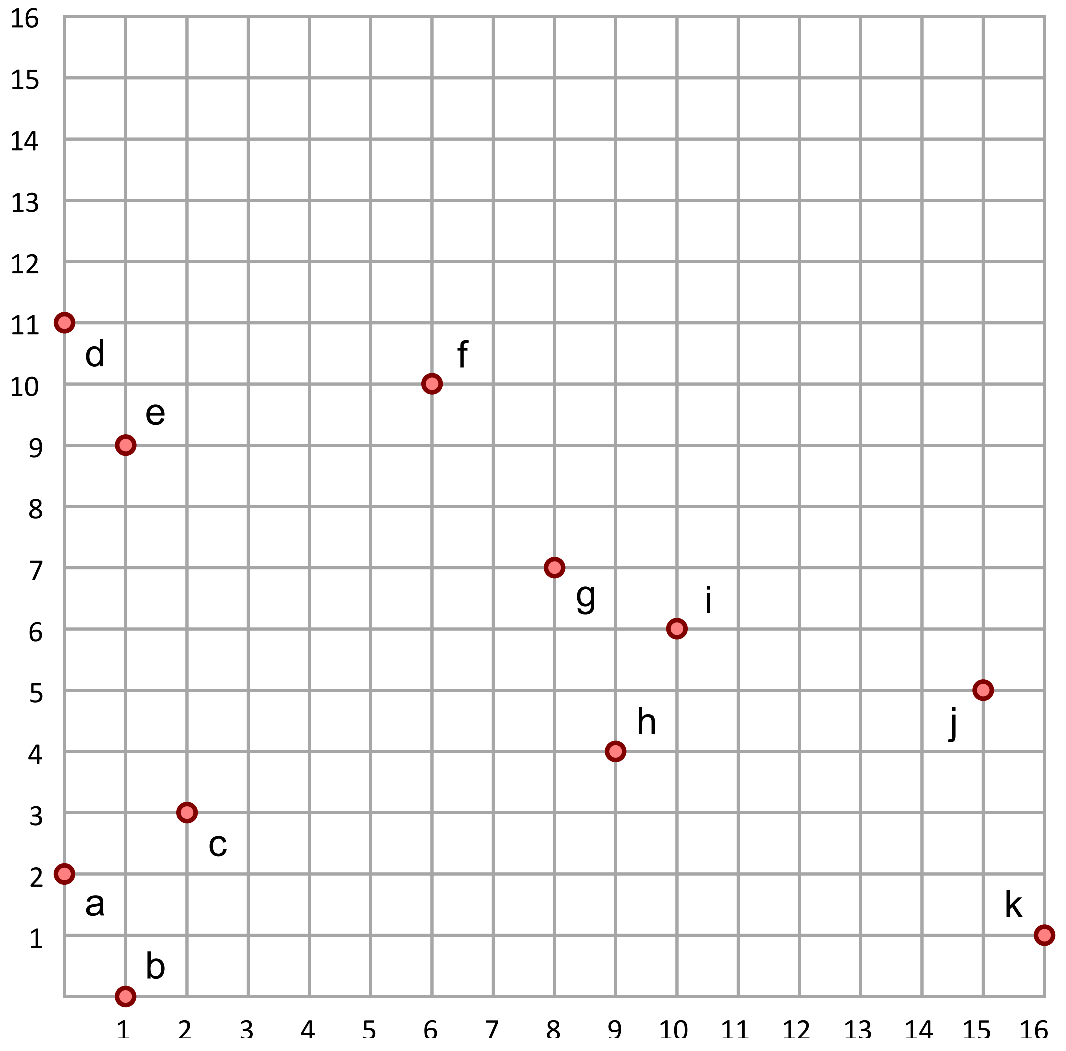
1

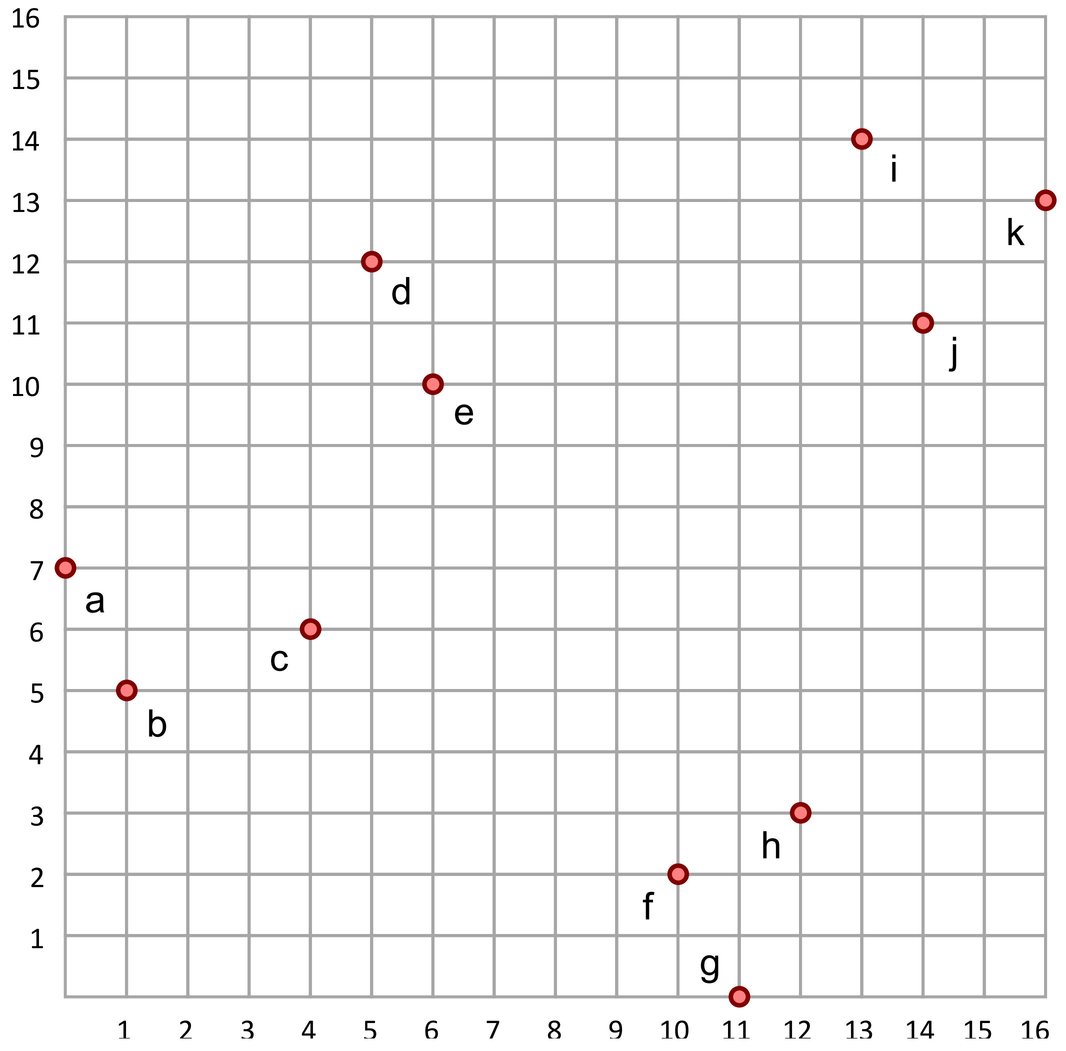
2

3

Well-Separated Pair *Decomposition (WSPD)*







10. M-Tree

M-*Tree*

Inserción

Insertar un nuevo objeto O_n:

- Desciende recursivamente por el árbol para localizar la hoja más adecuada para O_n
- En cada paso, acceda al subárbol con pivote p para el cual:
  - No se necesita ampliar el radio r_c, es decir, $d(O_n, p) \leq r_c$
    En caso de empate, elegir el que tenga el p más cercano a O_n
  - Minimizar la ampliación de r_c
- Al llegar al nodo hoja N entonces
  - **Si N no está lleno:** guardar O_n en N
  - **Si no:** split(N,O_n).

M-*Tree*

Split

- Sea S el conjunto que contiene todas las entradas de N y O_n
- Seleccionar los pivotes p_1 y p_2 de S
- Particionar S en S_1 y S_2 según p_1 y p_2
- Almacenar S_1 en N y S_2 en un nuevo nodo asignado N'
    - **Si N es raíz:**
        - Asignar una nueva raíz y almacenar allí las entradas de p_1, p_2
    - **Si no:** (deja que N_p y p_p sean el nodo y pivote padre de N)
        - Sustituir la entrada p_p por p_1
        - Si N_p está lleno, entonces **split**(N_p,p_2)
        - Sino, almacenar p_2 en el nodo N_p

M-*Tree*

Pivot selection policies

Aleatorio Completamente aleatorio

Mínima suma de radios

$$\min(r_1 + r_2)$$

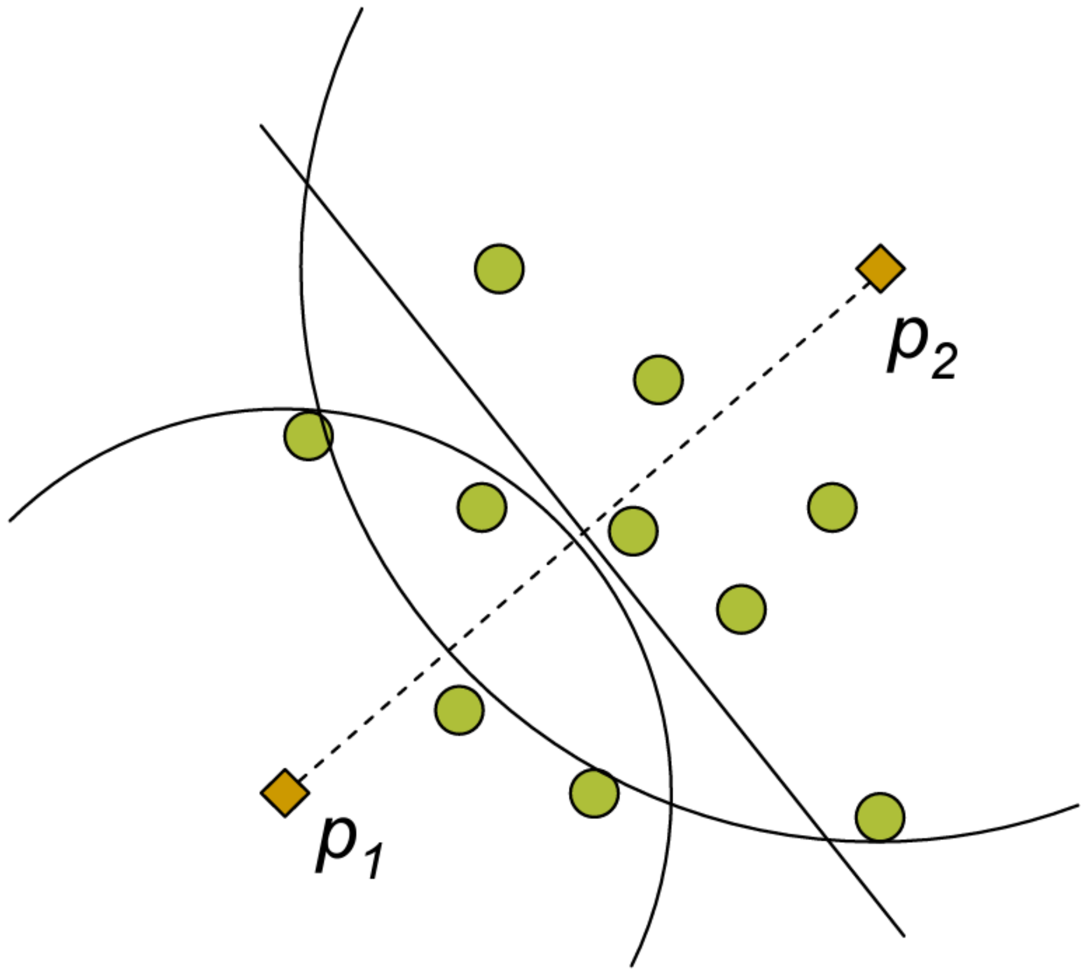
Muestreo **10%** aleatorio

$$\min(r_1 + r_2)$$

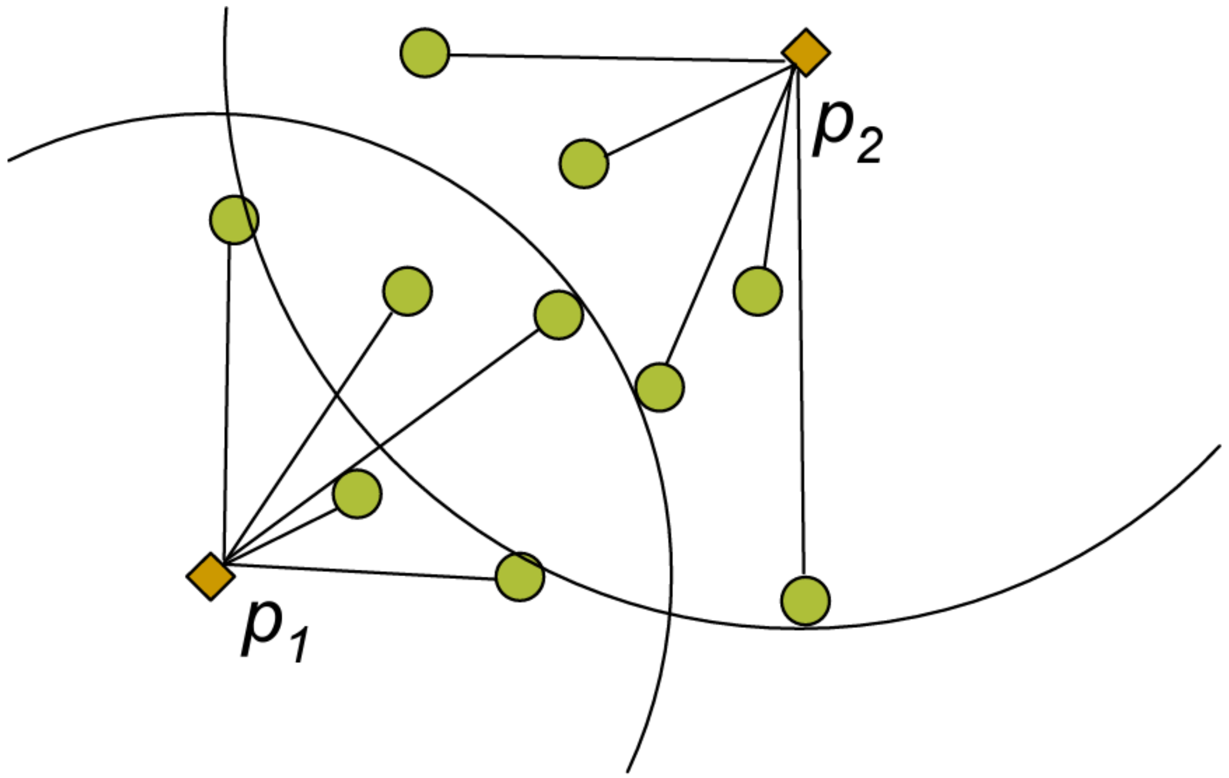
M-*Tree*

Split policies

Unbalanced Hiperplano generalizado



Balanced Radios de cobertura más grandes



Mejor es *unbalanced*

M-*Tree*

2

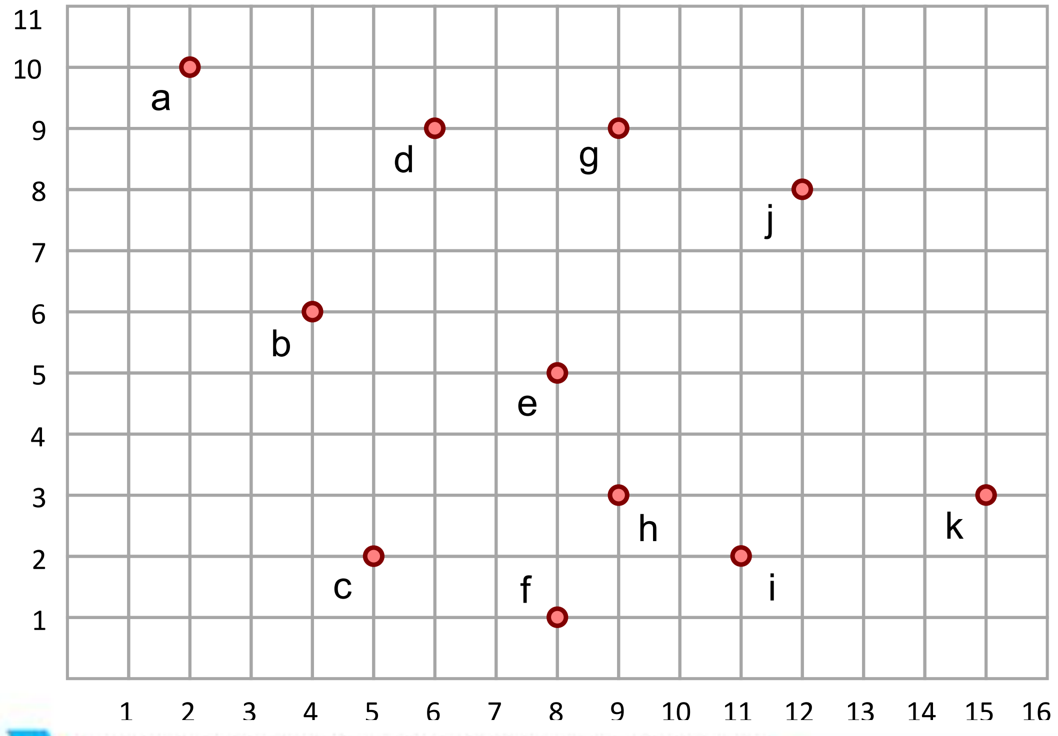
1

3

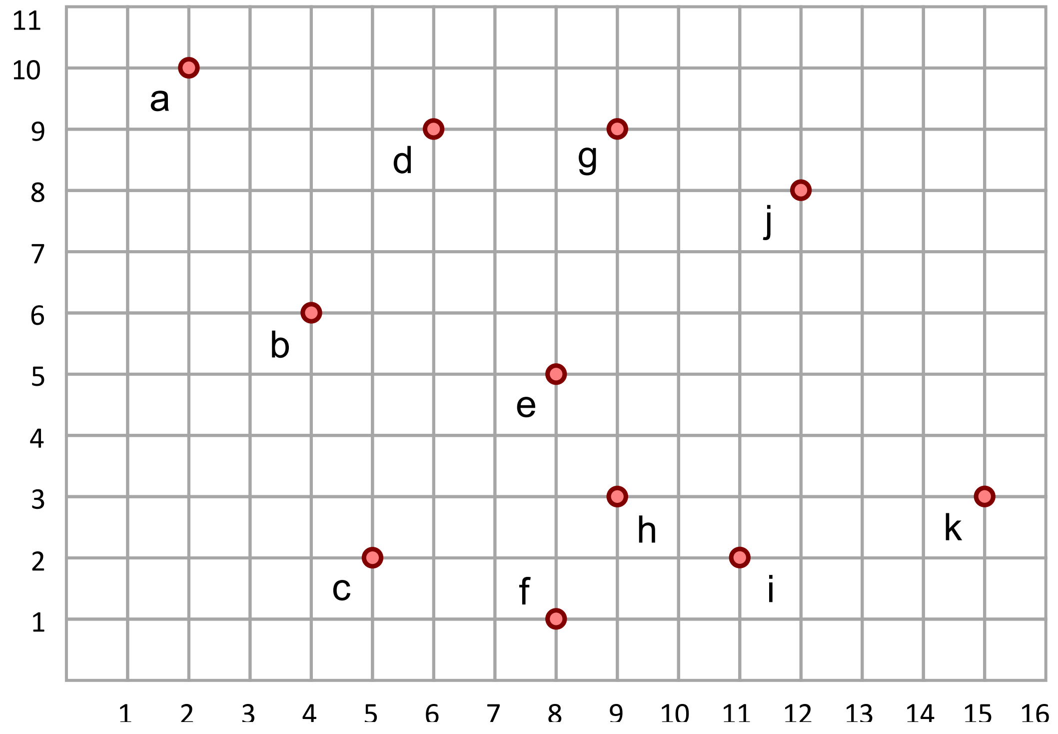
M-*Tree*

	a	b	c	d	e	f	g	h	i	j	k
a	0.00	8.49	8.19	2.61	2.39	5.56	7.45	5.62	5.07	7.02	10.71
b	8.49	0.00	10.45	11.93	10.98	12.20	5.15	9.21	5.20	2.18	8.81
c	8.19	10.45	0.00	14.27	4.07	11.92	7.56	6.51	2.81	0.81	11.24
d	2.61	11.93	14.27	0.00	5.23	13.91	6.35	4.70	2.21	2.88	10.65
e	2.39	10.98	4.07	5.23	0.00	15.43	11.82	11.42	12.88	14.58	4.26
f	5.56	12.20	11.92	13.91	15.43	0.00	14.91	5.86	14.51	2.98	4.07
g	7.45	5.15	7.56	6.35	11.82	14.91	0.00	6.82	15.00	14.32	14.84
h	5.62	9.21	6.51	4.70	11.42	5.86	6.82	0.00	16.86	3.92	16.82
i	5.07	5.20	2.81	2.21	12.88	14.51	15.00	16.86	0.00	4.67	19.18
j	7.02	2.18	0.81	2.88	14.58	2.98	14.32	3.92	4.67	0.00	22.70
k	10.71	8.81	11.24	10.65	4.26	4.07	14.84	16.82	19.18	22.70	0.00

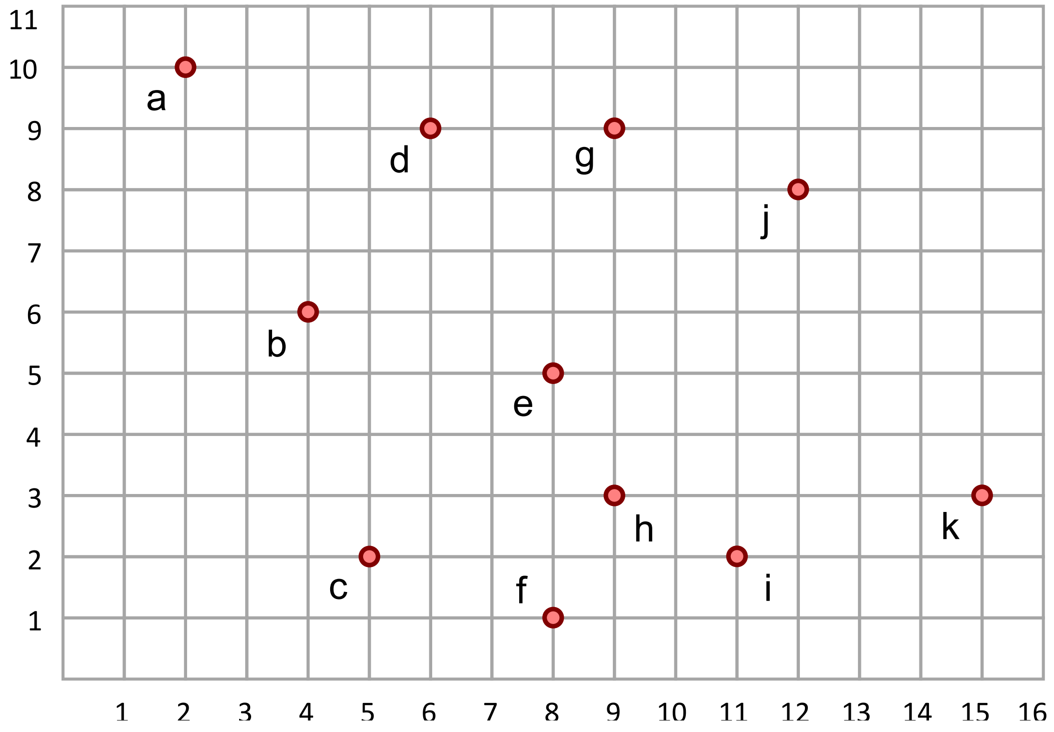
d, j, b, k, i, g, e, a, h, c, f



e, j, k, c, i, d, f, g, h, a, b



f, d, h, e, c, i, b, a, g, k, j

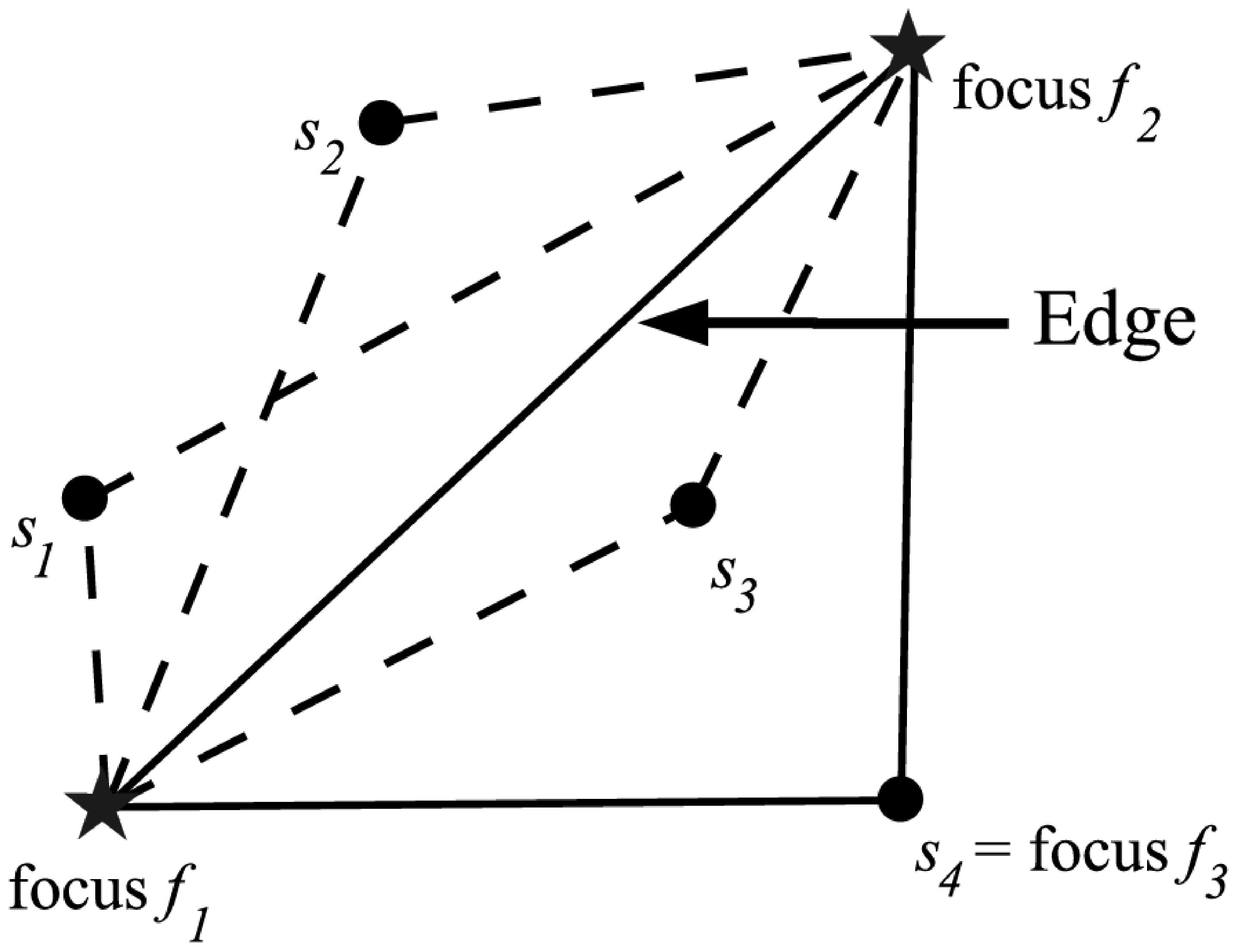


11. Hull of Foci

Hull of *Foci (HF)*

- Un punto cualquiera: p_0
- Buscar el punto más lejano a p_0: f_1
- Buscar el punto más lejano a f_1: f_2
- Los siguientes foci se obtienen con:

$$\min_{s_i} \sum_k |\underbrace{d(f_1, f_2)}_{\textbf{edge}} - d(f_k, s_i)|$$



Hull of *Foci (HF)*

1

2

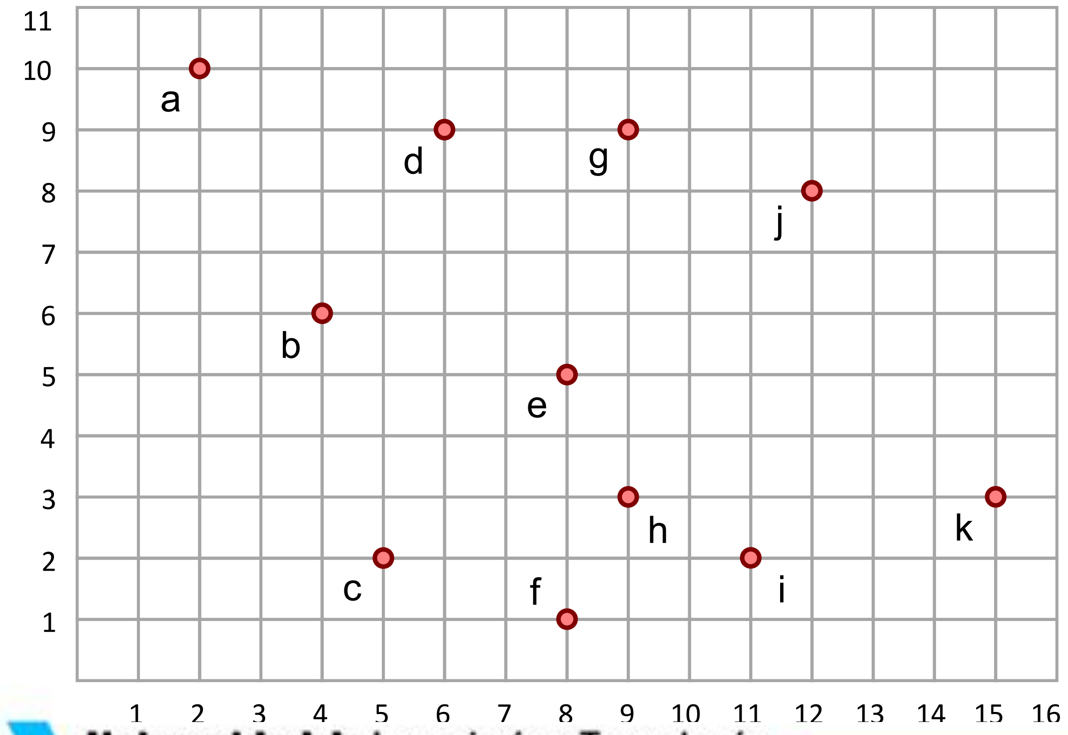
3

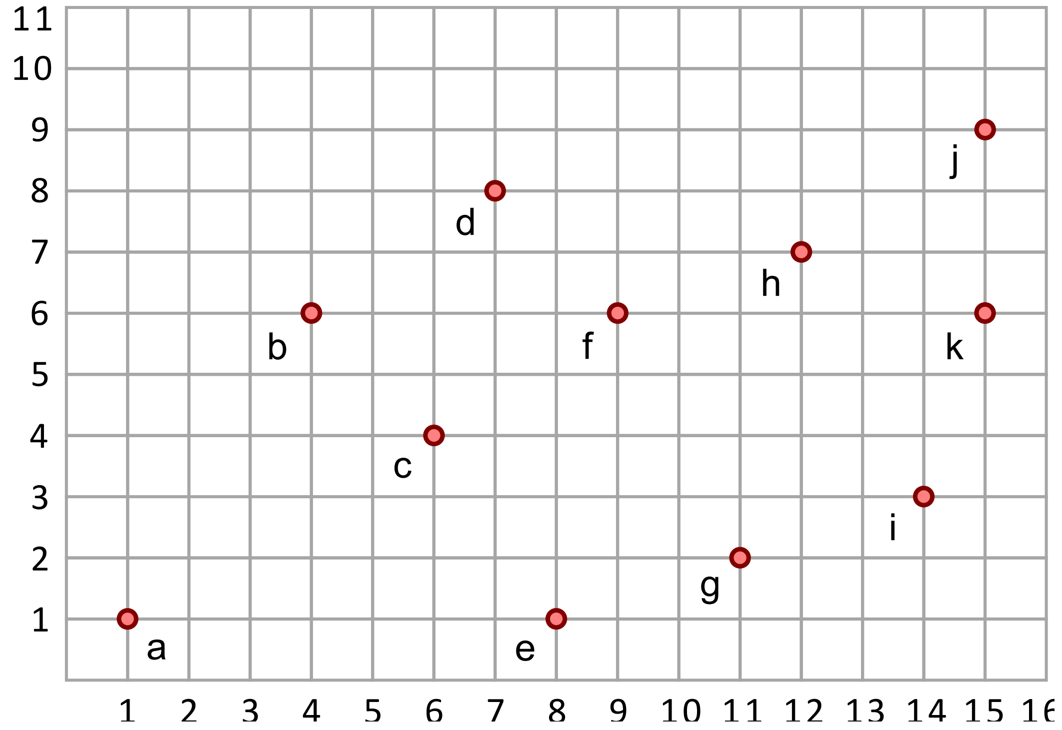
Hull of *Foci (HF)*

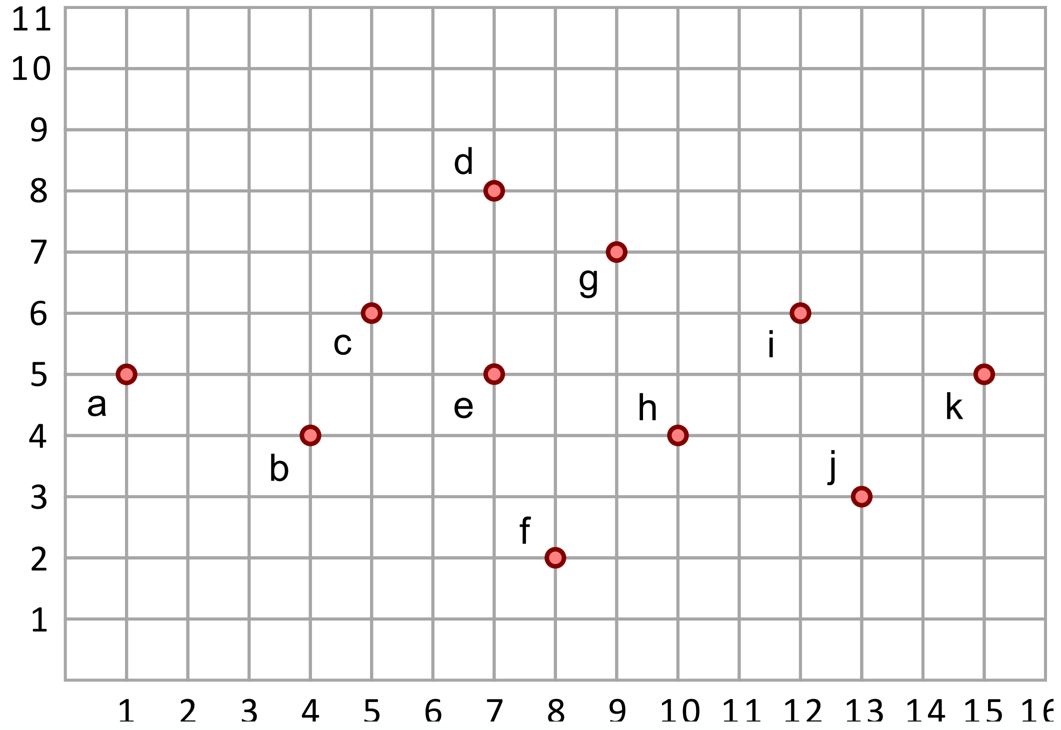
	a	b	c	d	e	f	g	h	i	j	k
a	0.00	8.49	8.19	2.61	2.39	5.56	7.45	5.62	5.07	7.02	10.71
b	8.49	0.00	10.45	11.93	10.98	12.20	5.15	9.21	5.20	2.18	8.81
c	8.19	10.45	0.00	14.27	4.07	11.92	7.56	6.51	2.81	0.81	11.24
d	2.61	11.93	14.27	0.00	5.23	13.91	6.35	4.70	2.21	2.88	10.65
e	2.39	10.98	4.07	5.23	0.00	15.43	11.82	11.42	12.88	14.58	4.26
f	5.56	12.20	11.92	13.91	15.43	0.00	14.91	5.86	14.51	2.98	4.07
g	7.45	5.15	7.56	6.35	11.82	14.91	0.00	6.82	15.00	14.32	14.84
h	5.62	9.21	6.51	4.70	11.42	5.86	6.82	0.00	16.86	3.92	16.82
i	5.07	5.20	2.81	2.21	12.88	14.51	15.00	16.86	0.00	4.67	19.18
j	7.02	2.18	0.81	2.88	14.58	2.98	14.32	3.92	4.67	0.00	22.70
k	10.71	8.81	11.24	10.65	4.26	4.07	14.84	16.82	19.18	22.70	0.00

	a	b	c	d	e	f	g	h	i	j	k
a	0.00	6.71	6.58	1.45	1.49	8.80	11.69	5.68	3.54	10.80	12.43
b	6.71	0.00	7.12	9.81	10.33	4.10	11.27	6.29	8.72	3.42	9.41
c	6.58	7.12	0.00	11.33	1.79	3.43	12.63	6.73	9.31	7.17	3.84
d	1.45	9.81	11.33	0.00	2.05	4.33	12.41	6.01	4.95	3.41	4.48
e	1.49	10.33	1.79	2.05	0.00	4.54	14.88	9.14	6.97	4.07	3.15
f	8.80	4.10	3.43	4.33	4.54	0.00	16.84	9.77	12.21	10.33	10.54
g	11.69	11.27	12.63	12.41	14.88	16.84	0.00	12.44	6.97	9.02	4.11
h	5.68	6.29	6.73	6.01	9.14	9.77	12.44	0.00	6.98	10.53	7.34
i	3.54	8.72	9.31	4.95	6.97	12.21	6.97	6.98	0.00	10.73	5.33
j	10.80	3.42	7.17	3.41	4.07	10.33	9.02	10.53	10.73	0.00	6.31
k	12.43	9.41	3.84	4.48	3.15	10.54	4.11	7.34	5.33	6.31	0.00

	a	b	c	d	e	f	g	h	i	j	k
a	0.00	4.12	5.34	3.92	1.98	4.08	7.60	6.93	4.50	6.25	10.58
b	4.12	0.00	5.66	8.19	6.24	6.55	1.29	6.19	5.00	3.42	7.16
c	5.34	5.66	0.00	8.37	2.91	5.63	6.39	1.31	4.14	4.99	6.79
d	3.92	8.19	8.37	0.00	3.60	6.86	2.36	1.24	3.92	2.43	5.43
e	1.98	6.24	2.91	3.60	0.00	7.15	7.99	8.92	6.30	5.52	0.50
f	4.08	6.55	5.63	6.86	7.15	0.00	9.31	1.30	7.35	2.15	2.54
g	7.60	1.29	6.39	2.36	7.99	9.31	0.00	1.36	8.69	7.75	9.71
h	6.93	6.19	1.31	1.24	8.92	1.30	1.36	0.00	10.56	3.54	10.12
i	4.50	5.00	4.14	3.92	6.30	7.35	8.69	10.56	0.00	4.51	11.22
j	6.25	3.42	4.99	2.43	5.52	2.15	7.75	3.54	4.51	0.00	12.54
k	10.58	7.16	6.79	5.43	0.50	2.54	9.71	10.12	11.22	12.54	0.00





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