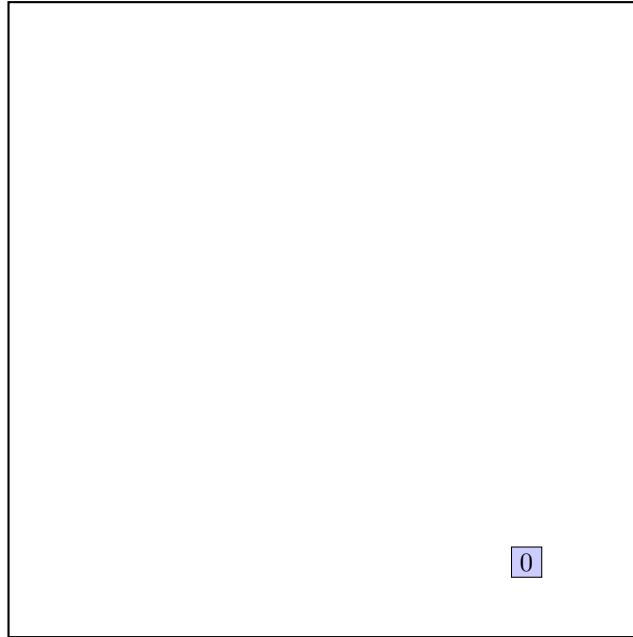


call INSERT R , #S(P :X 3327/1000 :Y 99/250)

structure view:



data view:

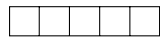


call CHOOSE-LEAF R , 0

a leaf is found: root

return from CHOOSE-LEAF

the leaf root is not full, add the record.



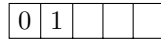
call ADJUST-TREE with R , node root

we are at the root

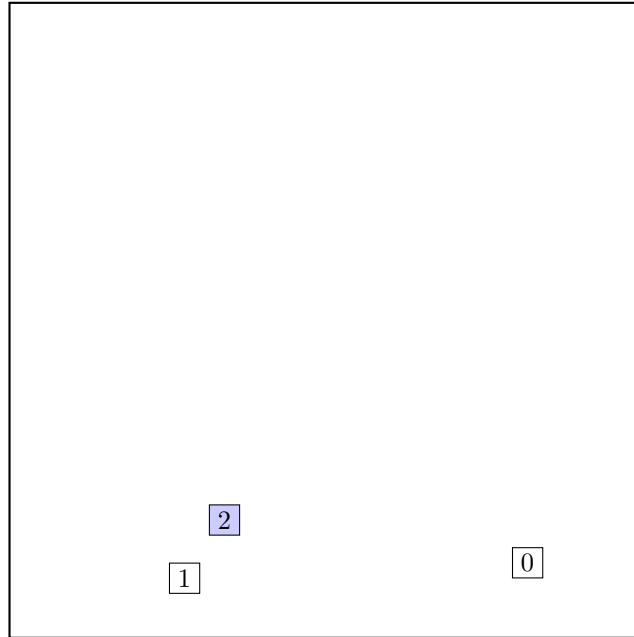
return from ADJUST-TREE

call INSERT R , #S(P :X 661/500 :Y 679/1000)

structure view:



data view:

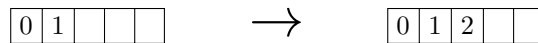


call CHOOSE-LEAF R , 2

a leaf is found: root

return from CHOOSE-LEAF

the leaf root is not full, add the record.



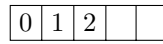
call ADJUST-TREE with R , node root

we are at the root

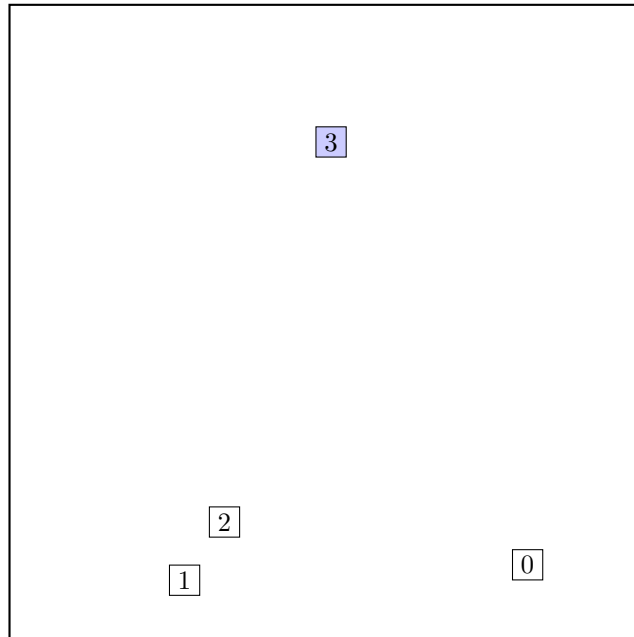
return from ADJUST-TREE

call INSERT R , #S(P :X 2027/1000 :Y 3193/1000)

structure view:



data view:

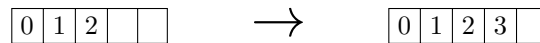


call CHOOSE-LEAF R , 3

a leaf is found: root

return from CHOOSE-LEAF

the leaf root is not full, add the record.



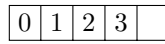
call ADJUST-TREE with R , node root

we are at the root

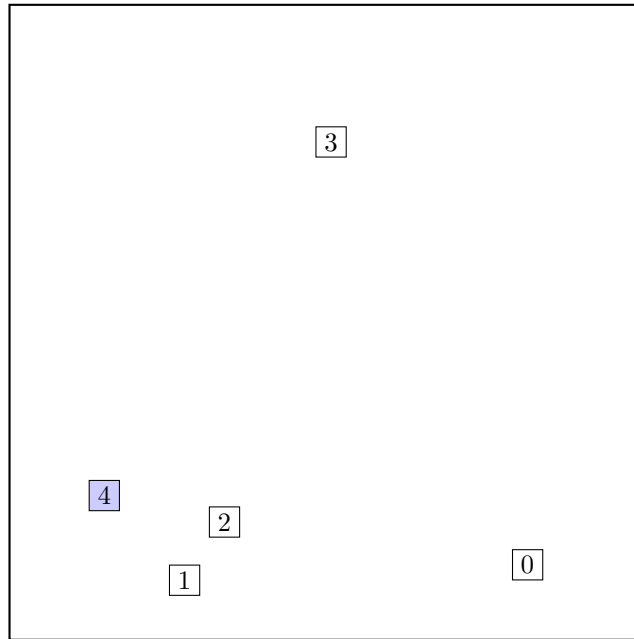
return from ADJUST-TREE

call INSERT R , #S(P :X 527/1000 :Y 427/500)

structure view:



data view:

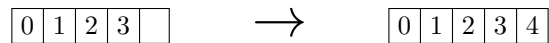


call CHOOSE-LEAF R , 4

a leaf is found: root

return from CHOOSE-LEAF

the leaf root is not full, add the record.



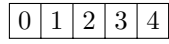
call ADJUST-TREE with R , node root

we are at the root

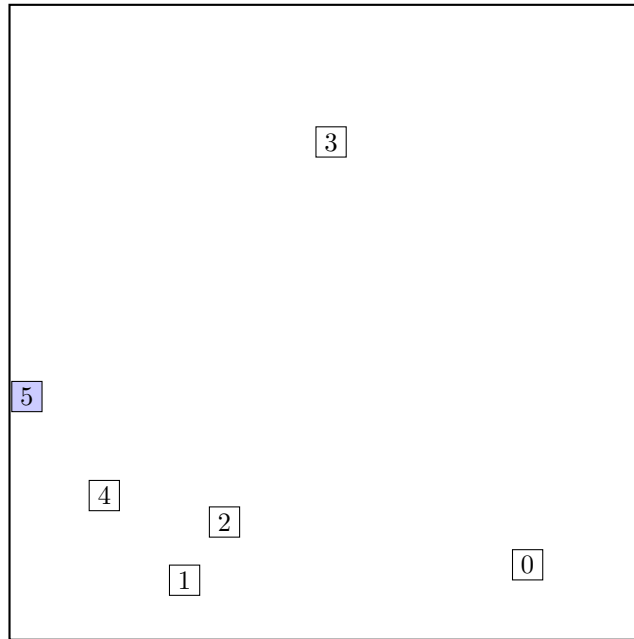
return from ADJUST-TREE

call INSERT R , #S(P :X 3/200 :Y 1509/1000)

structure view:



data view:



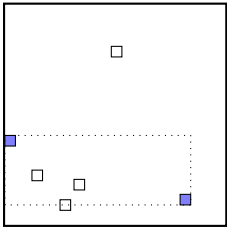
call CHOOSE-LEAF R , 5

a leaf is found: root

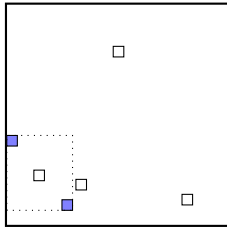
return from CHOOSE-LEAF

call SPLIT-NODE R new node call PICK-SEEDS

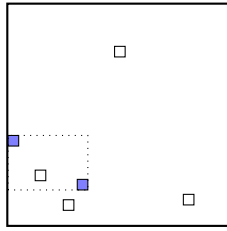
5 0 1 2 3 4



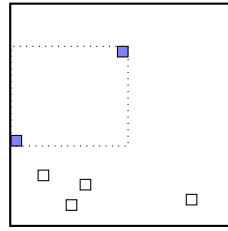
$$d(5, 0) = 4.5312557$$



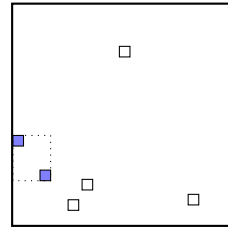
$$d(5, 1) = 1.678845$$



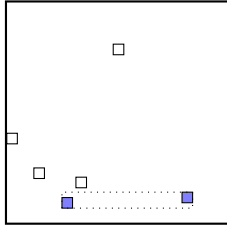
$$d(5, 2) = 1.4722102$$



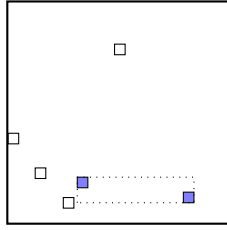
$$d(5, 3) = 4.087408$$



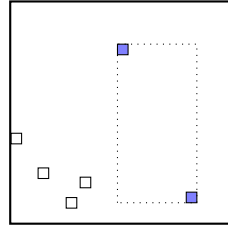
$$d(5, 4) = 0.52875996$$



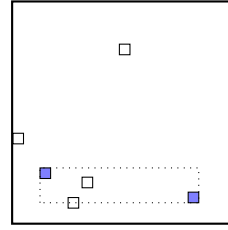
$$d(0, 1) = 0.66563797$$



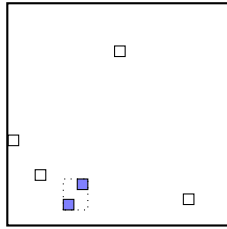
$$d(0, 2) = 0.9850151$$



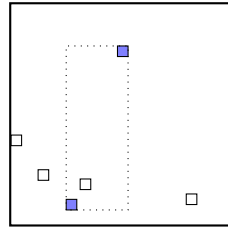
$$d(0, 3) = 4.4154997$$



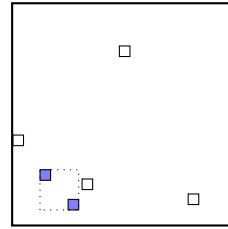
$$d(0, 4) = 1.8939999$$



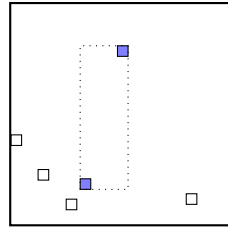
$$d(1, 2) = 0.19144006$$



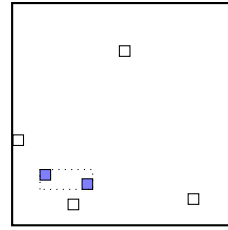
$$d(1, 3) = 3.5427308$$



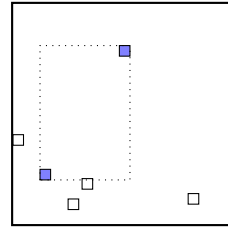
$$d(1, 4) = 0.4755599$$



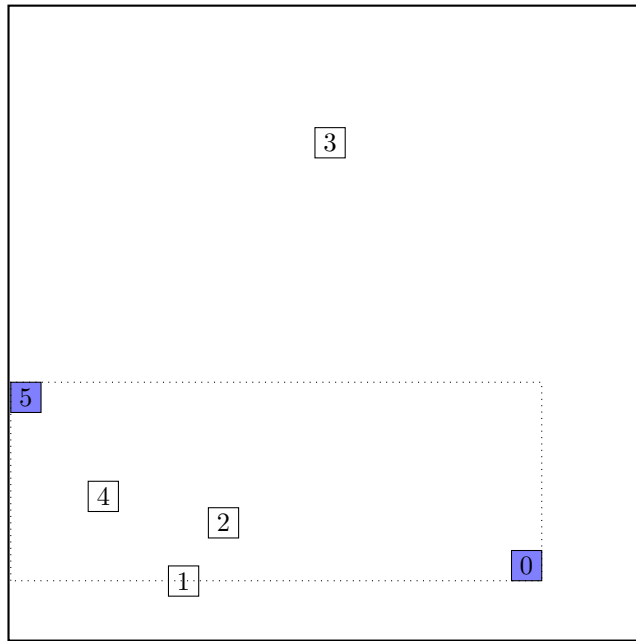
$$d(2, 3) = 2.3761697$$



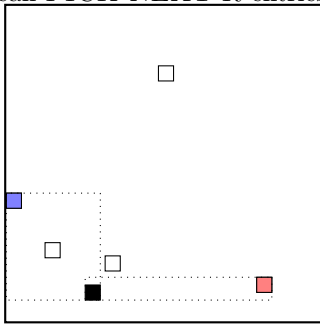
$$d(2, 4) = 0.29312497$$



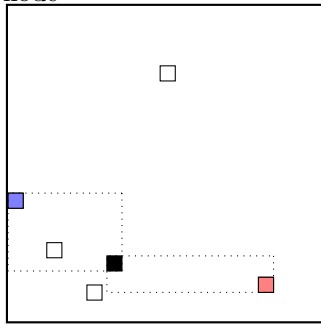
$$d(3, 4) = 4.2362995$$



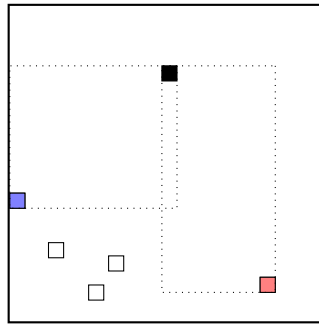
call PICK-NEXT R entries node



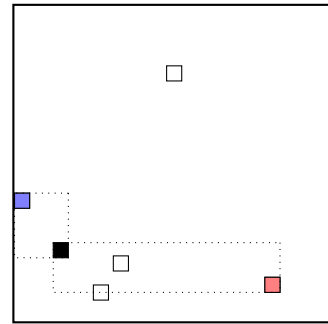
1: $\Delta d = -1.0132071$



2: $\Delta d = -0.48719502$



3: $\Delta d = 0.32809162$



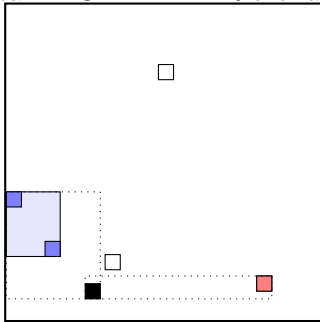
4: $\Delta d = 1.36524$

maximal $|\Delta d|$ occurs for node 4.

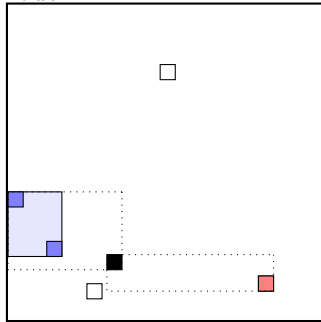
add the node to the **blue group** ($\Delta d \geq 0$)

update MBR of the **blue group** group

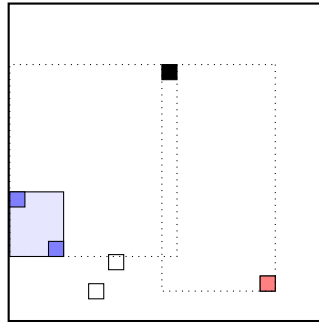
call PICK-NEXT R entries node



1: $\Delta d = -0.44444704$



2: $\Delta d = 0.08156502$



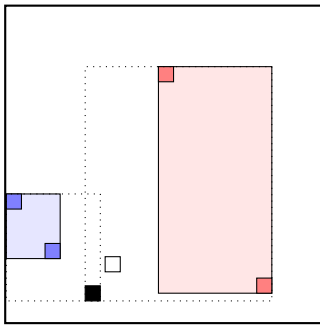
3: $\Delta d = -0.55200816$

maximal $|\Delta d|$ is for node 3.

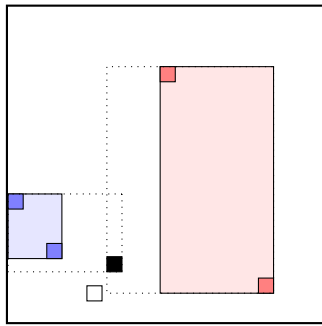
add the node to the **red group** ($\Delta d < 0$)

update MBR of the **red group** group

call PICK-NEXT R entries node



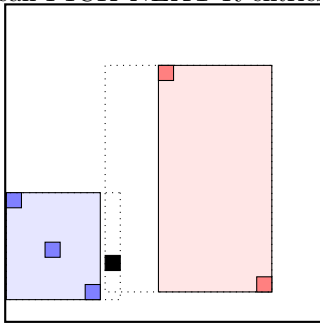
1: $\Delta d = 2.005846$



2: $\Delta d = 1.1694349$

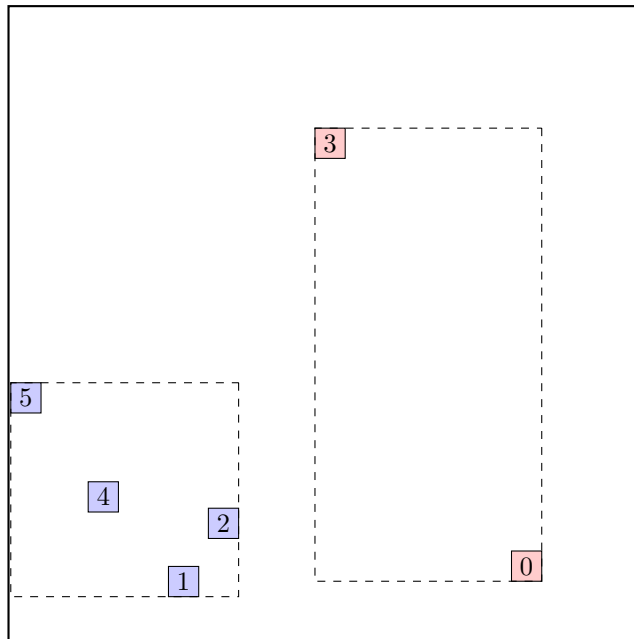
maximal $|\Delta d|$ occurs for node 1.
 add the node to the blue group ($\Delta d \geq 0$)
 update MBR of the blue group

call PICK-NEXT R entries node



2: $\Delta d = 1.7393249$

maximal $|\Delta d|$ occurs for node 2.
 add the node to the blue group ($\Delta d \geq 0$)
 update MBR of the blue group
 the rest of rectangles must be put to the red group.
 ... the final split is:

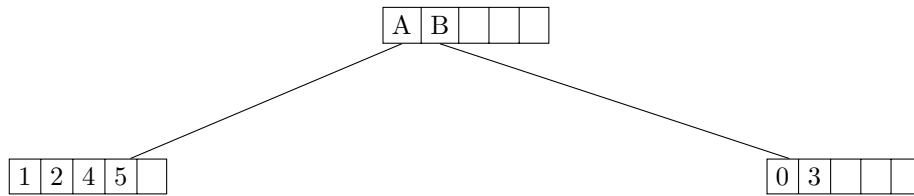


call ADJUST-TREE with R , node A and the new node
 we are at the root
 return from ADJUST-TREE

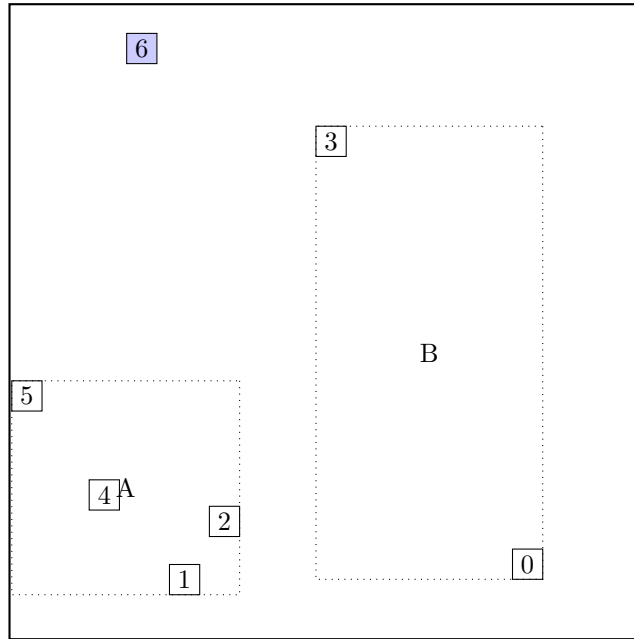
the ADJUST-TREE procedure returned additional new node: B.
create a new root, and make the old root and the new node its children.

call INSERT *R*, #S(P :X 31/40 :Y 3807/1000)

structure view:

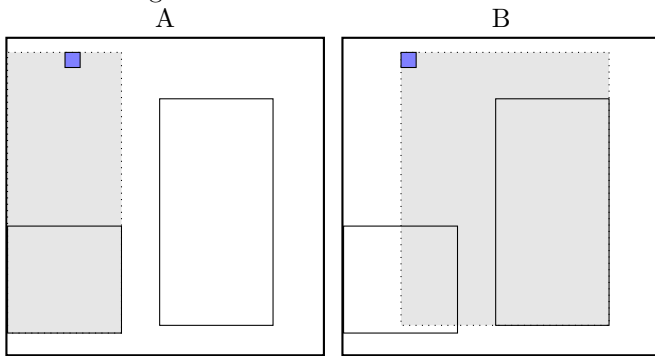


data view:



call CHOOSE-LEAF *R*, 6

choose among children:



old area: 2.132405
 new area: 5.595491
 extension: 3.463086

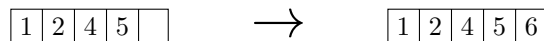
old area: 4.4954996
 new area: 9.937471
 extension: 5.441972

selected A

a leaf is found: A

return from CHOOSE-LEAF

the leaf A is not full, add the record.



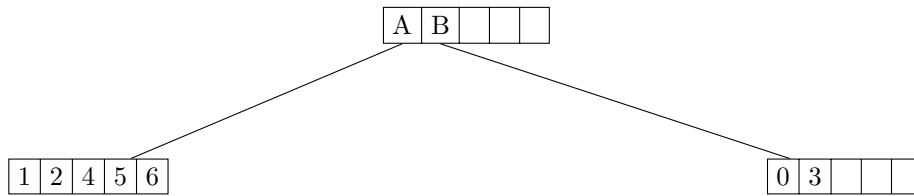
call ADJUST-TREE with *R*, node A
 update MBR of node A.

continue by adjusting the parent node root

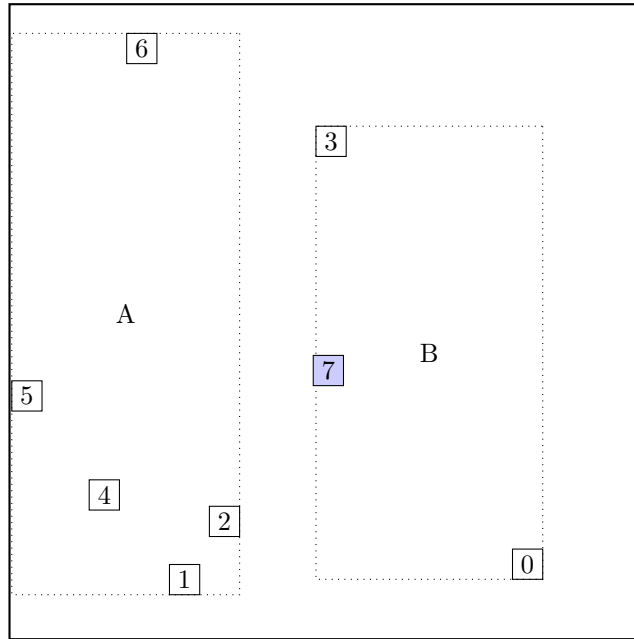
call ADJUST-TREE with R , node root
we are at the root
return from ADJUST-TREE

call INSERT *R*, #S(P :X 2009/1000 :Y 1677/1000)

structure view:

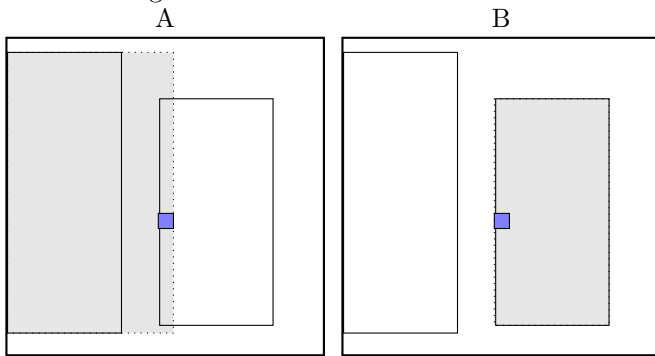


data view:



call CHOOSE-LEAF *R*, 7

choose among children:



old area: 5.595491
 new area: 8.146321
 extension: 2.5508304

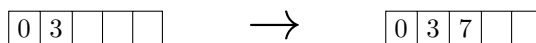
old area: 4.4954996
 new area: 4.549445
 extension: 0.05394554

selected B

a leaf is found: B

return from CHOOSE-LEAF

the leaf B is not full, add the record.



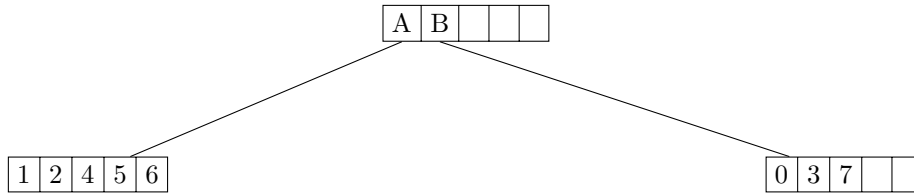
call ADJUST-TREE with *R*, node B
 update MBR of node B.

continue by adjusting the parent node root

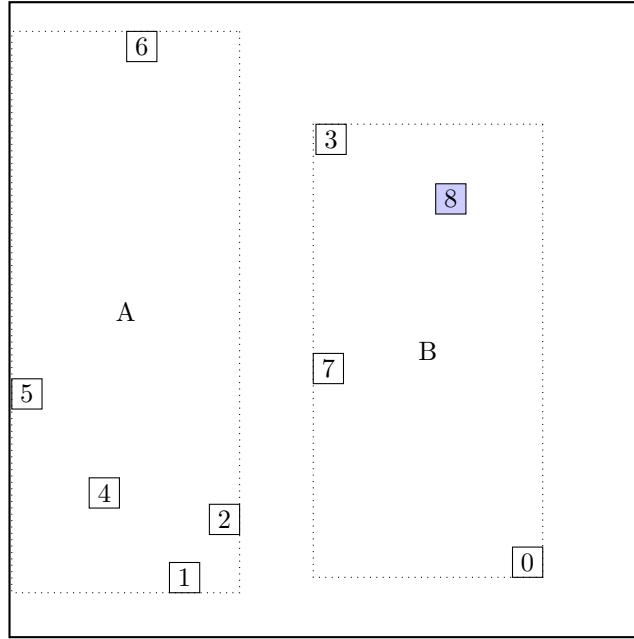
call ADJUST-TREE with R , node root
we are at the root
return from ADJUST-TREE

call INSERT *R*, #S(P :X 2819/1000 :Y 2799/1000)

structure view:

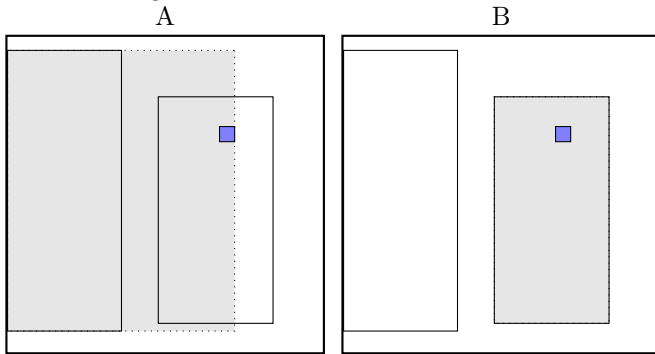


data view:



call CHOOSE-LEAF *R*, 8

choose among children:



old area: 5.595491
 new area: 11.1538515
 extension: 5.5583606

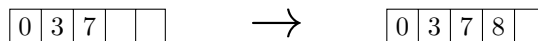
old area: 4.549445
 new area: 4.549445
 extension: 0.0

selected B

a leaf is found: B

return from CHOOSE-LEAF

the leaf B is not full, add the record.



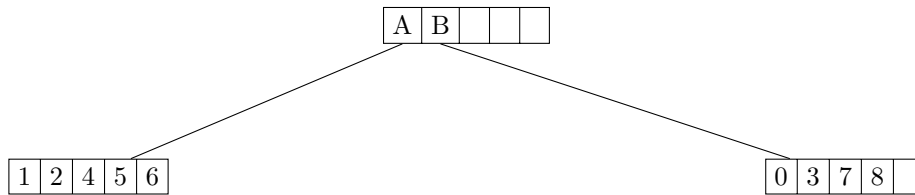
call ADJUST-TREE with *R*, node B
 update MBR of node B.

continue by adjusting the parent node root

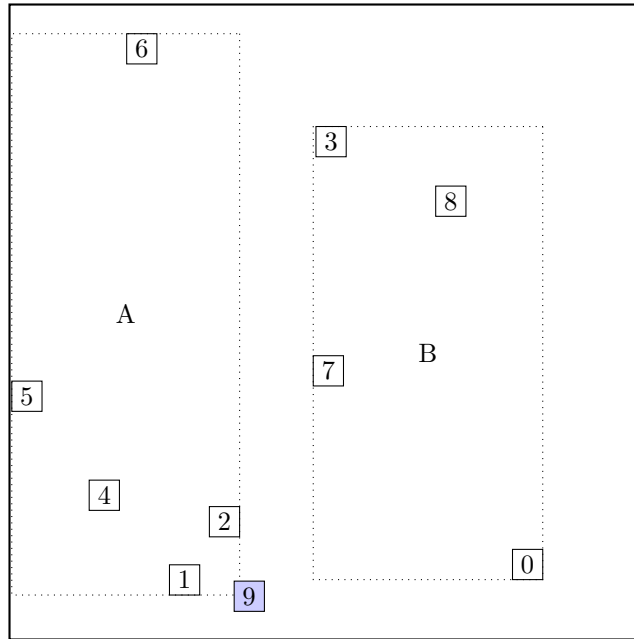
call ADJUST-TREE with R , node root
we are at the root
return from ADJUST-TREE

call INSERT *R*, #S(P :X 743/500 :Y 93/500)

structure view:

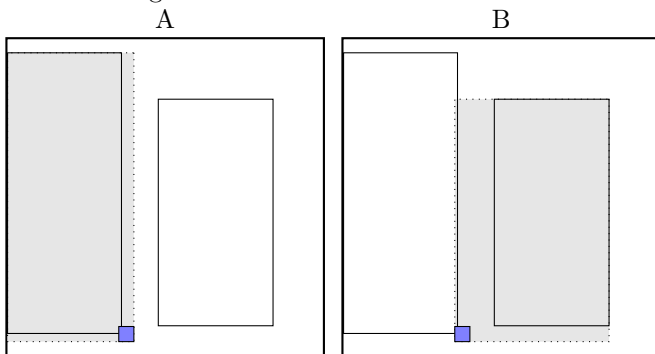


data view:



call CHOOSE-LEAF *R*, 9

choose among children:



old area: 5.595491
new area: 6.3848906
extension: 0.7893996

old area: 4.549445
new area: 6.5454865
extension: 1.9960413

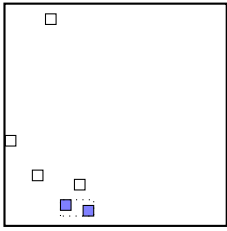
selected A

a leaf is found: A

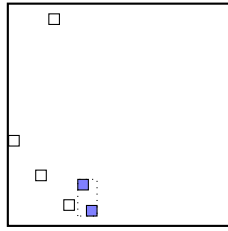
return from CHOOSE-LEAF

call SPLIT-NODE *R* new node call PICK-SEEDS

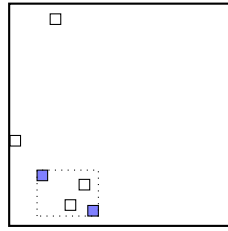
9 1 2 4 5 6



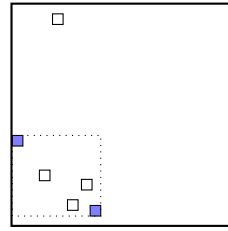
$$d(9, 1) = 0.11342399$$



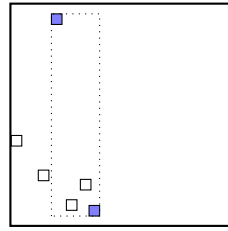
$$d(9, 2) = 0.17225194$$



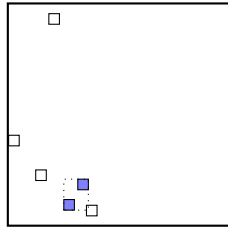
$$d(9, 4) = 0.9260118$$



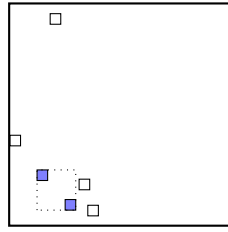
$$d(9, 5) = 2.4649332$$



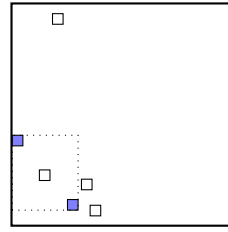
$$d(9, 6) = 3.400931$$



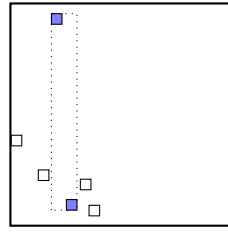
$$d(1, 2) = 0.19144006$$



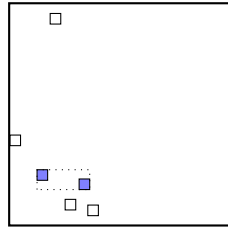
$$d(1, 4) = 0.4755599$$



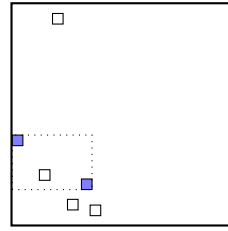
$$d(1, 5) = 1.678845$$



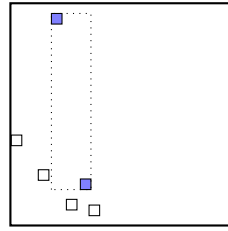
$$d(1, 6) = 1.7133792$$



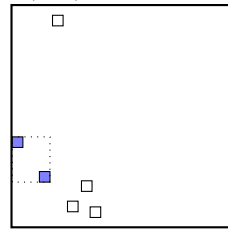
$$d(2, 4) = 0.29312497$$



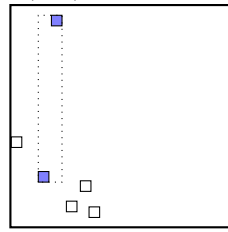
$$d(2, 5) = 1.4722102$$



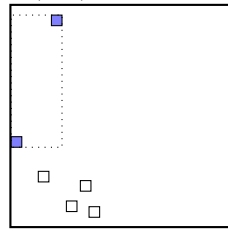
$$d(2, 6) = 2.4060164$$



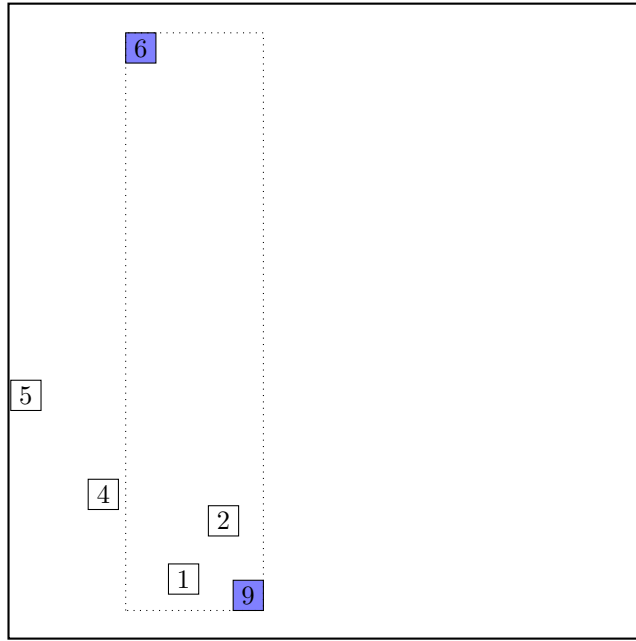
$$d(4, 5) = 0.52875996$$



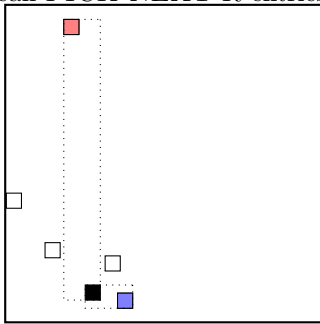
$$d(4, 6) = 1.332544$$



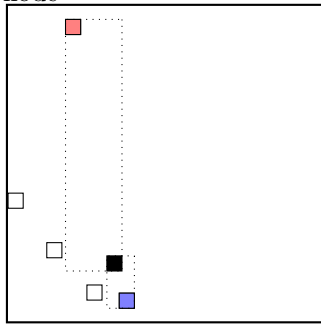
$$d(5, 6) = 2.31808$$



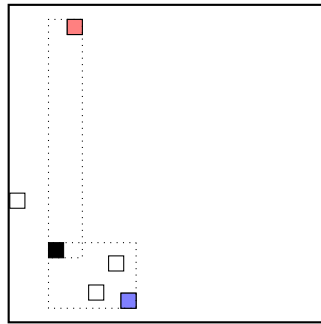
call PICK-NEXT R entries node



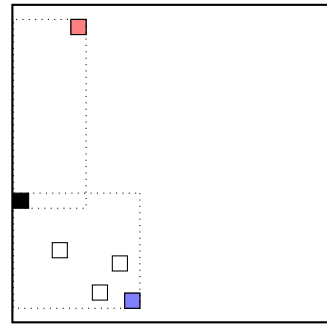
1: $\Delta d = 1.5999552$



2: $\Delta d = 2.2337644$



4: $\Delta d = 0.40653217$



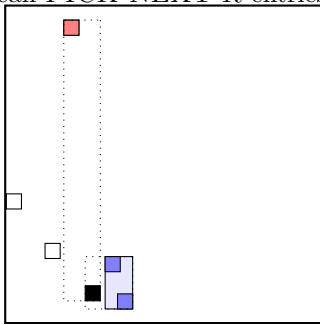
5: $\Delta d = -0.14685321$

maximal $|\Delta d|$ occurs for node 2.

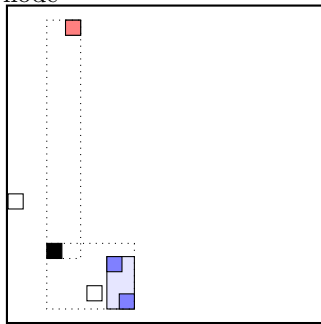
add the node to the blue group ($\Delta d \geq 0$)

update MBR of the blue group group

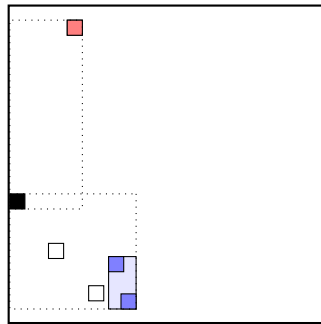
call PICK-NEXT R entries node



1: $\Delta d = 1.5704272$



4: $\Delta d = 0.6187841$



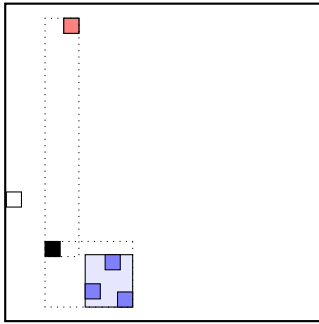
5: $\Delta d = 0.06539869$

maximal $|\Delta d|$ occurs for node 1.

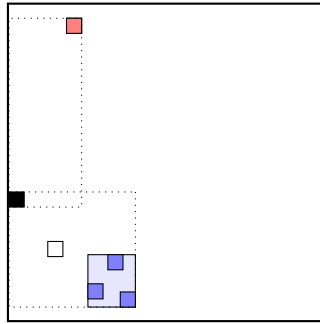
add the node to the blue group ($\Delta d \geq 0$)

update MBR of the blue group group

call PICK-NEXT R entries node

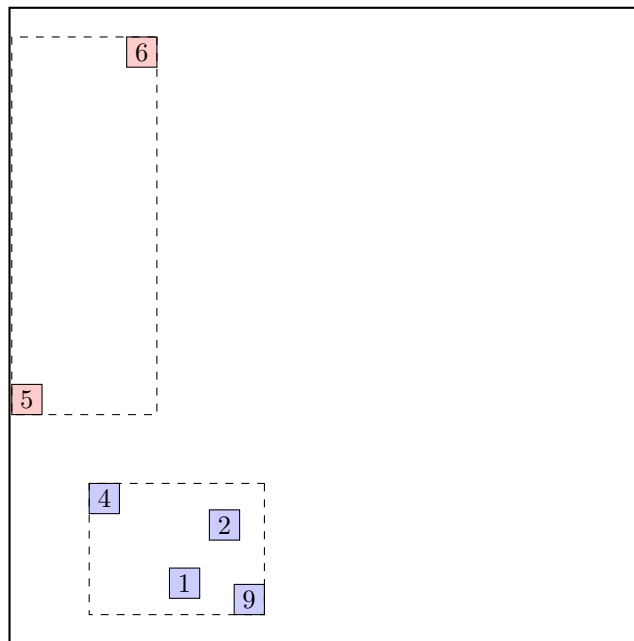


4: $\Delta d = 0.8017362$

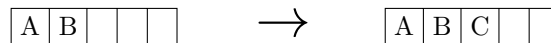


5: $\Delta d = 0.24835086$

maximal $|\Delta d|$ occurs for node 4.
 add the node to the blue group ($\Delta d \geq 0$)
 update MBR of the blue group
 the rest of rectangles must be put to the red group.
 ... the final split is:



call ADJUST-TREE with R , node A and the new node
 update MBR of node A.
 add the new node NIL to the parent node root
 the parent node root is not full, we can add the new node C directly.

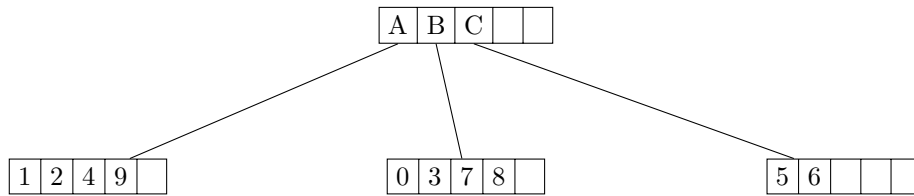


noindentcontinue by adjusting the parent node root.

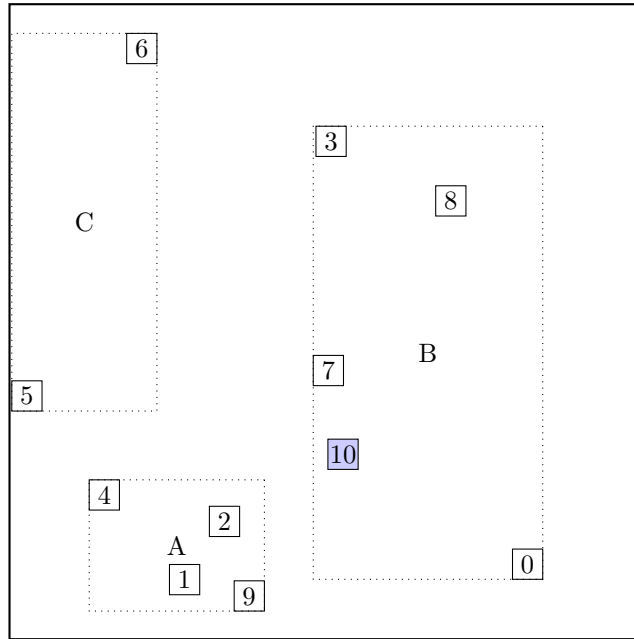
call ADJUST-TREE with R , node root
 we are at the root
 return from ADJUST-TREE

call INSERT R , #S(P :X 1053/500 :Y 1123/1000)

structure view:

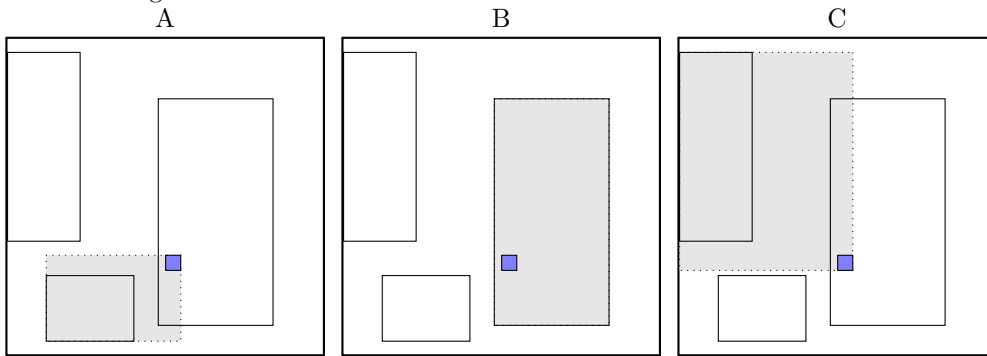


data view:



call CHOOSE-LEAF R , 10

choose among children:



old area: 1.0060119
new area: 2.022723
extension: 1.0167111

old area: 4.549445
new area: 4.549445
extension: 0.0

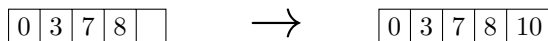
old area: 2.3980799
new area: 6.607243
extension: 4.209163

selected B

a leaf is found: B

return from CHOOSE-LEAF

the leaf B is not full, add the record.



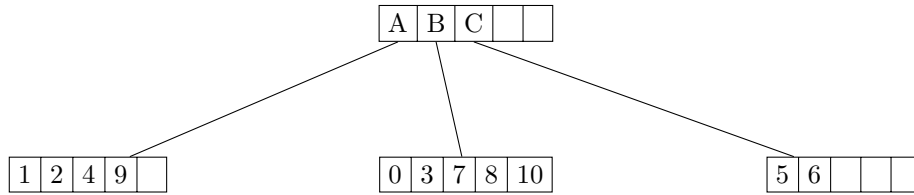
call ADJUST-TREE with R , node B
update MBR of node B.

continue by adjusting the parent node root

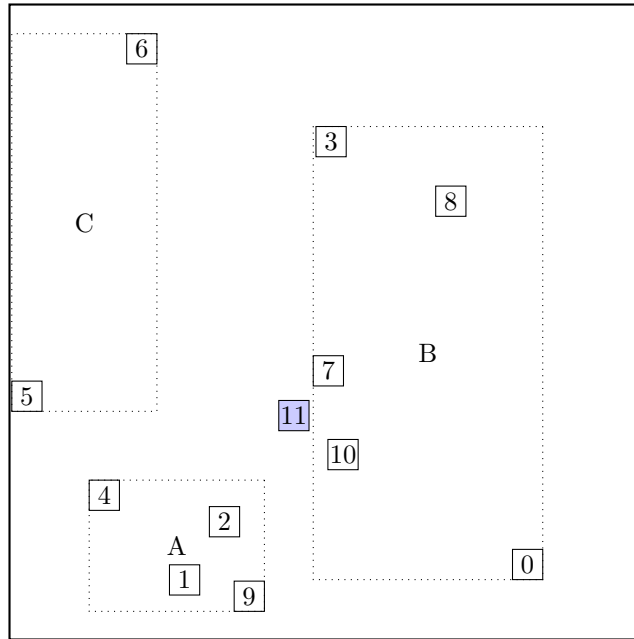
call ADJUST-TREE with R , node root
we are at the root
return from ADJUST-TREE

call INSERT *R*, #S(P :X 1781/1000 :Y 1381/1000)

structure view:

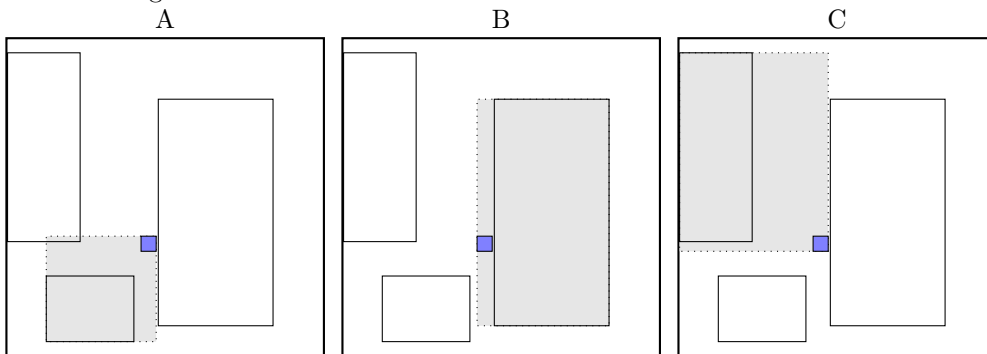


data view:



call CHOOSE-LEAF *R*, 11

choose among children:



old area: 1.0060119
new area: 2.02833
extension: 1.0223183

old area: 4.549445
new area: 5.2327614
extension: 0.68331624

old area: 2.3980799
new area: 5.162716
extension: 2.764636

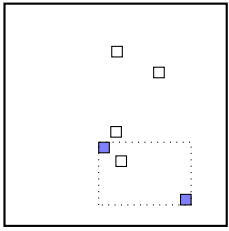
selected B

a leaf is found: B

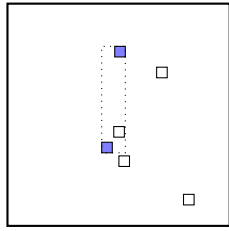
return from CHOOSE-LEAF

call SPLIT-NODE *R* new node call PICK-SEEDS

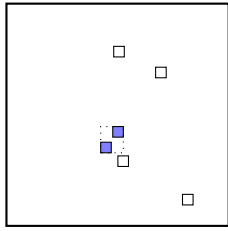
11 0 3 7 8 10



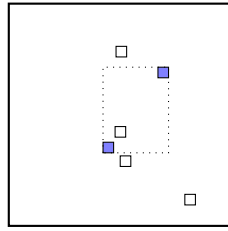
$$d(11, 0) = 1.9890099$$



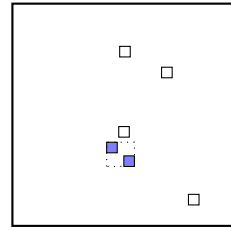
$$d(11, 3) = 0.81735176$$



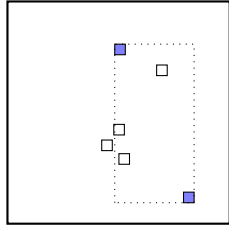
$$d(11, 7) = 0.132288$$



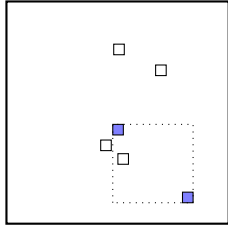
$$d(11, 8) = 1.9230838$$



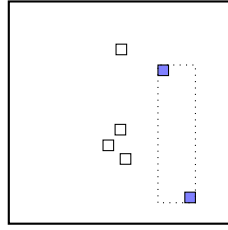
$$d(11, 10) = 0.16044997$$



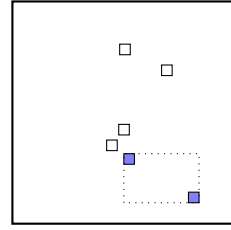
$$d(0, 3) = 4.4154997$$



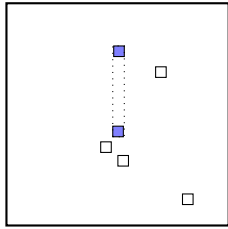
$$d(0, 7) = 2.1681578$$



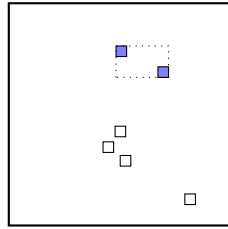
$$d(0, 8) = 1.7629233$$



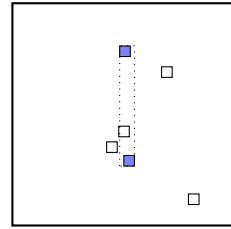
$$d(0, 10) = 1.2372669$$



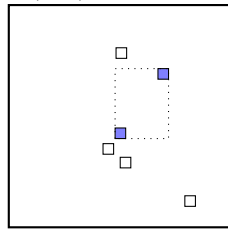
$$d(3, 7) = 0.29408774$$



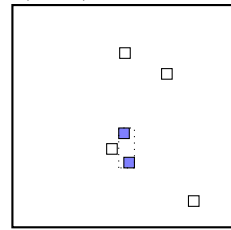
$$d(3, 8) = 0.509248$$



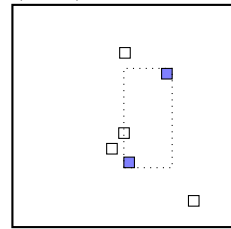
$$d(3, 10) = 0.5533299$$



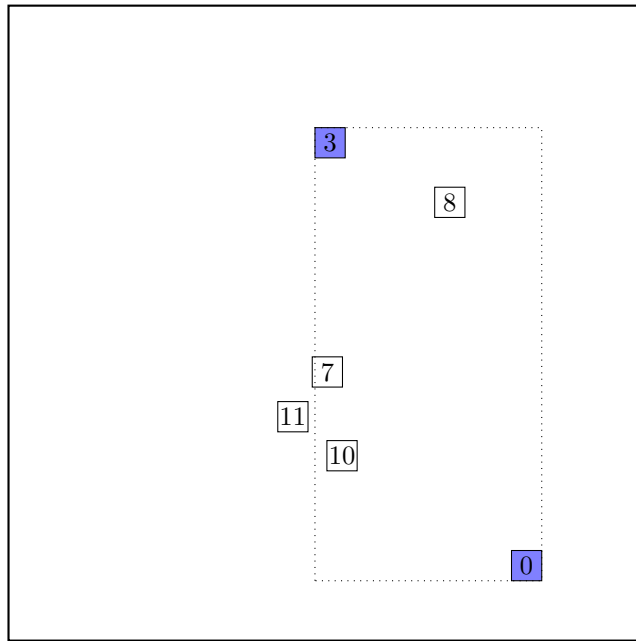
$$d(7, 8) = 1.2552198$$



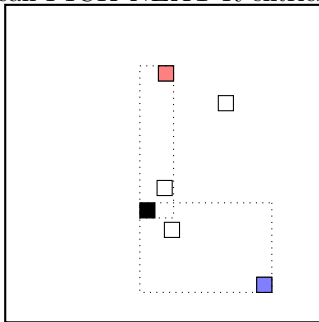
$$d(7, 10) = 0.14393792$$



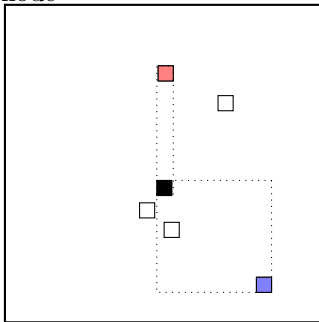
$$d(8, 10) = 1.6327877$$



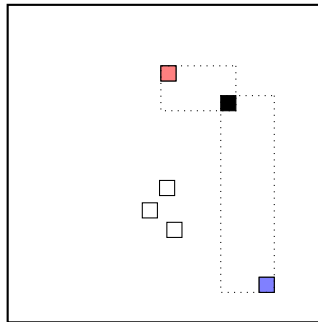
call PICK-NEXT R entries node



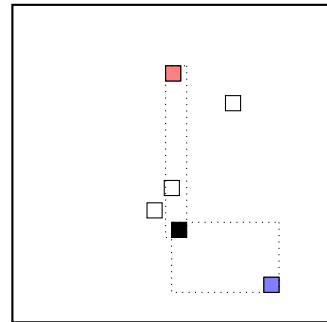
11: $\Delta d = -1.171658$



7: $\Delta d = -1.8740702$



8: $\Delta d = -1.2536752$



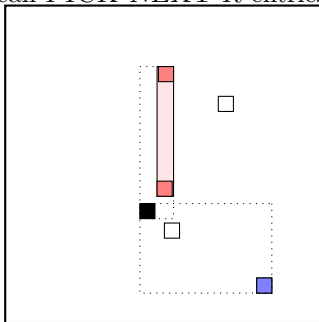
10: $\Delta d = -0.683937$

maximal $|\Delta d|$ is for node 7.

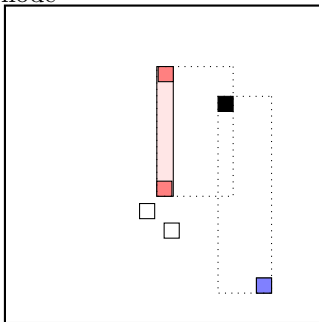
add the node to the **red group** ($\Delta d < 0$)

update MBR of the **red group** group

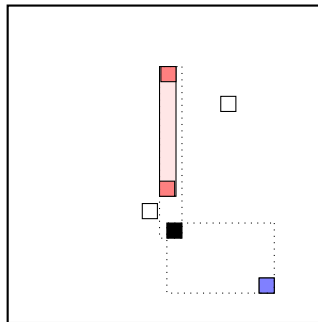
call PICK-NEXT R entries node



11: $\Delta d = -1.5057458$



8: $\Delta d = -0.4438511$



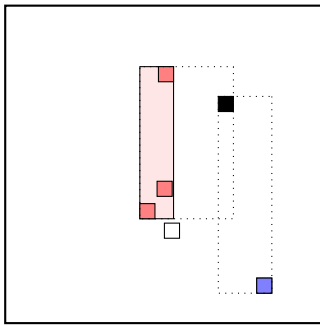
10: $\Delta d = -0.977165$

maximal $|\Delta d|$ is for node 11.

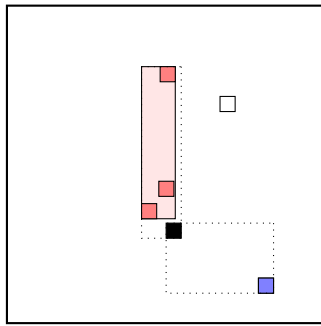
add the node to the **red group** ($\Delta d < 0$)

update MBR of the **red group** group

call PICK-NEXT R entries node



8: $\Delta d = -0.20941901$



10: $\Delta d = -0.9828689$

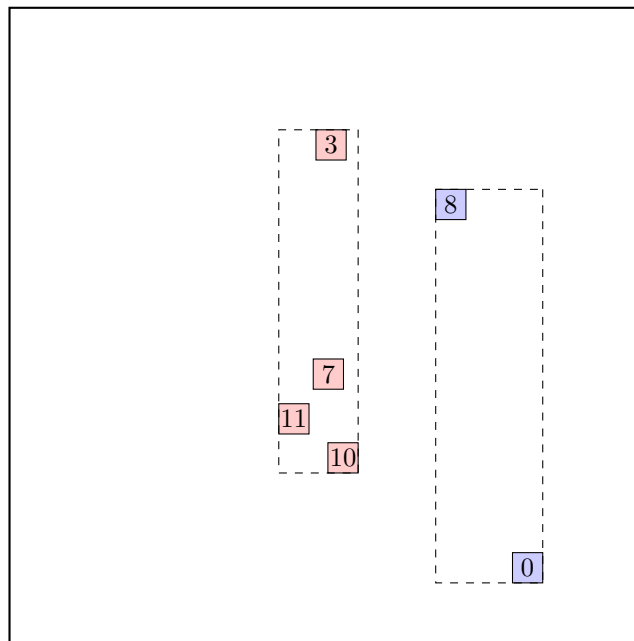
maximal $|\Delta d|$ is for node 10.

add the node to the **red group** ($\Delta d < 0$)

update MBR of the **red group**

the rest of rectangles must be put to the **blue group**.

... the final split is:

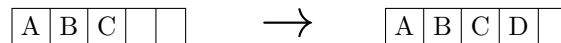


call ADJUST-TREE with R , node B and the new node

update MBR of node B.

add the new node NIL to the parent node root

the parent node root is not full, we can add the new node D directly.



noindentcontinue by adjusting the parent node root.

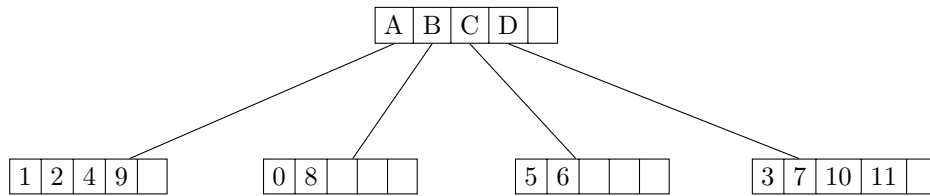
call ADJUST-TREE with R , node root

we are at the root

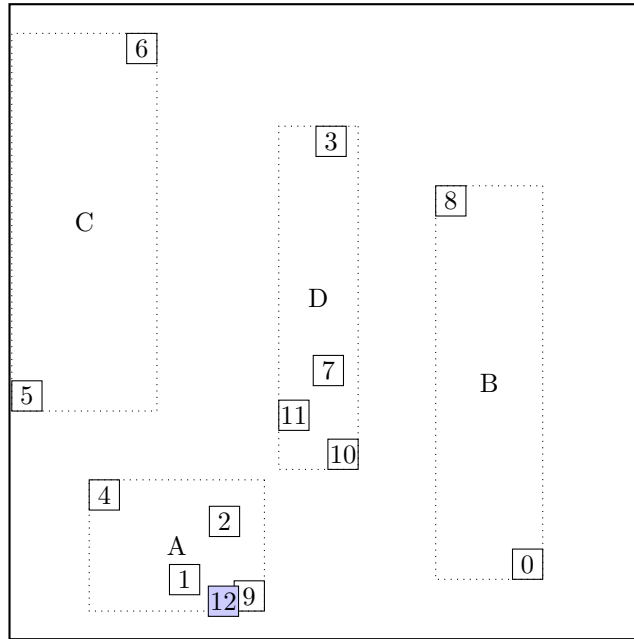
return from ADJUST-TREE

call INSERT *R*, #S(P :X 263/200 :Y 151/1000)

structure view:



data view:



call CHOOSE-LEAF *R*, 12

choose among children:

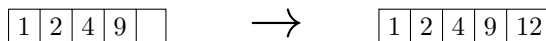
A	B	C	D
old area: 1.0060119 new area: 1.046577 extension: 0.040565133	old area: 1.8429232 new area: 6.2997756 extension: 4.4568524	old area: 2.3980799 new area: 5.7840004 extension: 3.3859206	old area: 1.1917497 new area: 3.2128215 extension: 2.021072

selected A

a leaf is found: A

return from CHOOSE-LEAF

the leaf A is not full, add the record.



call ADJUST-TREE with *R*, node A

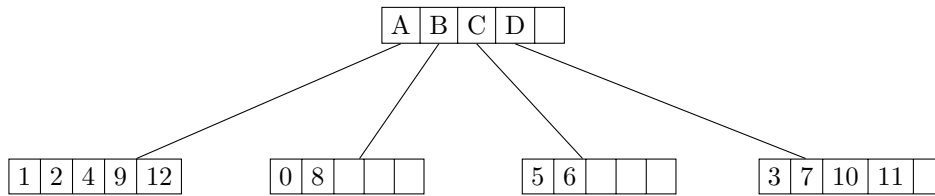
update MBR of node A.

continue by adjusting the parent node root

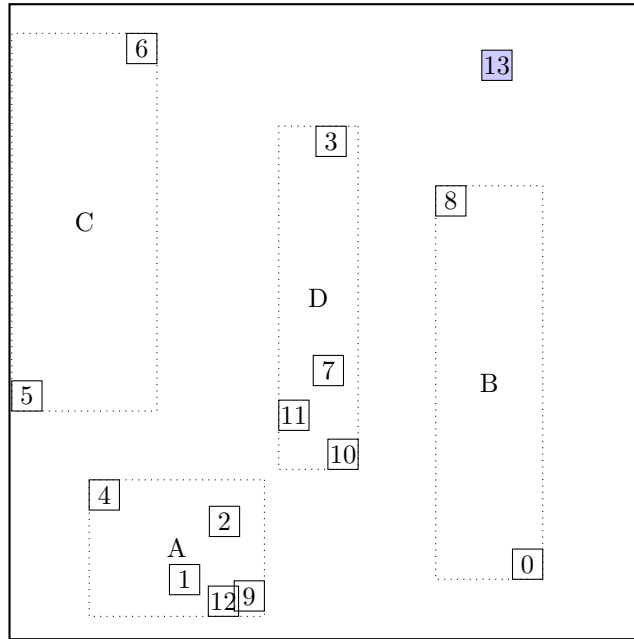
call ADJUST-TREE with R , node root
we are at the root
return from ADJUST-TREE

call INSERT *R*, #S(P :X 781/250 :Y 462/125)

structure view:

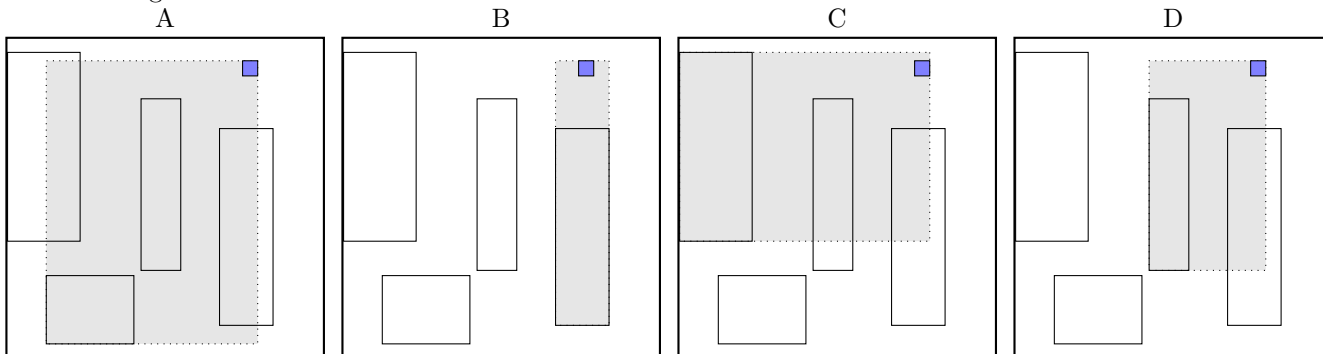


data view:



call CHOOSE-LEAF *R*, 13

choose among children:



old area: 1.046577
new area: 10.474765
extension: 9.428188

old area: 1.8429232
new area: 2.477999
extension: 0.6350758

old area: 2.3980799
new area: 8.265882
extension: 5.8678017

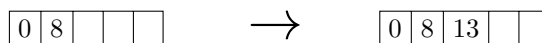
old area: 1.1917497
new area: 4.278739
extension: 3.0869894

selected B

a leaf is found: B

return from CHOOSE-LEAF

the leaf B is not full, add the record.



call ADJUST-TREE with *R*, node B

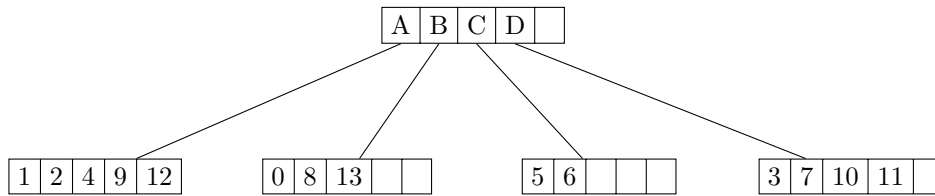
update MBR of node B.

continue by adjusting the parent node root

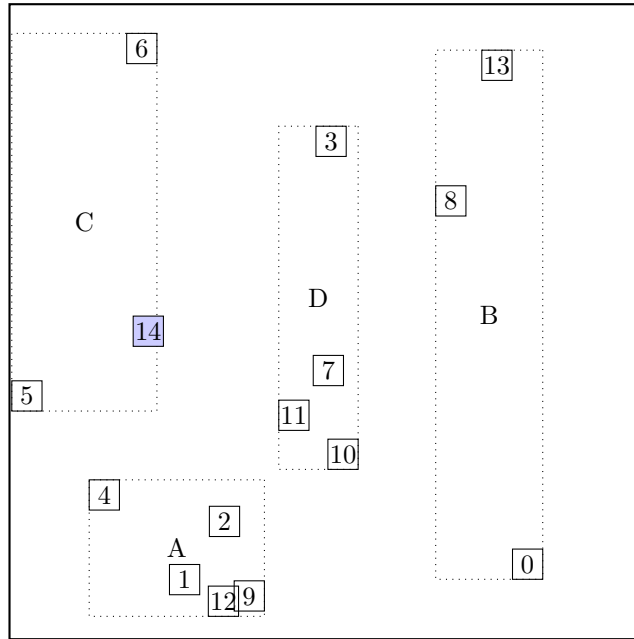
call ADJUST-TREE with R , node root
we are at the root
return from ADJUST-TREE

call INSERT *R*, #S(P :X 409/500 :Y 1937/1000)

structure view:

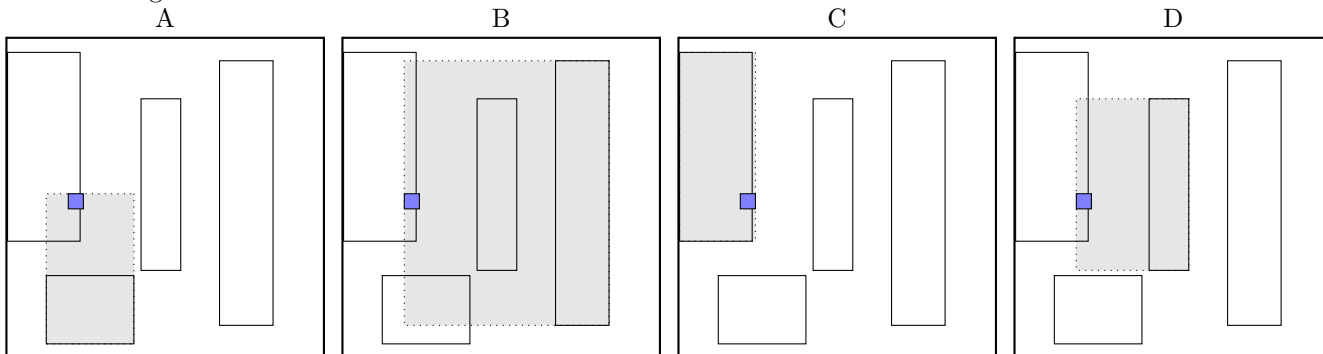


data view:



call CHOOSE-LEAF *R*, 14

choose among children:



old area: 1.046577
new area: 2.3017738
extension: 1.2551968

old area: 2.477999
new area: 9.4815
extension: 7.003501

old area: 2.3980799
new area: 2.5054939
extension: 0.10741401

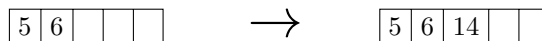
old area: 1.1917497
new area: 3.3777597
extension: 2.18601

selected C

a leaf is found: C

return from CHOOSE-LEAF

the leaf C is not full, add the record.



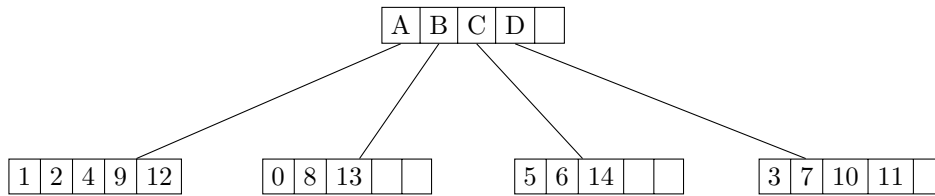
call ADJUST-TREE with *R*, node C
update MBR of node C.

continue by adjusting the parent node root

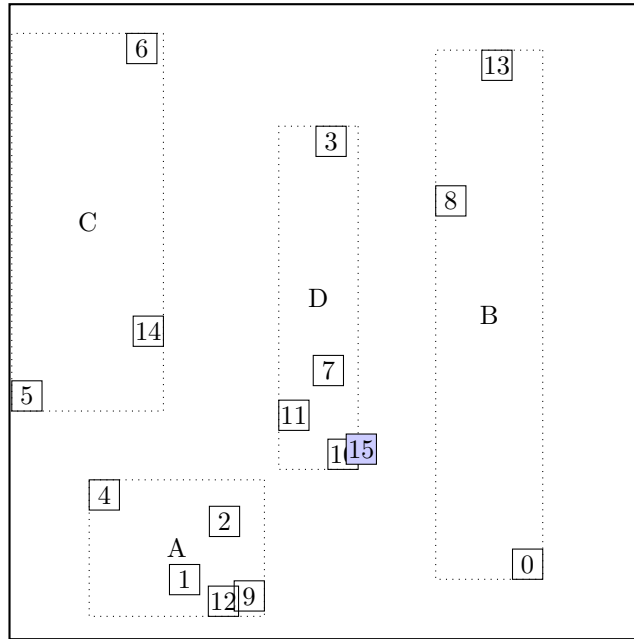
call ADJUST-TREE with R , node root
we are at the root
return from ADJUST-TREE

call INSERT R , #S(P :X 2227/1000 :Y 1157/1000)

structure view:

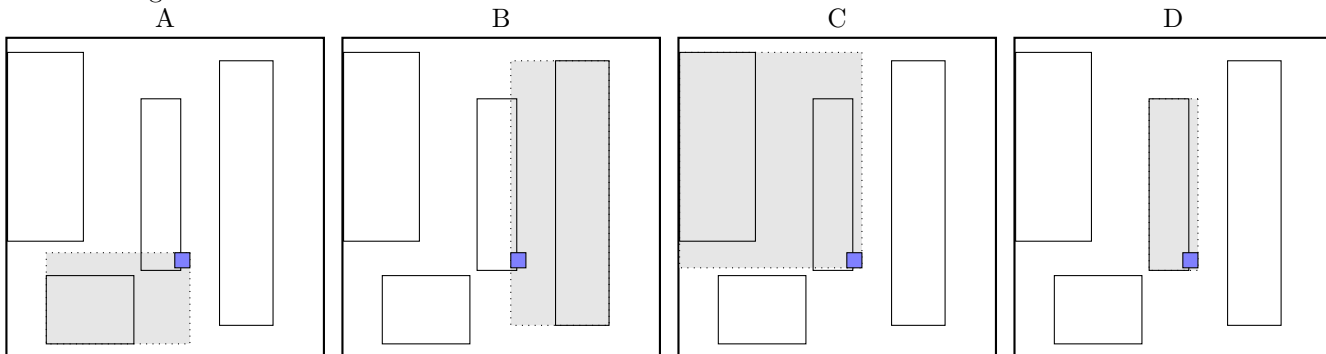


data view:



call CHOOSE-LEAF R , 15

choose among children:



old area: 1.046577
new area: 2.2913997
extension: 1.2448228

old area: 2.477999
new area: 4.549999
extension: 2.0720003

old area: 2.5054939
new area: 6.8741994
extension: 4.3687058

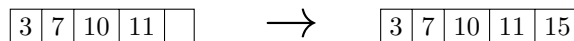
old area: 1.1917497
new area: 1.4664198
extension: 0.27467012

selected D

a leaf is found: D

return from CHOOSE-LEAF

the leaf D is not full, add the record.



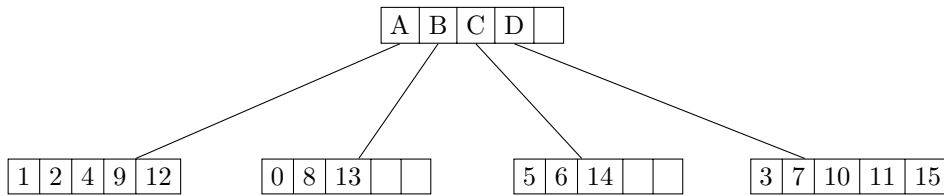
call ADJUST-TREE with R , node D
update MBR of node D.

continue by adjusting the parent node root

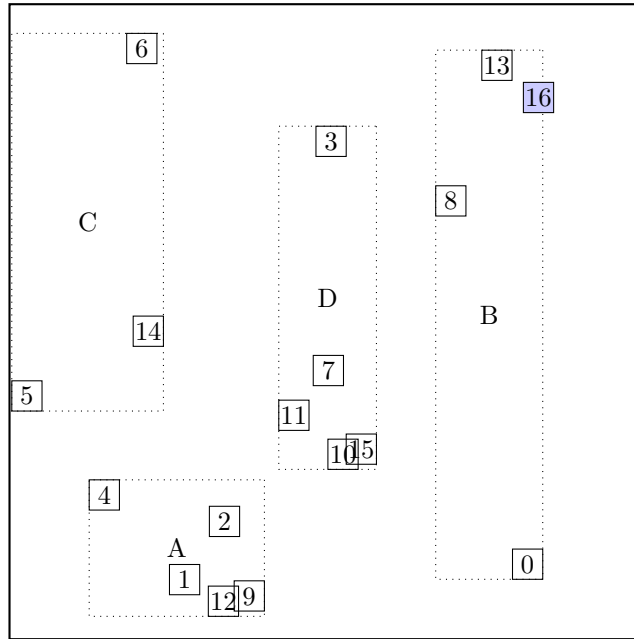
call ADJUST-TREE with R , node root
we are at the root
return from ADJUST-TREE

call INSERT *R*, #S(P :X 3399/1000 :Y 3483/1000)

structure view:

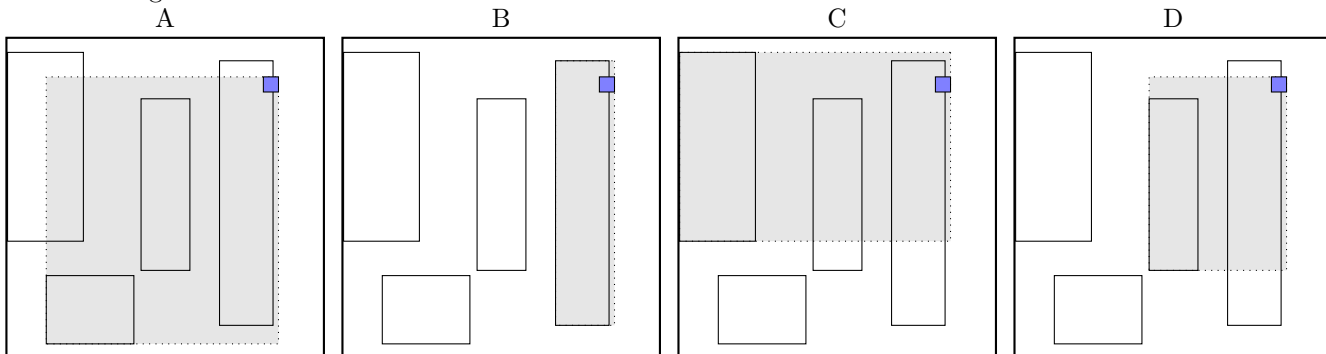


data view:



call CHOOSE-LEAF *R*, 16

choose among children:



old area: 1.046577
 new area: 10.850304
 extension: 9.803726

old area: 2.477999
 new area: 2.729999
 extension: 0.2520001

old area: 2.5054939
 new area: 8.952831
 extension: 6.447337

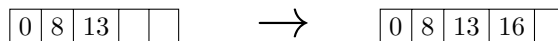
old area: 1.4664198
 new area: 4.6540794
 extension: 3.1876598

selected B

a leaf is found: B

return from CHOOSE-LEAF

the leaf B is not full, add the record.



call ADJUST-TREE with *R*, node B

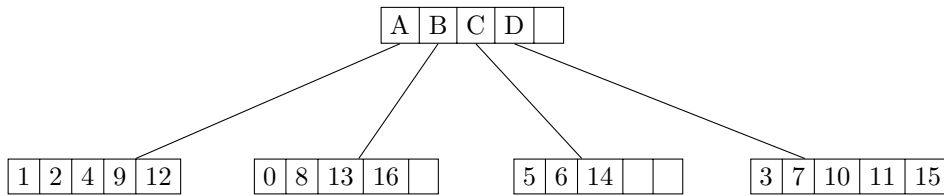
update MBR of node B.

continue by adjusting the parent node root

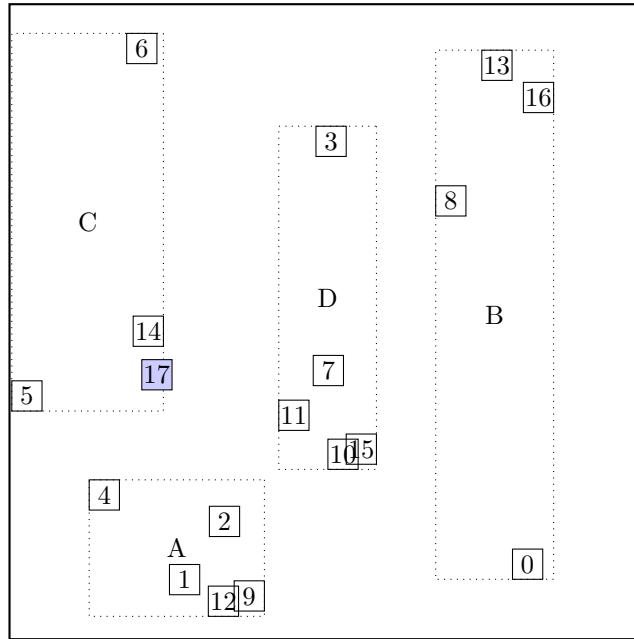
call ADJUST-TREE with R , node root
we are at the root
return from ADJUST-TREE

call INSERT R , #S(P :X 7/8 :Y 1649/1000)

structure view:

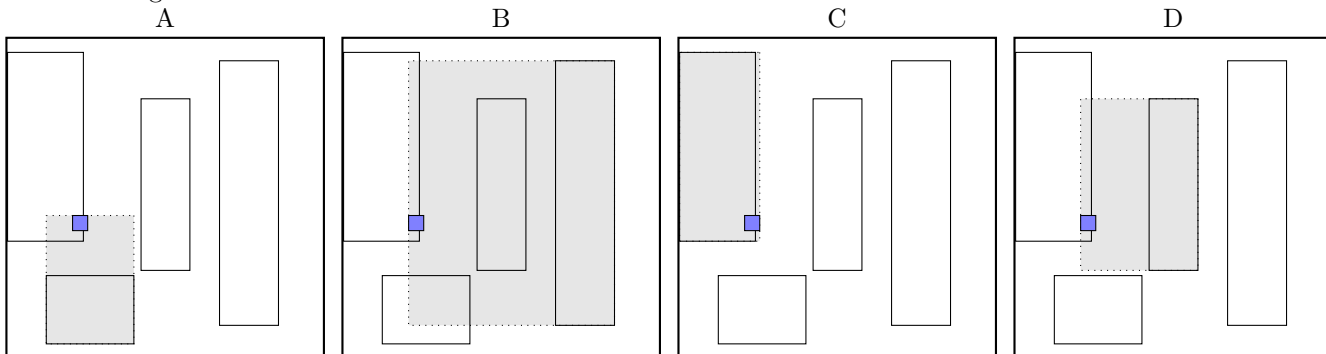


data view:



call CHOOSE-LEAF R , 17

choose among children:



old area: 1.046577
new area: 1.9679819
extension: 0.92140496

old area: 2.729999
new area: 9.534
extension: 6.8040013

old area: 2.5054939
new area: 2.64788
extension: 0.1423862

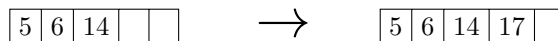
old area: 1.4664198
new area: 3.5230398
extension: 2.0566202

selected C

a leaf is found: C

return from CHOOSE-LEAF

the leaf C is not full, add the record.



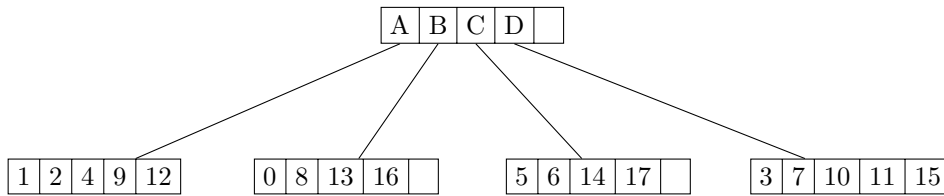
call ADJUST-TREE with R , node C
update MBR of node C.

continue by adjusting the parent node root

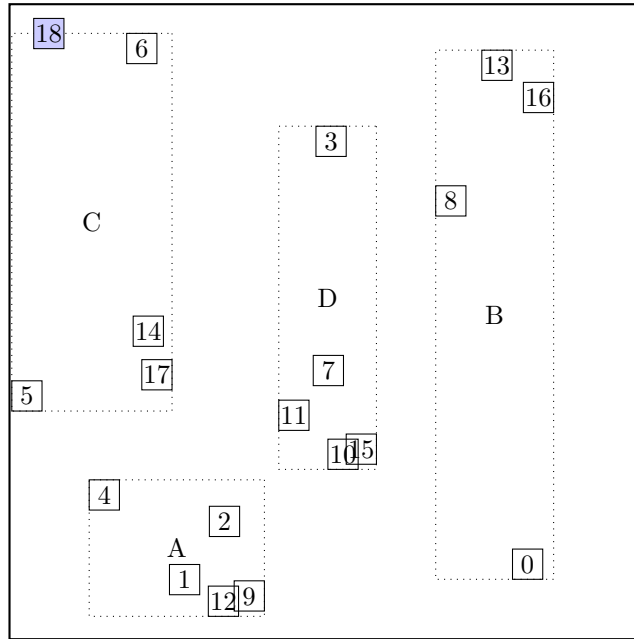
call ADJUST-TREE with R , node root
we are at the root
return from ADJUST-TREE

call INSERT R , #S(P :X 4/25 :Y 1953/500)

structure view:

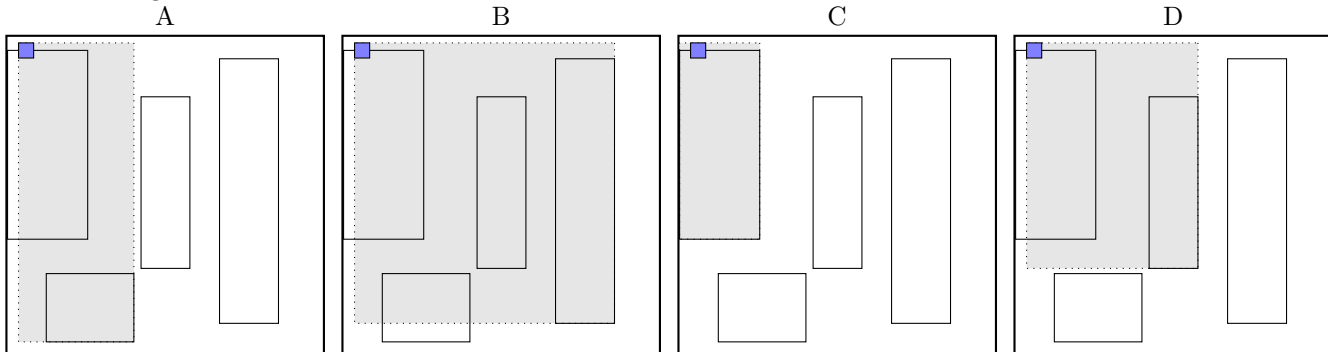


data view:



call CHOOSE-LEAF R , 18

choose among children:



old area: 1.046577
new area: 6.0353303
extension: 4.9887533

old area: 2.729999
new area: 12.75869
extension: 10.02869

old area: 2.64788
new area: 2.7528203
extension: 0.104940176

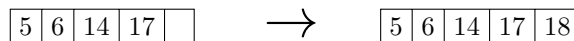
old area: 1.4664198
new area: 6.762461
extension: 5.2960415

selected C

a leaf is found: C

return from CHOOSE-LEAF

the leaf C is not full, add the record.



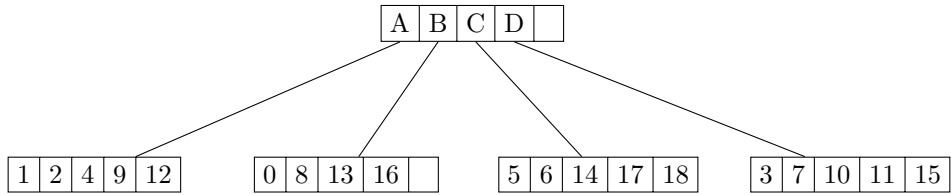
call ADJUST-TREE with R , node C

update MBR of node C.

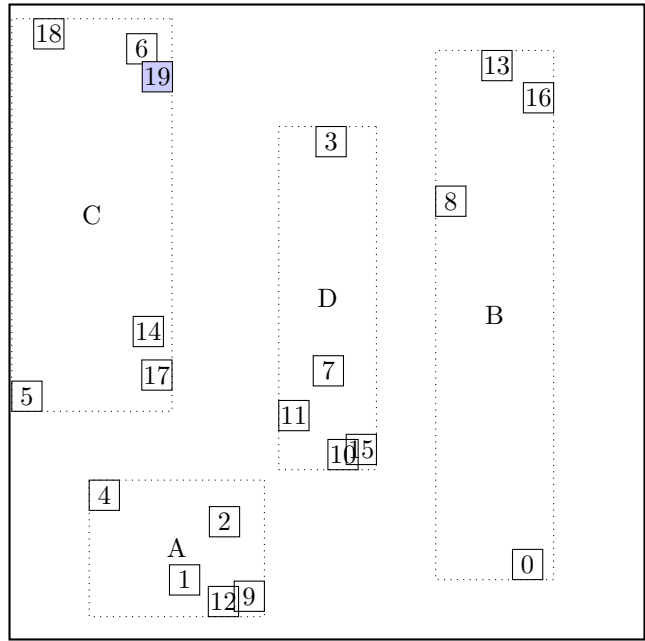
continue by adjusting the parent node root

call ADJUST-TREE with R , node root
we are at the root
return from ADJUST-TREE

call INSERT *R*, #S(P :X 439/500 :Y 1811/500)
 structure view:

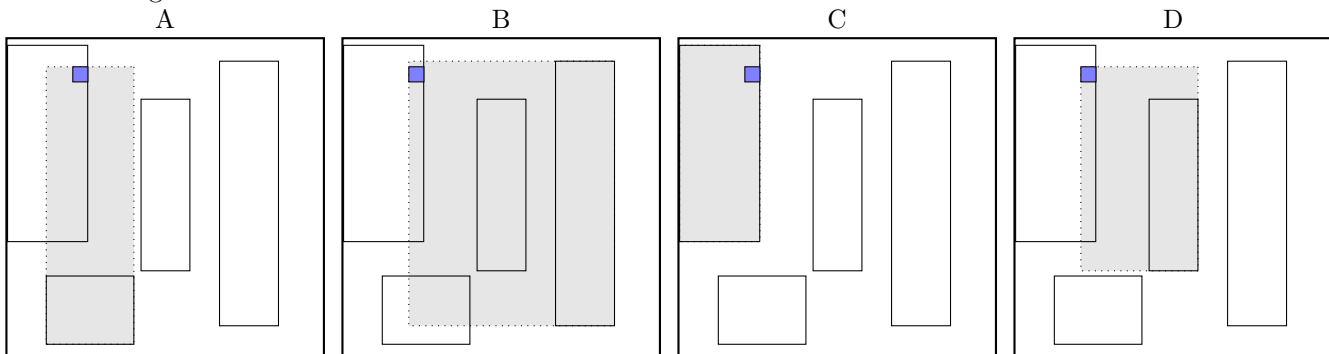


data view:



call CHOOSE-LEAF *R*, 19

choose among children:



old area: 1.046577
 new area: 4.2546888
 extension: 3.2081118

old area: 2.729999
 new area: 9.523499
 extension: 6.7934995

old area: 2.7528203
 new area: 2.7606113
 extension: 0.0077910423

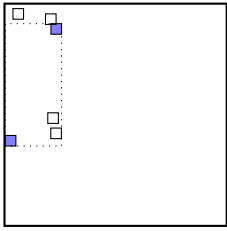
old area: 1.4664198
 new area: 4.1807504
 extension: 2.7143307

selected C

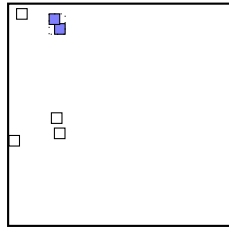
a leaf is found: C

return from CHOOSE-LEAF

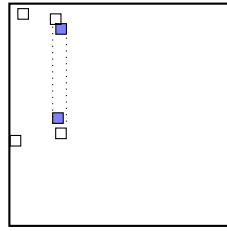
call SPLIT-NODE *R* new node call PICK-SEEDS
 19 5 6 14 17 18



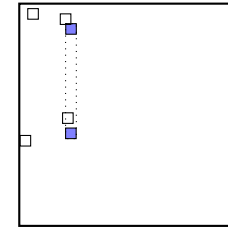
$$d(19, 5) = 2.3787194$$



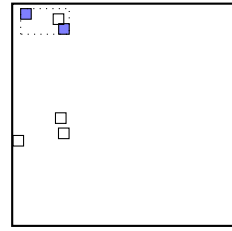
$$d(19, 6) = 0.036655013$$



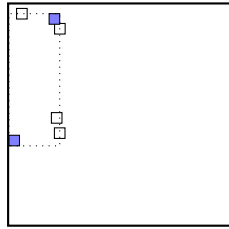
$$d(19, 14) = 0.4101001$$



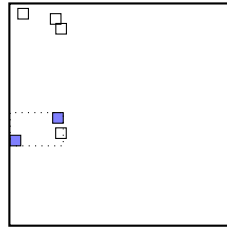
$$d(19, 17) = 0.36111915$$



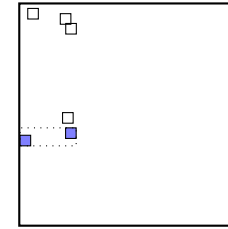
$$d(19, 18) = 0.364312$$



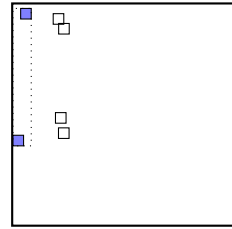
$$d(5, 6) = 2.31808$$



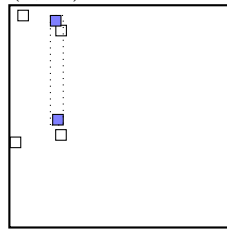
$$d(5, 14) = 0.54988397$$



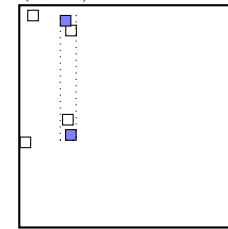
$$d(5, 17) = 0.28040013$$



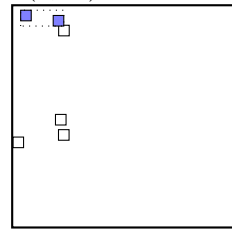
$$d(5, 18) = 0.815965$$



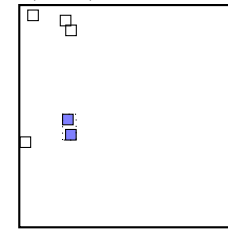
$$d(6, 14) = 0.42301014$$



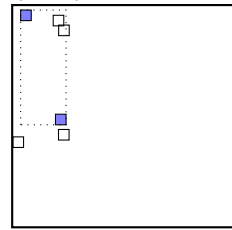
$$d(6, 17) = 0.6274001$$



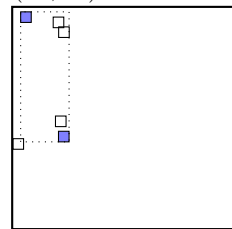
$$d(6, 18) = 0.16368504$$



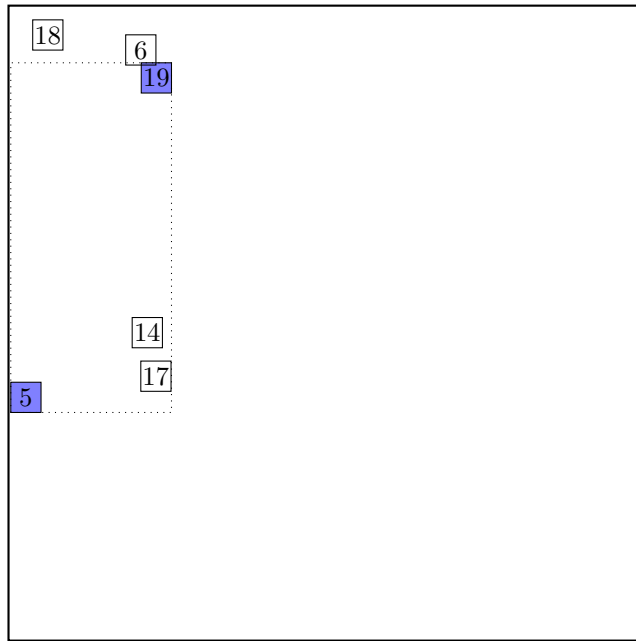
$$d(14, 17) = 0.045415987$$



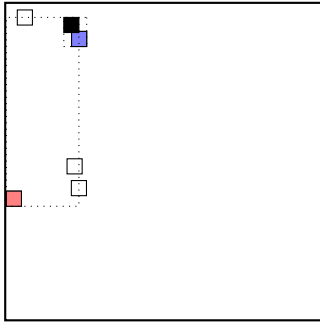
$$d(14, 18) = 1.7810023$$



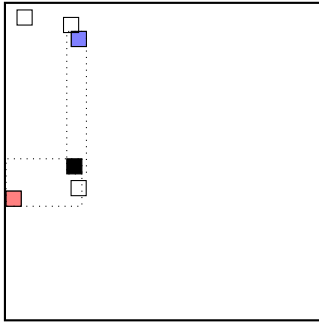
$$d(17, 18) = 2.1681552$$



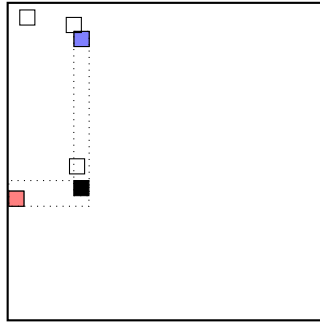
call PICK-NEXT R entries node



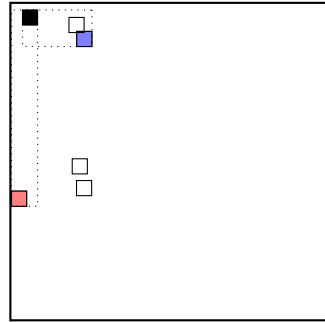
6: $\Delta d = 2.281425$



14: $\Delta d = 0.13978386$



17: $\Delta d = -0.080719024$



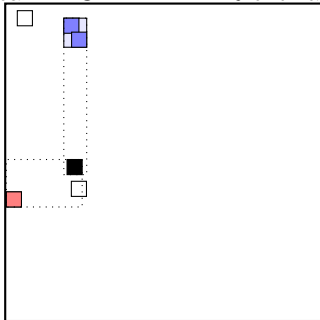
18: $\Delta d = 0.451653$

maximal $|\Delta d|$ occurs for node 6.

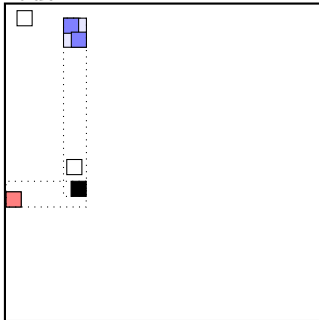
add the node to the blue group ($\Delta d \geq 0$)

update MBR of the blue group group

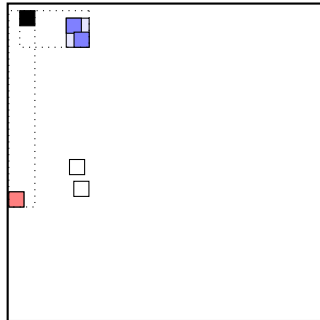
call PICK-NEXT R entries node



14: $\Delta d = 0.079328865$



17: $\Delta d = -0.277419$



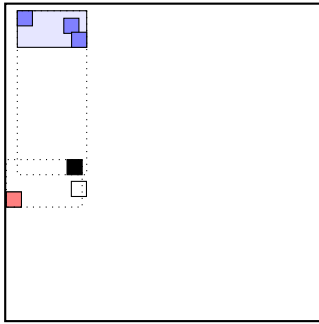
18: $\Delta d = 0.52830804$

maximal $|\Delta d|$ occurs for node 18.

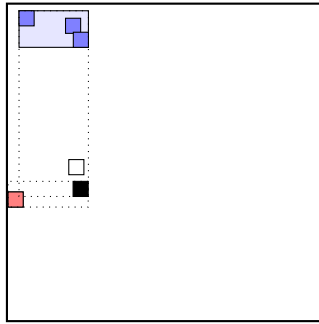
add the node to the blue group ($\Delta d \geq 0$)

update MBR of the blue group group

call PICK-NEXT R entries node



14: $\Delta d = -0.9569464$



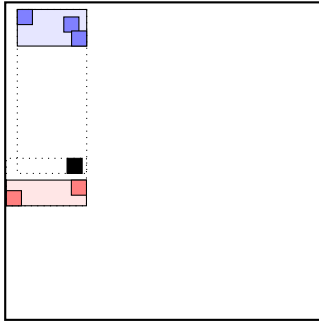
17: $\Delta d = -1.490814$

maximal $|\Delta d|$ is for node 17.

add the node to the **red group** ($\Delta d < 0$)

update MBR of the **red group** group

call PICK-NEXT R entries node



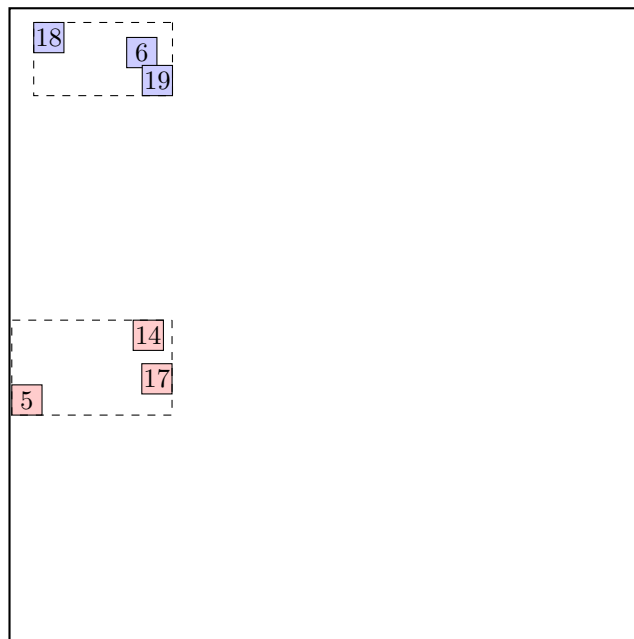
14: $\Delta d = -1.2415505$

maximal $|\Delta d|$ is for node 14.

add the node to the **red group** ($\Delta d < 0$)

update MBR of the **red group** group

... the final split is:

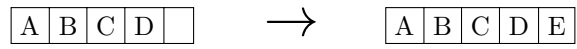


call ADJUST-TREE with R , node C and the new node

update MBR of node C.

add the new node NIL to the parent node root

the parent node root is not full, we can add the new node E directly.

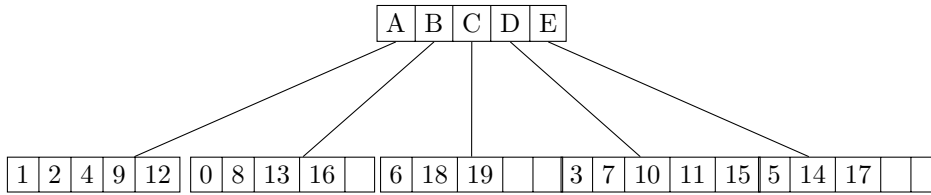


noindentcontinue by adjusting the parent node root.

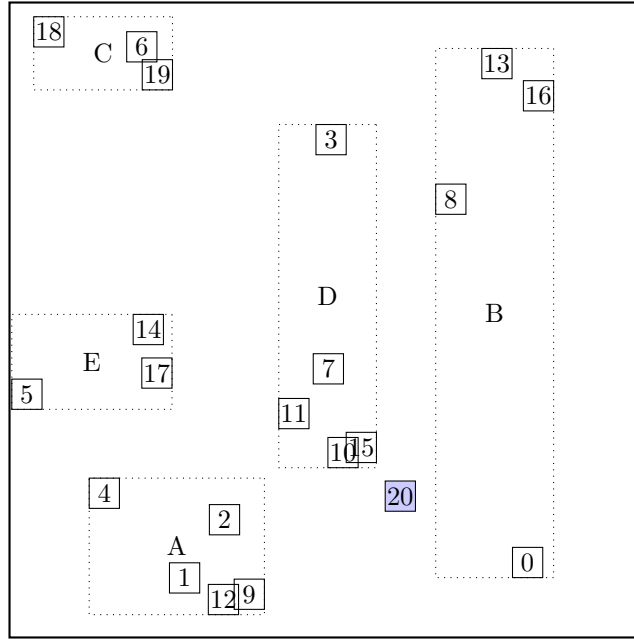
call ADJUST-TREE with R , node root
we are at the root
return from ADJUST-TREE

call INSERT *R*, #S(P :X 497/200 :Y 167/200)

structure view:

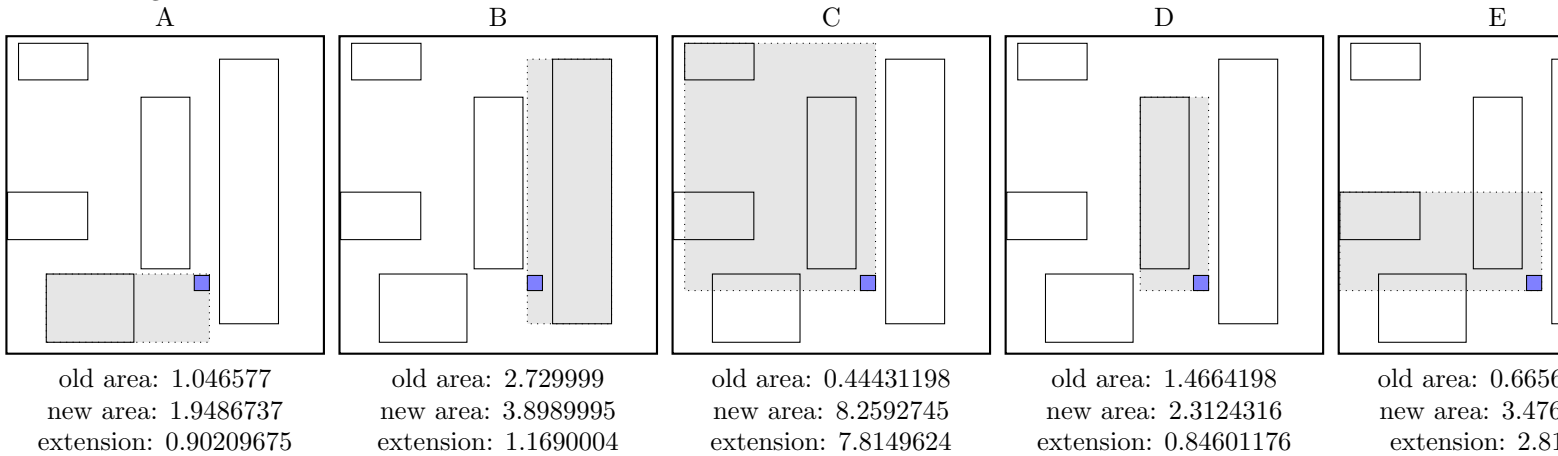


data view:



call CHOOSE-LEAF *R*, 20

choose among children:



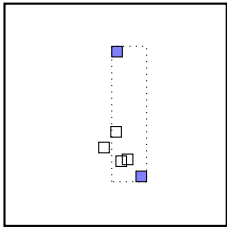
selected D

a leaf is found: D

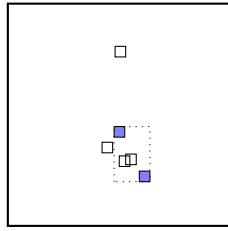
return from CHOOSE-LEAF

call SPLIT-NODE *R* new node call PICK-SEEDS

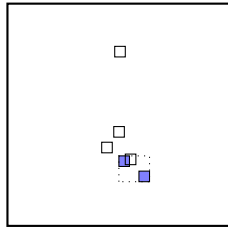
20 3 7 10 11 15



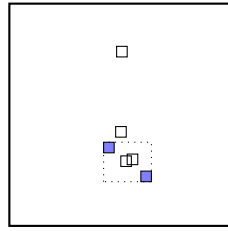
$$d(20, 3) = 1.6031638$$



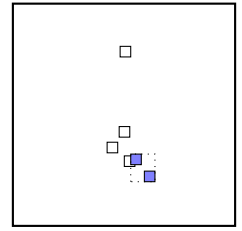
$$d(20, 7) = 0.6243918$$



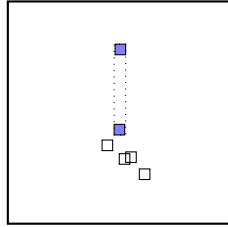
$$d(20, 10) = 0.20255199$$



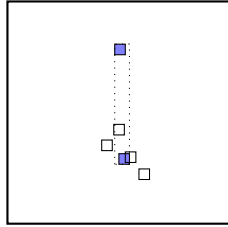
$$d(20, 11) = 0.59438396$$



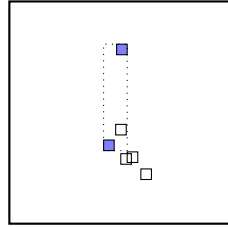
$$d(20, 15) = 0.1590759$$



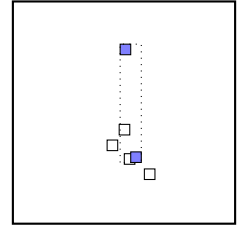
$$d(3, 7) = 0.29408774$$



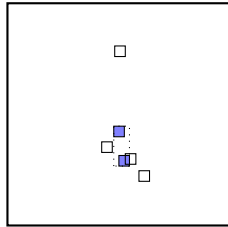
$$d(3, 10) = 0.5533299$$



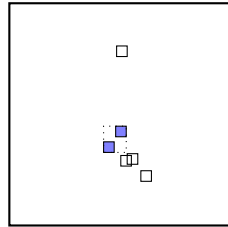
$$d(3, 11) = 0.81735176$$



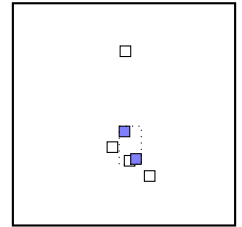
$$d(3, 15) = 0.8144001$$



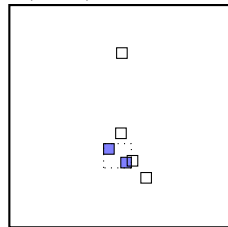
$$d(7, 10) = 0.14393792$$



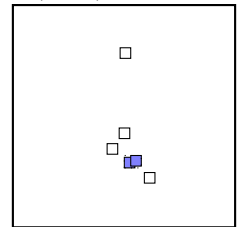
$$d(7, 11) = 0.132288$$



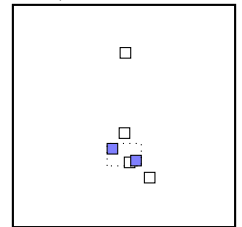
$$d(7, 15) = 0.22096$$



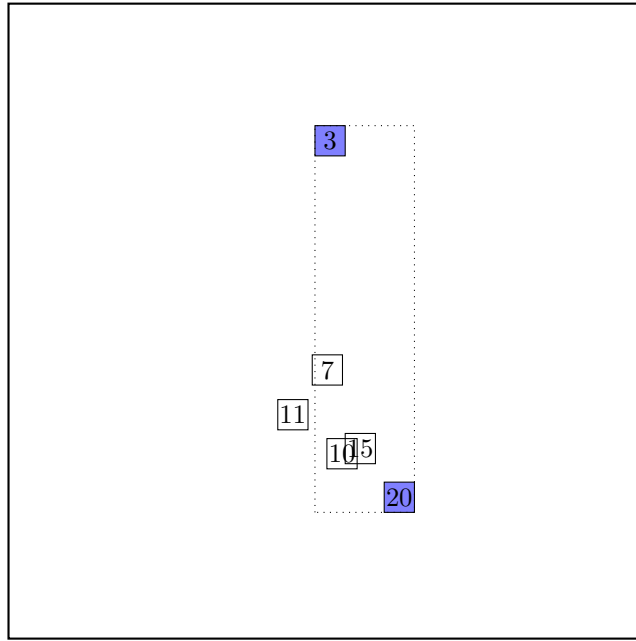
$$d(10, 11) = 0.16044997$$



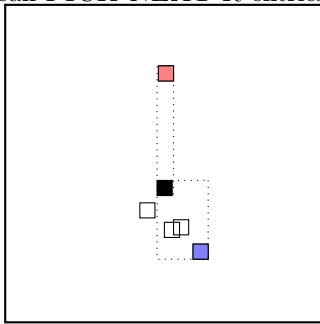
$$d(10, 15) = -0.0048859865$$



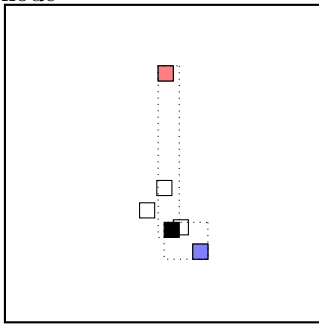
$$d(11, 15) = 0.19390406$$



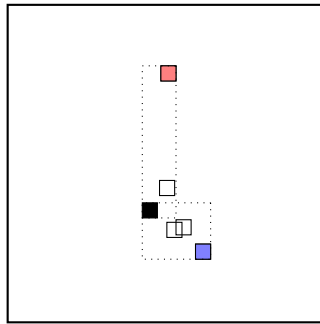
call PICK-NEXT R entries node



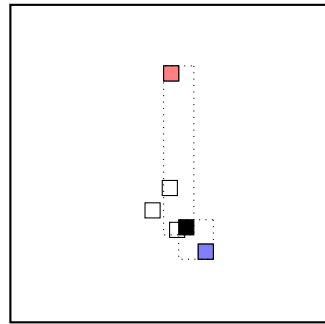
7: $\Delta d = -0.3303041$



10: $\Delta d = 0.3507779$



11: $\Delta d = 0.2229678$



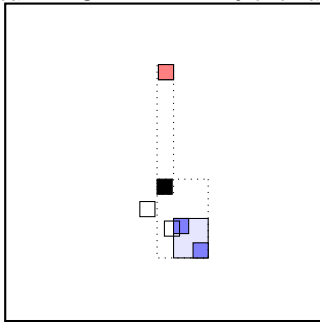
15: $\Delta d = 0.65532417$

maximal $|\Delta d|$ occurs for node 15.

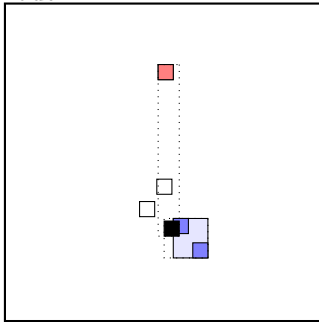
add the node to the blue group ($\Delta d \geq 0$)

update MBR of the blue group group

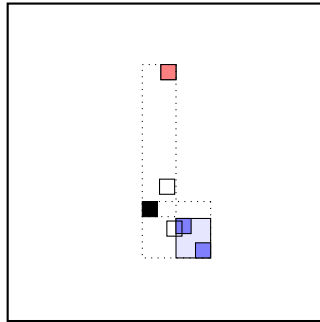
call PICK-NEXT R entries node



7: $\Delta d = -0.13122821$



10: $\Delta d = 0.5301678$



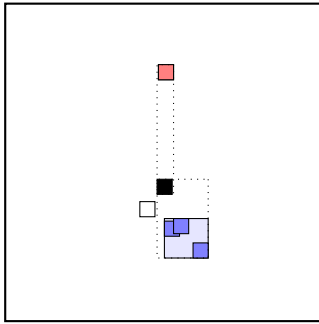
11: $\Delta d = 0.42204368$

maximal $|\Delta d|$ occurs for node 10.

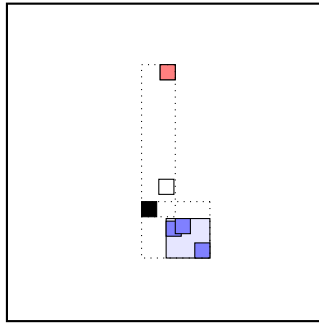
add the node to the blue group ($\Delta d \geq 0$)

update MBR of the blue group group

call PICK-NEXT R entries node

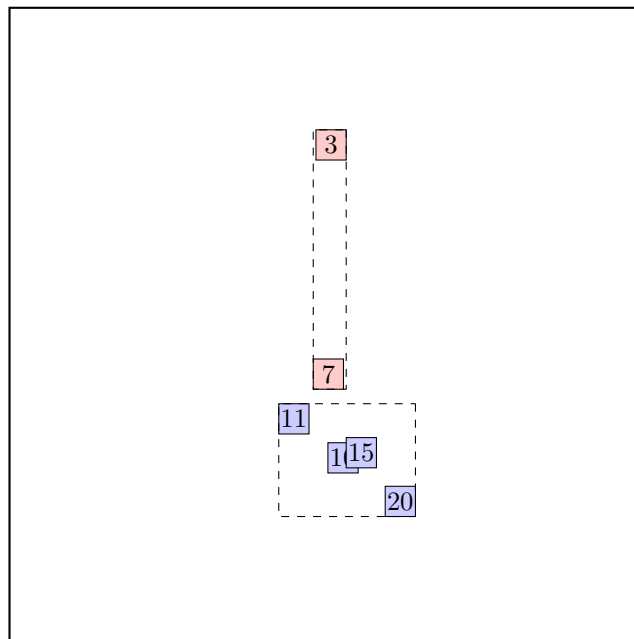


7: $\Delta d = -0.06806618$

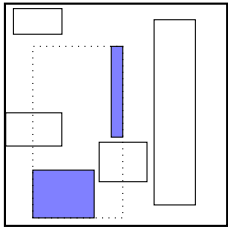


11: $\Delta d = 0.4852057$

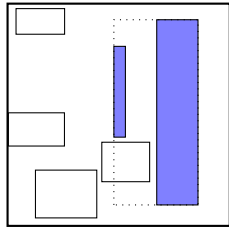
maximal $|\Delta d|$ occurs for node 11.
 add the node to the blue group ($\Delta d \geq 0$)
 update MBR of the blue group group
 the rest of rectangles must be put to the red group group.
 ... the final split is:



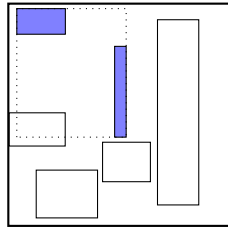
call ADJUST-TREE with R , node D and the new node
 update MBR of node D.
 add the new node NIL to the parent node root
 Parent node root is full, promote split (create a new parent)
 call SPLIT-NODE R new node call PICK-SEEDS
 NIL A B C D E



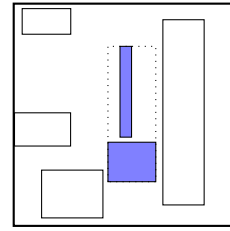
$$d(NIL, A) = 4.090735$$



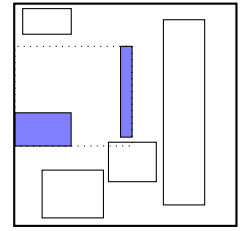
$$d(NIL, B) = 2.4609123$$



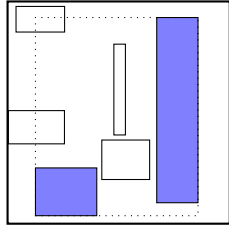
$$d(NIL, C) = 4.2023425$$



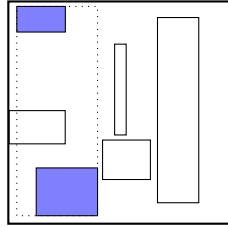
$$d(NIL, D) = 1.2639599$$



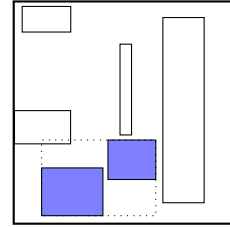
$$d(NIL, E) = 3.1276403$$



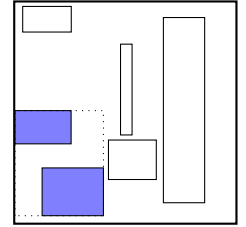
$$d(A, B) = 7.728064$$



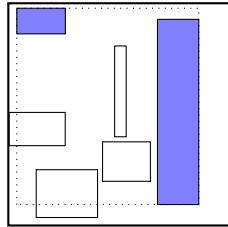
$$d(A, C) = 4.544441$$



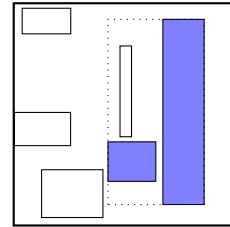
$$d(A, D) = 1.364979$$



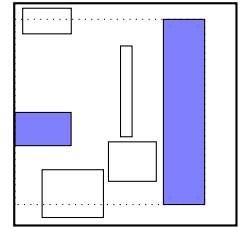
$$d(A, E) = 1.6063489$$



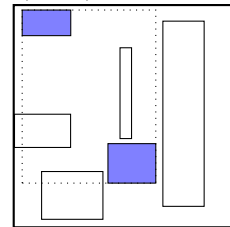
$$d(B, C) = 9.584378$$



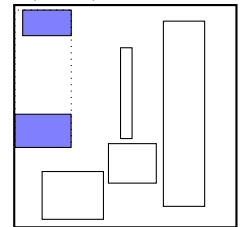
$$d(B, D) = 2.9586165$$



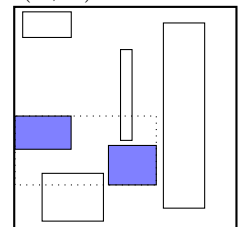
$$d(B, E) = 9.148321$$



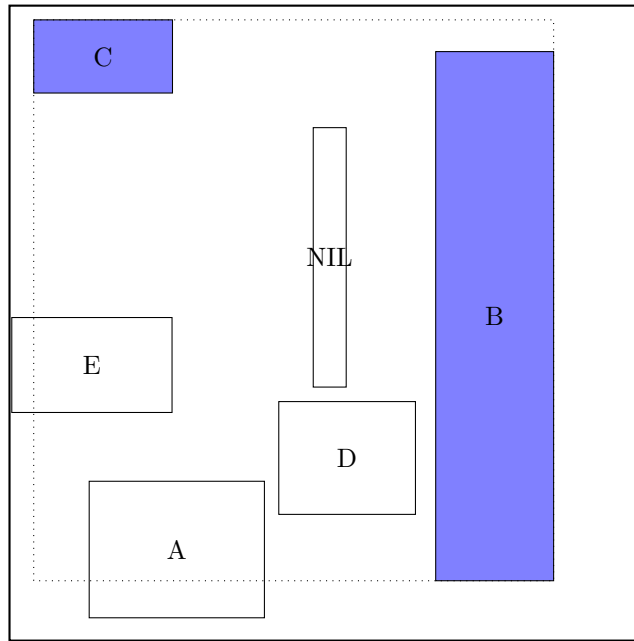
$$d(C, D) = 7.1405783$$



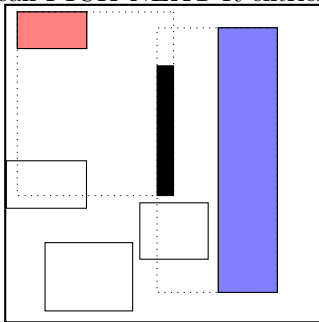
$$d(C, E) = 1.6506194$$



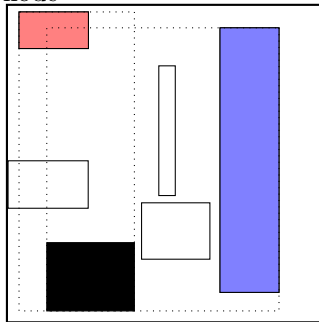
$$d(D, E) = 2.1362758$$



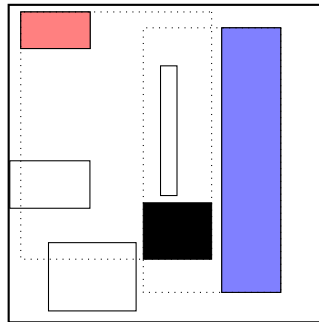
call PICK-NEXT R entries node



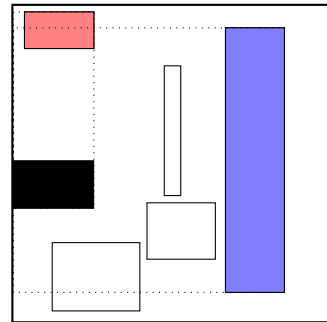
NIL: $\Delta d = 1.7414303$



A: $\Delta d = -3.1836229$



D: $\Delta d = 4.181962$



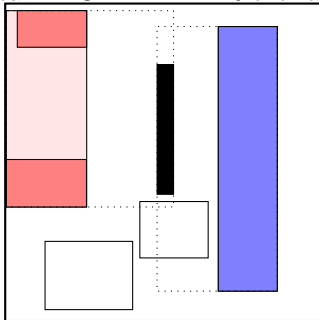
E: $\Delta d = -7.497702$

maximal $|\Delta d|$ is for node E.

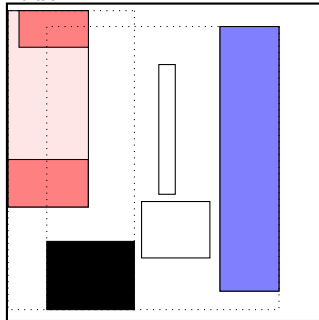
add the node to the **red group** ($\Delta d < 0$)

update MBR of the **red group** group

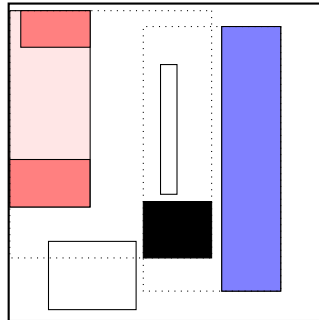
call PICK-NEXT R entries node



NIL: $\Delta d = 0.14895273$



A: $\Delta d = -4.926447$



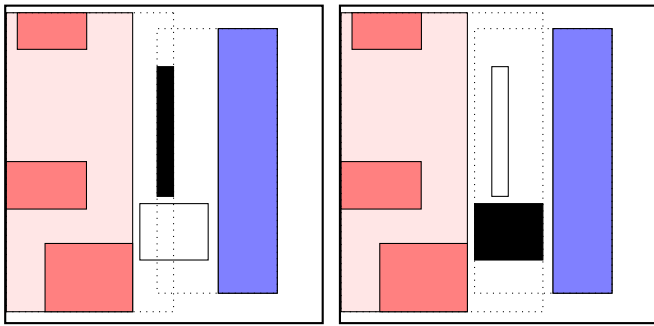
D: $\Delta d = 2.3399582$

maximal $|\Delta d|$ is for node A.

add the node to the **red group** ($\Delta d < 0$)

update MBR of the **red group** group

call PICK-NEXT R entries node



NIL: $\Delta d = -0.6953449$

D: $\Delta d = 0.3180442$

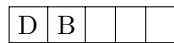
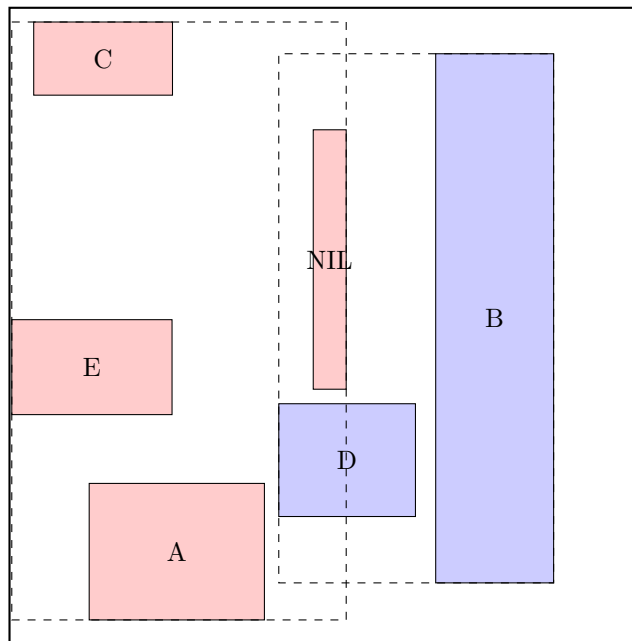
maximal $|\Delta d|$ is for node NIL.

add the node to the red group ($\Delta d < 0$)

update MBR of the red group

the rest of rectangles must be put to the blue group.

... the final split is:



+



continue by adjusting the parent node F, the new parent

call ADJUST-TREE with R , node F and the new node

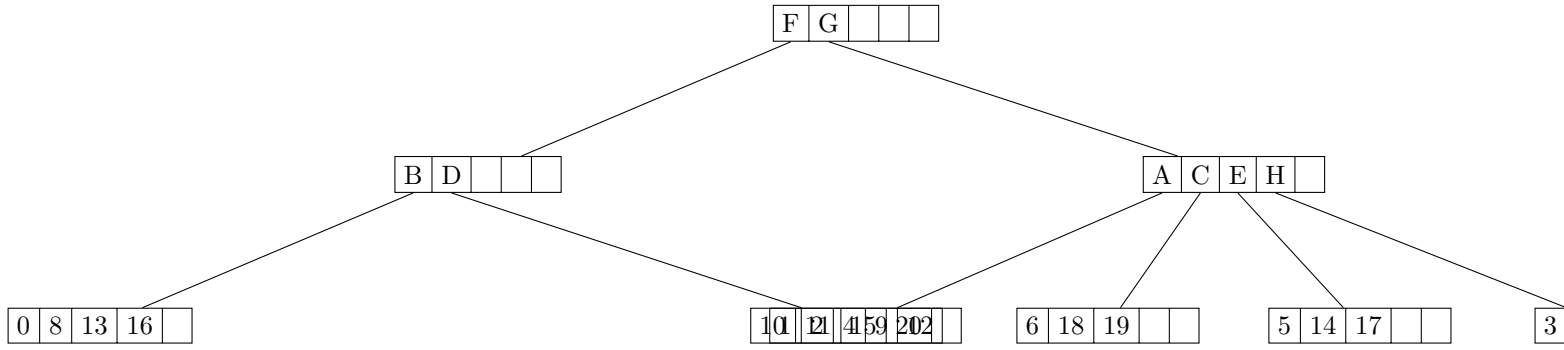
we are at the root

return from ADJUST-TREE

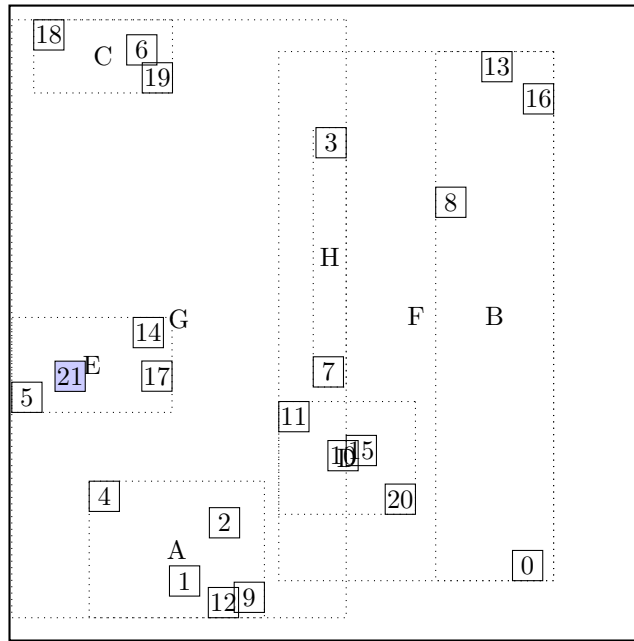
the ADJUST-TREE procedure returned additional new node: H.

create a new root, and make the old root and the new node its children.

call INSERT *R*, #S(P :X 301/1000 :Y 206/125)
 structure view:

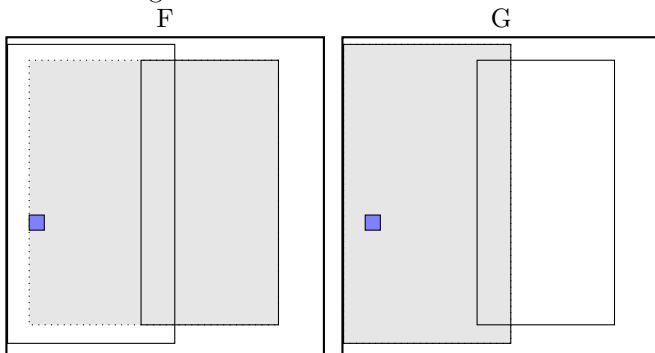


data view:



call CHOOSE-LEAF *R*, 21

choose among children:

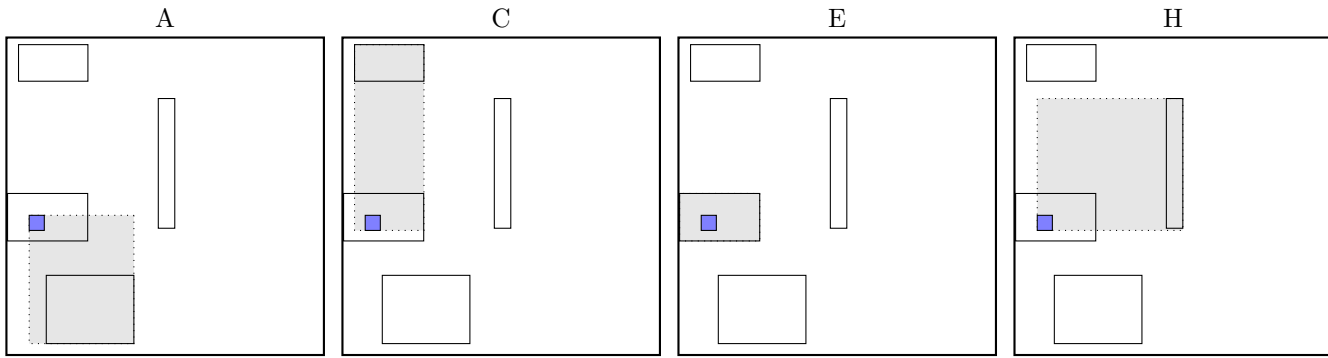


old area: 6.362995
 new area: 11.542999
 extension: 5.18

old area: 8.74846
 new area: 8.74846
 extension: 0.0

selected G

choose among children:



old area: 1.046577
 new area: 2.3503452
 extension: 1.3037682

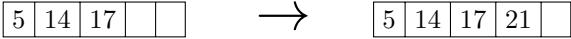
old area: 0.44431198
 new area: 2.2564442
 extension: 1.8121322

old area: 0.66568006
 new area: 0.66568006
 extension: 0.0

old area: 0.37408766
 new area: 3.36087
 extension: 2.9867823

selected E
 a leaf is found: E
 return from CHOOSE-LEAF

the leaf E is not full, add the record.

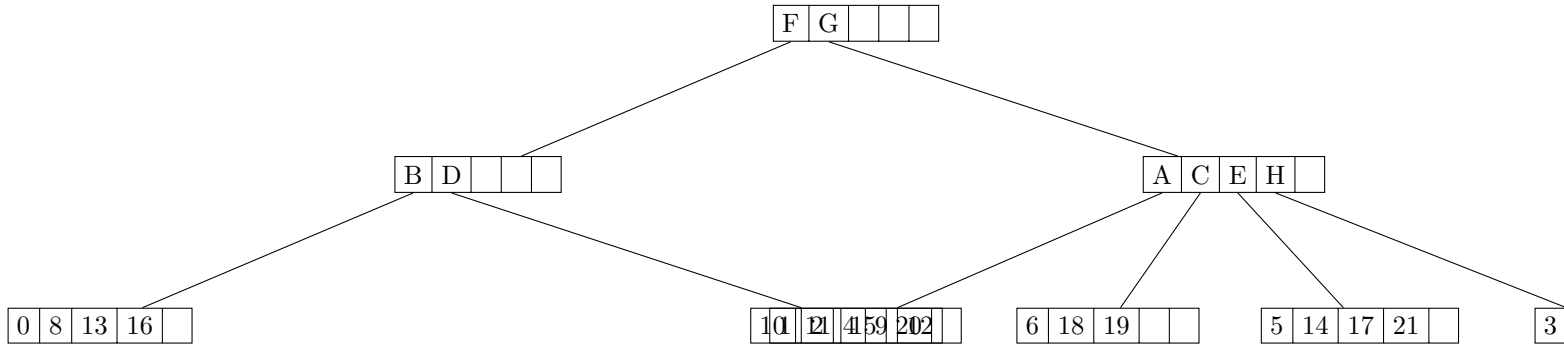


call ADJUST-TREE with R , node E
 update MBR of node E.
 continue by adjusting the parent node G

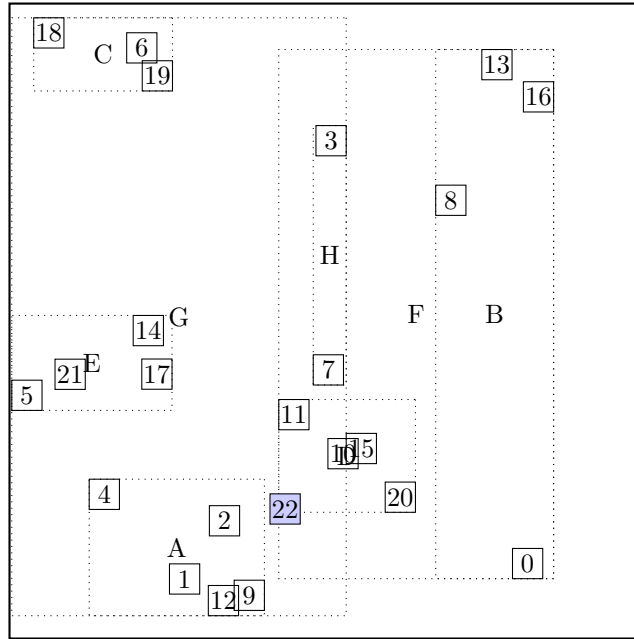
call ADJUST-TREE with R , node G
 update MBR of node G.
 continue by adjusting the parent node root

call ADJUST-TREE with R , node root
 we are at the root
 return from ADJUST-TREE

call INSERT *R*, #S(P :X 1723/1000 :Y 757/1000)
 structure view:

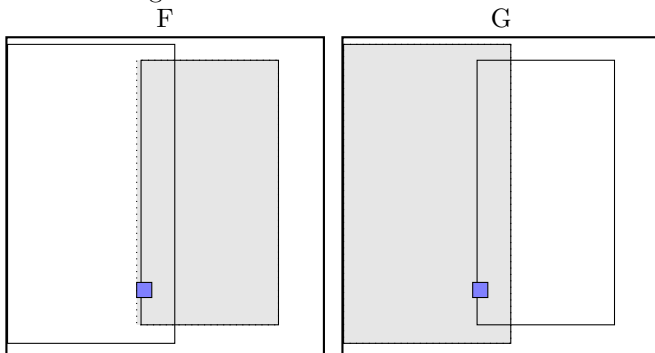


data view:



call CHOOSE-LEAF *R*, 22

choose among children:

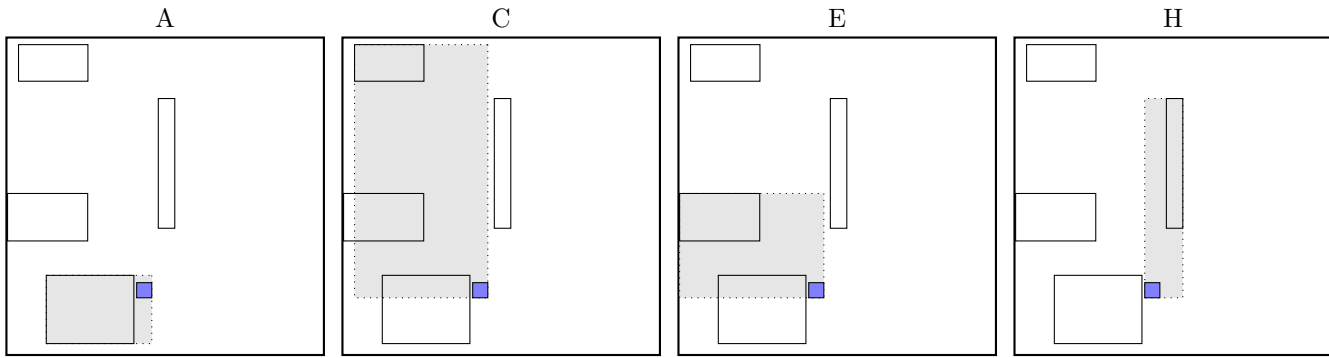


old area: 6.362995
 new area: 6.565995
 extension: 0.2030007

old area: 8.74846
 new area: 8.74846
 extension: 0.0

selected G

choose among children:



old area: 1.046577
 new area: 1.260588
 extension: 0.21401108

old area: 0.44431198
 new area: 5.9042873
 extension: 5.4599753

old area: 0.66568006
 new area: 2.63304
 extension: 1.9673599

old area: 0.37408766
 new area: 1.3285436
 extension: 0.95445586

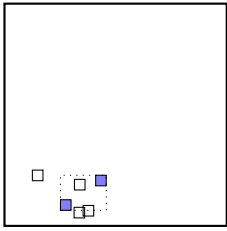
selected A

a leaf is found: A

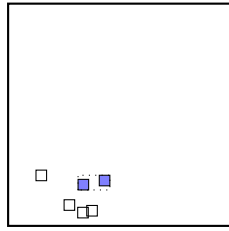
return from CHOOSE-LEAF

call SPLIT-NODE *R* new node call PICK-SEEDS

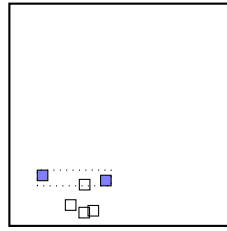
22 1 2 4 9 12



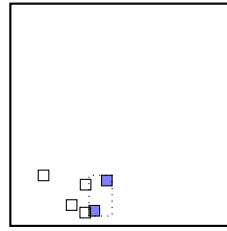
$$d(22, 1) = 0.4934951$$



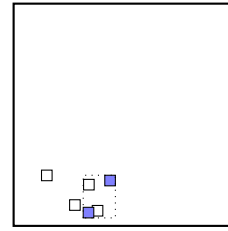
$$d(22, 2) = 0.087078005$$



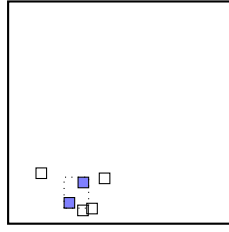
$$d(22, 4) = 0.33461195$$



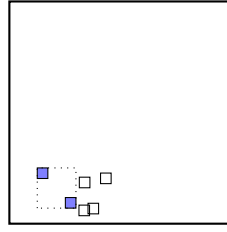
$$d(22, 9) = 0.2569271$$



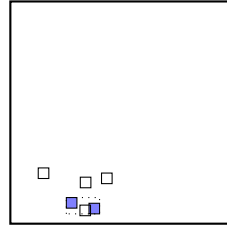
$$d(22, 12) = 0.410048$$



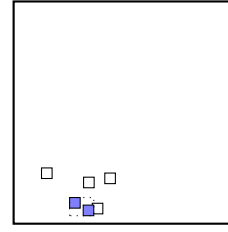
$$d(1, 2) = 0.19144006$$



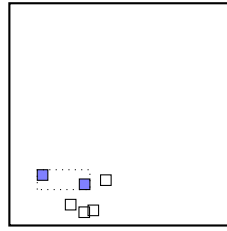
$$d(1, 4) = 0.4755599$$



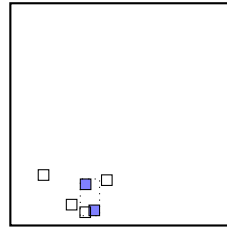
$$d(1, 9) = 0.11342398$$



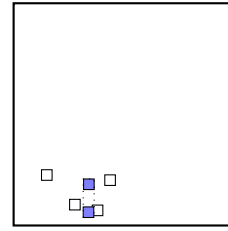
$$d(1, 12) = 0.07675104$$



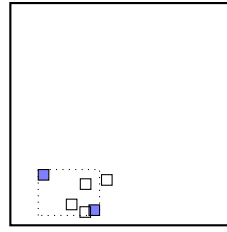
$$d(2, 4) = 0.29312497$$



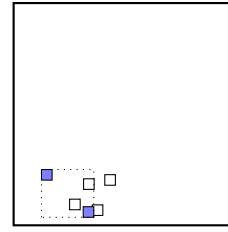
$$d(2, 9) = 0.17225194$$



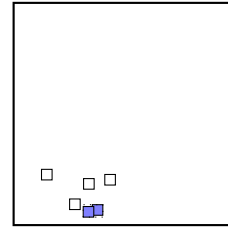
$$d(2, 12) = 0.070696$$



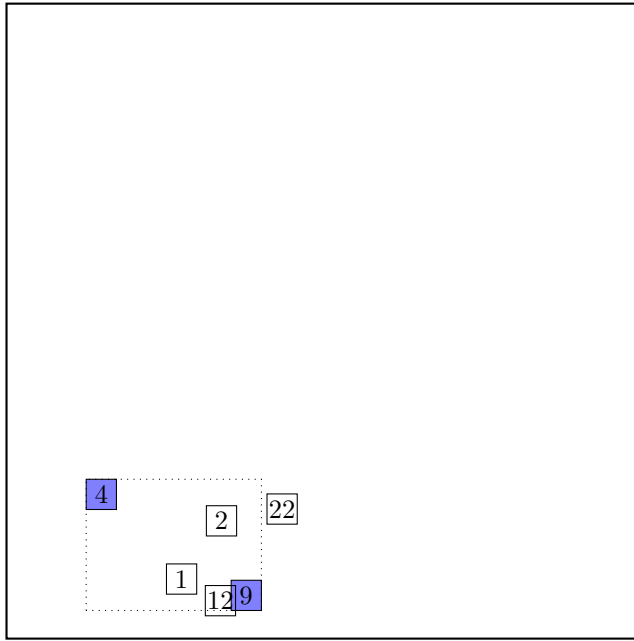
$$d(4, 9) = 0.9260118$$



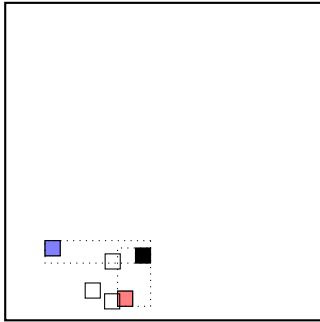
$$d(4, 12) = 0.812164$$



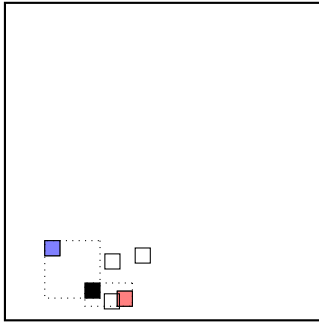
$$d(9, 12) = 0.0071849674$$



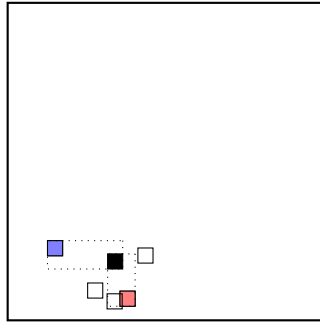
call PICK-NEXT R entries node



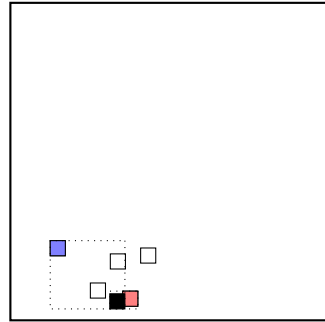
22: $\Delta d = -0.07768485$



1: $\Delta d = -0.36213592$



2: $\Delta d = -0.120873034$



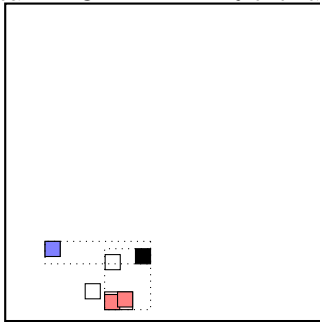
12: $\Delta d = -0.804979$

maximal $|\Delta d|$ is for node 12.

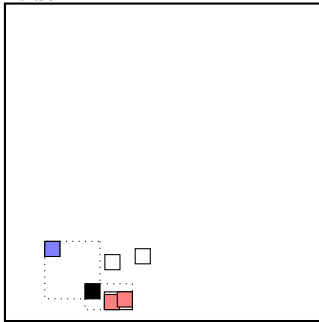
add the node to the **red group** ($\Delta d < 0$)

update MBR of the **red group** group

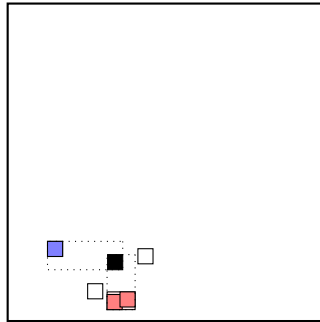
call PICK-NEXT R entries node



22: $\Delta d = 0.028251082$



1: $\Delta d = -0.38734087$



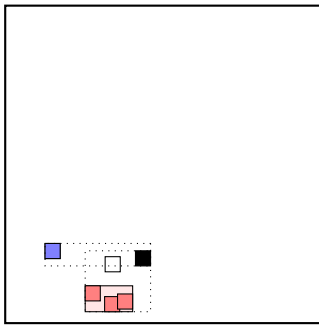
2: $\Delta d = -0.15022204$

maximal $|\Delta d|$ is for node 1.

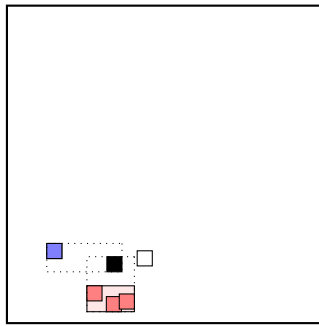
add the node to the **red group** ($\Delta d < 0$)

update MBR of the **red group** group

call PICK-NEXT R entries node



22: $\Delta d = 0.10717419$



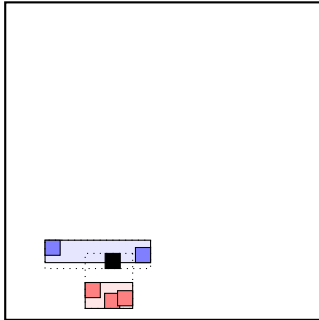
2: $\Delta d = -0.09134495$

maximal $|\Delta d|$ occurs for node 22.

add the node to the blue group ($\Delta d \geq 0$)

update MBR of the blue group group

call PICK-NEXT R entries node



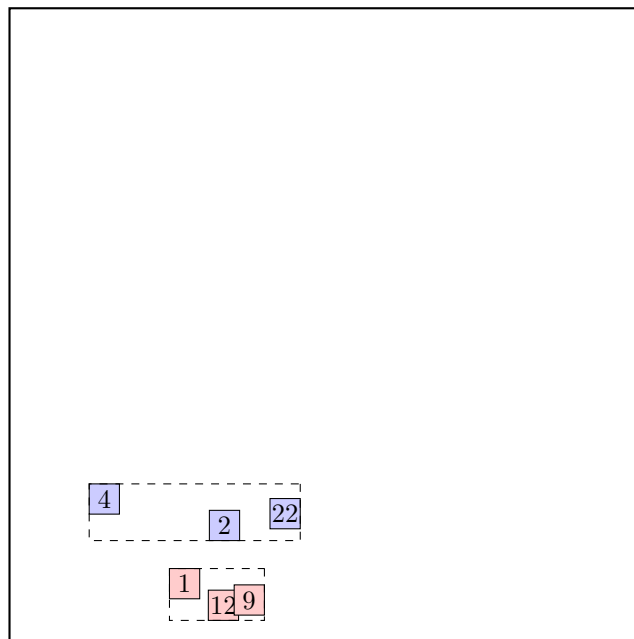
2: $\Delta d = 0.13289202$

maximal $|\Delta d|$ occurs for node 2.

add the node to the blue group ($\Delta d \geq 0$)

update MBR of the blue group group

... the final split is:



call ADJUST-TREE with R , node A and the new node

update MBR of node A.

add the new node NIL to the parent node G

the parent node G is not full, we can add the new node I directly.

A	C	E	H	
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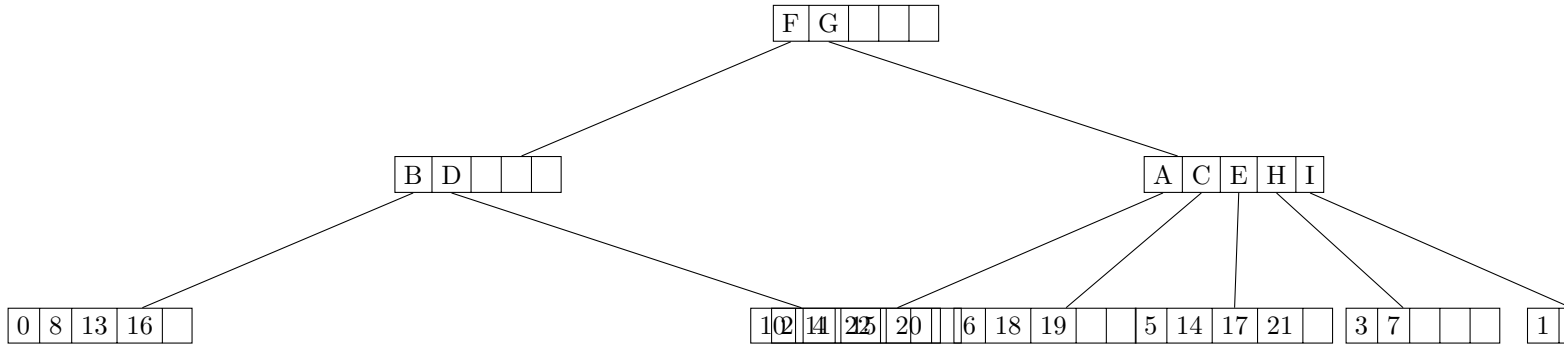
A	C	E	H	I
---	---	---	---	---

noindentcontinue by adjusting the parent node G.

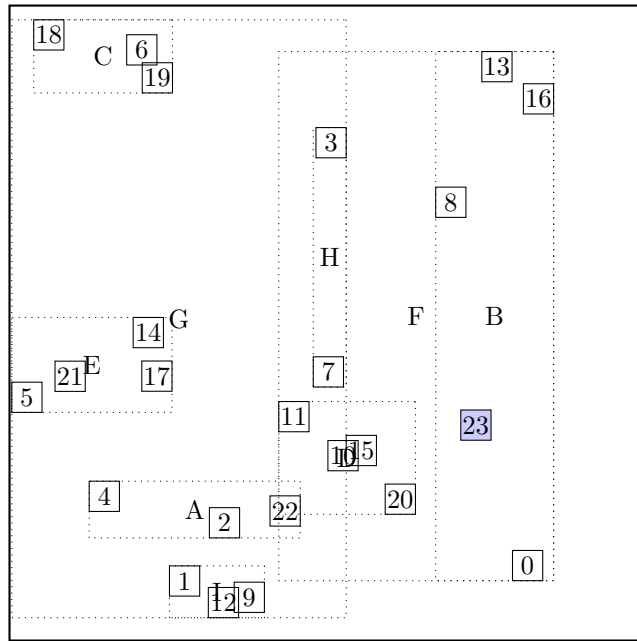
call ADJUST-TREE with R , node G
update MBR of node G.
continue by adjusting the parent node root

call ADJUST-TREE with R , node root
we are at the root
return from ADJUST-TREE

call INSERT *R*, #S(P :X 597/200 :Y 53/40)
 structure view:

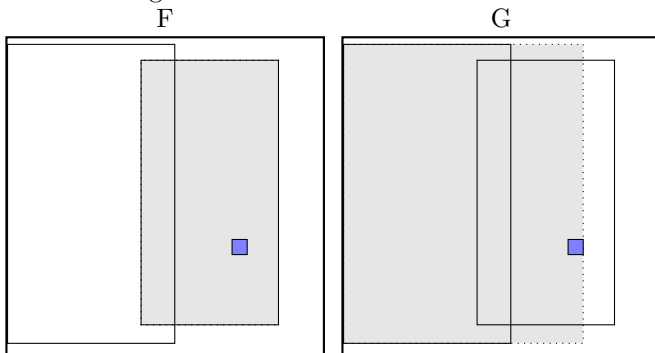


data view:



call CHOOSE-LEAF *R*, 23

choose among children:

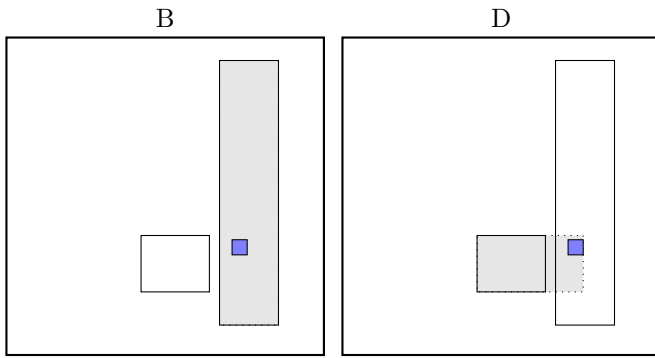


old area: 6.362995
 new area: 6.362995
 extension: 0.0

old area: 8.74846
 new area: 12.53735
 extension: 3.78889

selected F

choose among children:

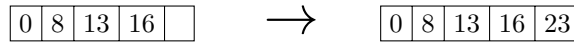


old area: 2.729999
 new area: 2.729999
 extension: 0.0

old area: 0.67438394
 new area: 1.047384
 extension: 0.3730001

selected B
 a leaf is found: B
 return from CHOOSE-LEAF

the leaf B is not full, add the record.

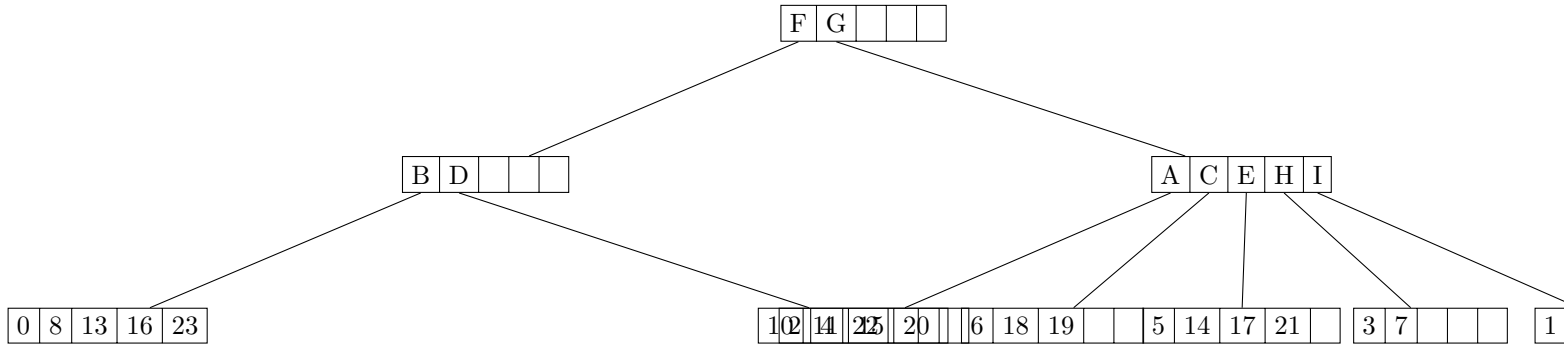


call ADJUST-TREE with R , node B
 update MBR of node B.
 continue by adjusting the parent node F

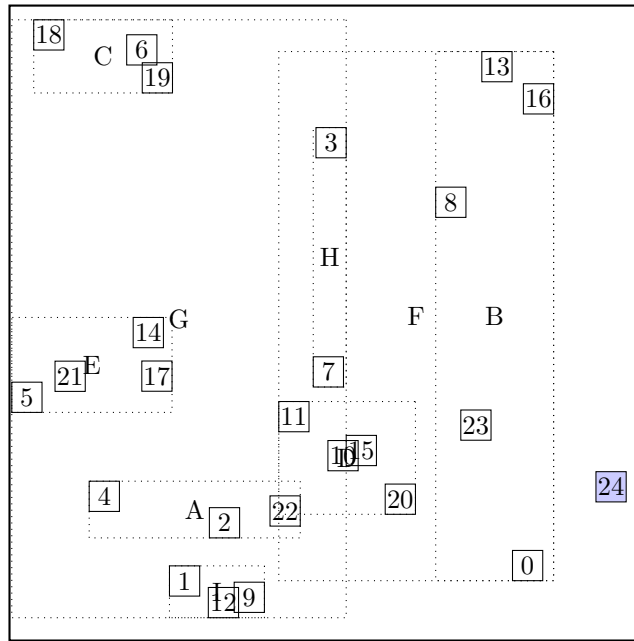
call ADJUST-TREE with R , node F
 update MBR of node F.
 continue by adjusting the parent node root

call ADJUST-TREE with R , node root
 we are at the root
 return from ADJUST-TREE

call INSERT *R*, #S(P :X 3879/1000 :Y 917/1000)
 structure view:

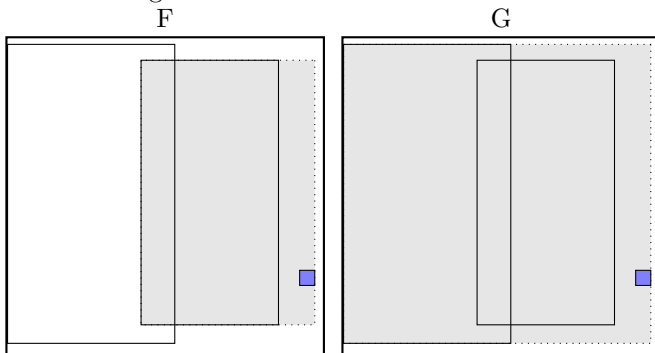


data view:



call CHOOSE-LEAF *R*, 24

choose among children:

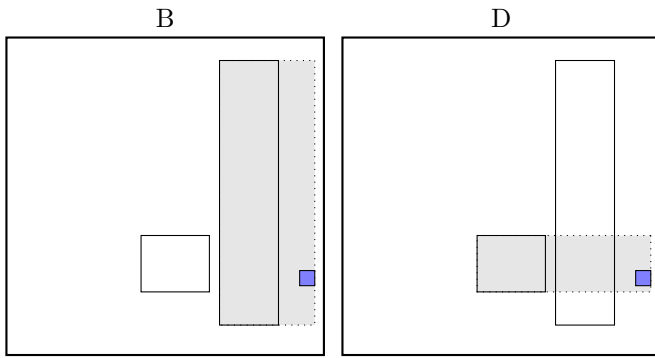


old area: 6.3629995
 new area: 8.042999
 extension: 1.6799998

old area: 8.74846
 new area: 16.07312
 extension: 7.3246603

selected F

choose among children:



old area: 2.729999
 new area: 4.409999
 extension: 1.6799998

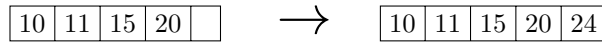
old area: 0.67438394
 new area: 1.7143082
 extension: 1.0399242

selected D

a leaf is found: D

return from CHOOSE-LEAF

the leaf D is not full, add the record.



call ADJUST-TREE with R , node D
 update MBR of node D.
 continue by adjusting the parent node F

call ADJUST-TREE with R , node F
 update MBR of node F.
 continue by adjusting the parent node root

call ADJUST-TREE with R , node root
 we are at the root
 return from ADJUST-TREE

