

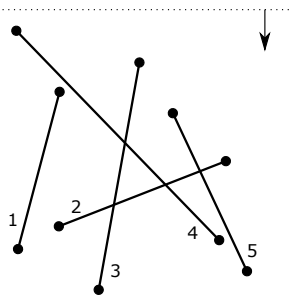
3D számítógépes geometria 2

Diszkrét geom. algoritmusok – ujjgyakorlat megoldások

Várady Tamás, Salvi Péter / BME

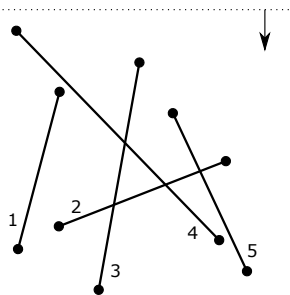
November 8, 2018

Ujjgyakorlat 1



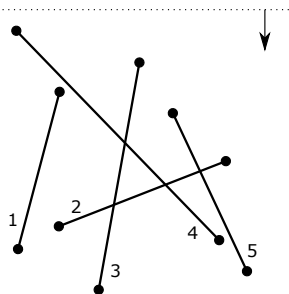
► $\bar{4}$,

Ujjgyakorlat 1



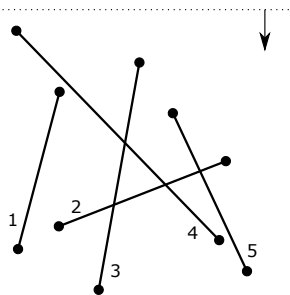
► $\bar{4}, \bar{3} \rightarrow (4, 3),$

Ujjgyakorlat 1



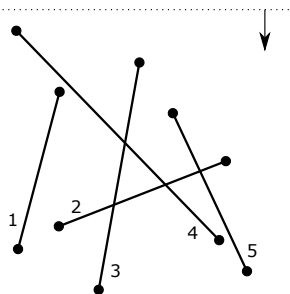
► $\bar{4}, \bar{3} \rightarrow (4, 3), \bar{1} \rightarrow (1, 4),$

Ujjgyakorlat 1



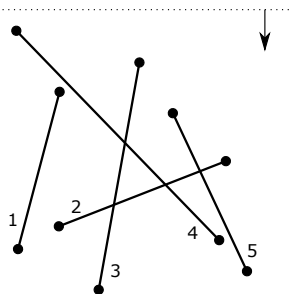
► $\bar{4}, \bar{3} \rightarrow (4, 3), \bar{1} \rightarrow (1, 4), \bar{5} \rightarrow (3, 5),$

Ujjgyakorlat 1



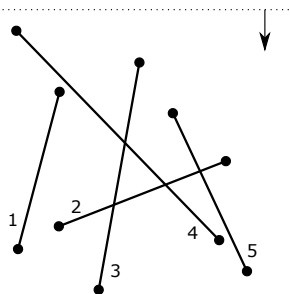
- $\bar{4}, \bar{3} \rightarrow (4, 3), \bar{1} \rightarrow (1, 4), \bar{5} \rightarrow (3, 5), 3 \times 4 \rightarrow (1, 3) + (4, 5)$

Ujjgyakorlat 1



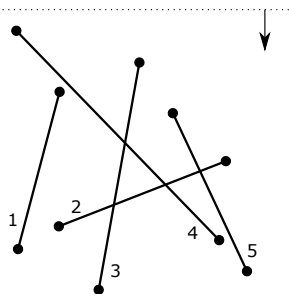
- ▶ $\bar{4}, \bar{3} \rightarrow (4, 3), \bar{1} \rightarrow (1, 4), \bar{5} \rightarrow (3, 5), 3 \times 4 \rightarrow (1, 3) + (4, 5)$
- ▶ $\bar{2} \rightarrow (5, 2),$

Ujjgyakorlat 1



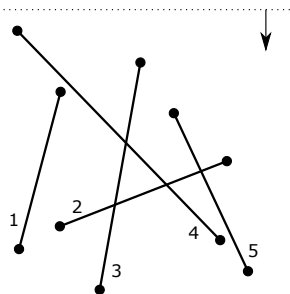
- ▶ $\bar{4}, \bar{3} \rightarrow (4, 3), \bar{1} \rightarrow (1, 4), \bar{5} \rightarrow (3, 5), 3 \times 4 \rightarrow (1, 3) + (4, 5)$
- ▶ $\bar{2} \rightarrow (5, 2), 2 \times 5 \rightarrow (4, 2),$

Ujjgyakorlat 1



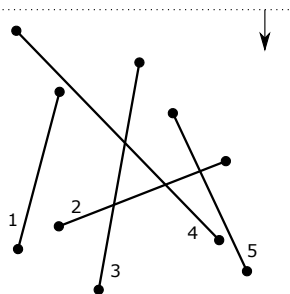
- ▶ $\bar{4}, \bar{3} \rightarrow (4, 3), \bar{1} \rightarrow (1, 4), \bar{5} \rightarrow (3, 5), 3 \times 4 \rightarrow (1, 3) + (4, 5)$
- ▶ $\bar{2} \rightarrow (5, 2), 2 \times 5 \rightarrow (4, 2), 2 \times 4 \rightarrow (3, 2) + (4, 5)$

Ujjgyakorlat 1



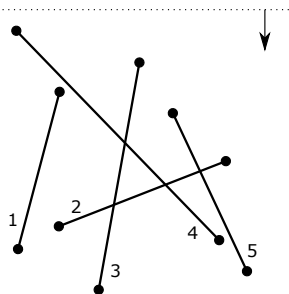
- ▶ $\bar{4}, \bar{3} \rightarrow (4, 3), \bar{1} \rightarrow (1, 4), \bar{5} \rightarrow (3, 5), 3 \times 4 \rightarrow (1, 3) + (4, 5)$
- ▶ $\bar{2} \rightarrow (5, 2), 2 \times 5 \rightarrow (4, 2), 2 \times 4 \rightarrow (3, 2) + (4, 5)$
- ▶ $2 \times 3 \rightarrow (1, 2) + (3, 4),$

Ujjgyakorlat 1



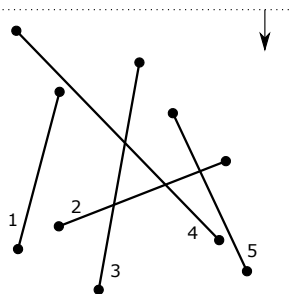
- ▶ $\bar{4}, \bar{3} \rightarrow (4, 3), \bar{1} \rightarrow (1, 4), \bar{5} \rightarrow (3, 5), 3 \times 4 \rightarrow (1, 3) + (4, 5)$
- ▶ $\bar{2} \rightarrow (5, 2), 2 \times 5 \rightarrow (4, 2), 2 \times 4 \rightarrow (3, 2) + (4, 5)$
- ▶ $2 \times 3 \rightarrow (1, 2) + (3, 4), \underline{2} \rightarrow (1, 3),$

Ujjgyakorlat 1



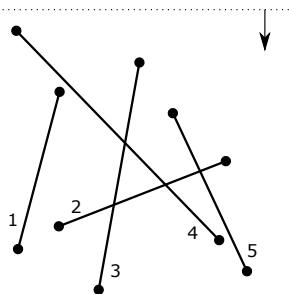
- ▶ $\bar{4}, \bar{3} \rightarrow (4, 3), \bar{1} \rightarrow (1, 4), \bar{5} \rightarrow (3, 5), 3 \times 4 \rightarrow (1, 3) + (4, 5)$
- ▶ $\bar{2} \rightarrow (5, 2), 2 \times 5 \rightarrow (4, 2), 2 \times 4 \rightarrow (3, 2) + (4, 5)$
- ▶ $2 \times 3 \rightarrow (1, 2) + (3, 4), \underline{2} \rightarrow (1, 3), \underline{4} \rightarrow (3, 5),$

Ujjgyakorlat 1



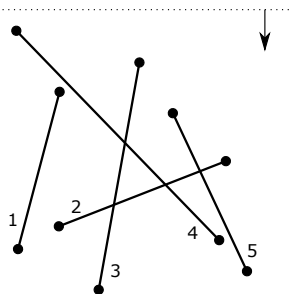
- ▶ $\bar{4}, \bar{3} \rightarrow (4, 3), \bar{1} \rightarrow (1, 4), \bar{5} \rightarrow (3, 5), 3 \times 4 \rightarrow (1, 3) + (4, 5)$
- ▶ $\bar{2} \rightarrow (5, 2), 2 \times 5 \rightarrow (4, 2), 2 \times 4 \rightarrow (3, 2) + (4, 5)$
- ▶ $2 \times 3 \rightarrow (1, 2) + (3, 4), \underline{2} \rightarrow (1, 3), \underline{4} \rightarrow (3, 5), \underline{1},$

Ujjgyakorlat 1



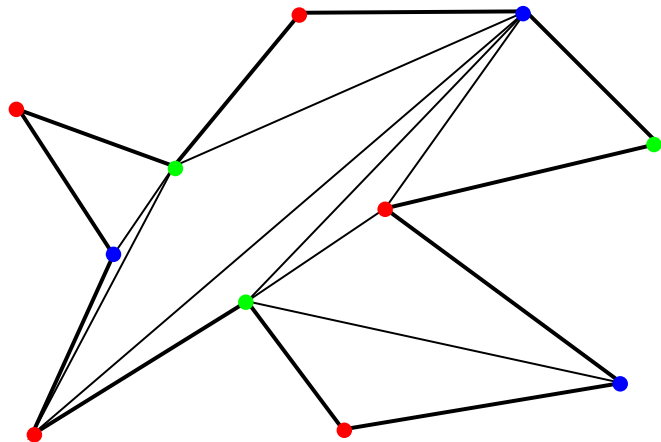
- ▶ $\bar{4}, \bar{3} \rightarrow (4, 3), \bar{1} \rightarrow (1, 4), \bar{5} \rightarrow (3, 5), 3 \times 4 \rightarrow (1, 3) + (4, 5)$
- ▶ $\bar{2} \rightarrow (5, 2), 2 \times 5 \rightarrow (4, 2), 2 \times 4 \rightarrow (3, 2) + (4, 5)$
- ▶ $2 \times 3 \rightarrow (1, 2) + (3, 4), \underline{2} \rightarrow (1, 3), \underline{4} \rightarrow (3, 5), \underline{1}, \underline{5},$

Ujjgyakorlat 1



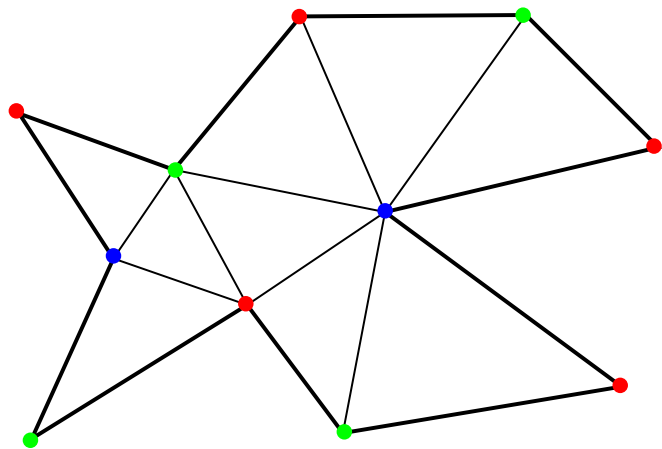
- ▶ $\bar{4}, \bar{3} \rightarrow (4, 3), \bar{1} \rightarrow (1, 4), \bar{5} \rightarrow (3, 5), 3 \times 4 \rightarrow (1, 3) + (4, 5)$
- ▶ $\bar{2} \rightarrow (5, 2), 2 \times 5 \rightarrow (4, 2), 2 \times 4 \rightarrow (3, 2) + (4, 5)$
- ▶ $2 \times 3 \rightarrow (1, 2) + (3, 4), \underline{2} \rightarrow (1, 3), \underline{4} \rightarrow (3, 5), \underline{1}, \underline{5}, \underline{3}$
- ▶ Összesen 13x hívódik meg – mindegyik egy metszés
- ▶ További metszések a $C(p)$ számításakor
- ▶ Itt a brute force jobb: $5 \cdot 4/2 = 10$ metszés

Ujjgyakorlat 2(a)



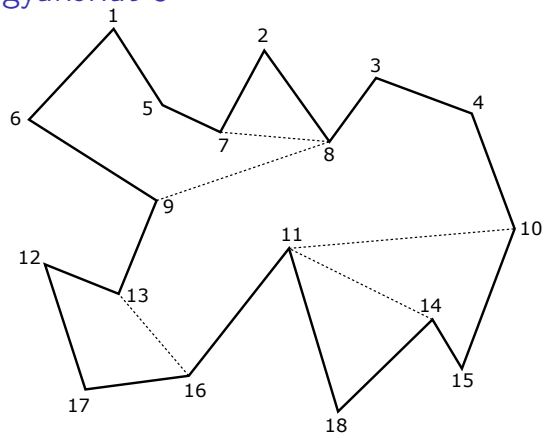
- ▶ A kék vagy zöld pozíciókra (3 kamera)
- ▶ Ennél több kamera nem is kellhet: $\lfloor 11/3 \rfloor = 3$

Ujjgyakorlat 2(b)



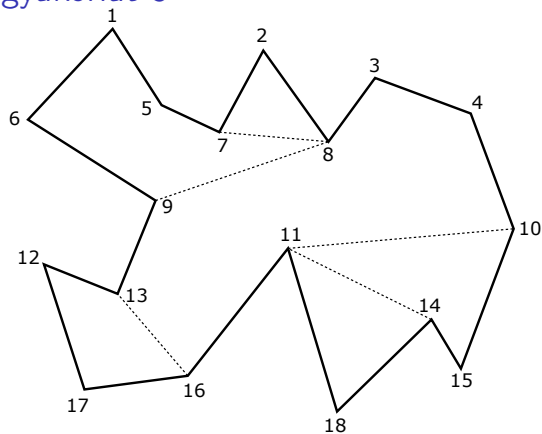
- ▶jobb háromszögeléssel elég csak két kamera (kék pozíciók)

Ujjgyakorlat 3



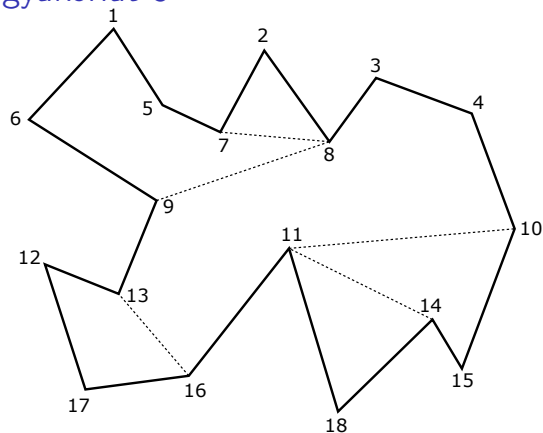
- ▶ 8 [merge]: mivel $\text{helper}(6 - 9) = 7$ merge csúcs

Ujjgyakorlat 3



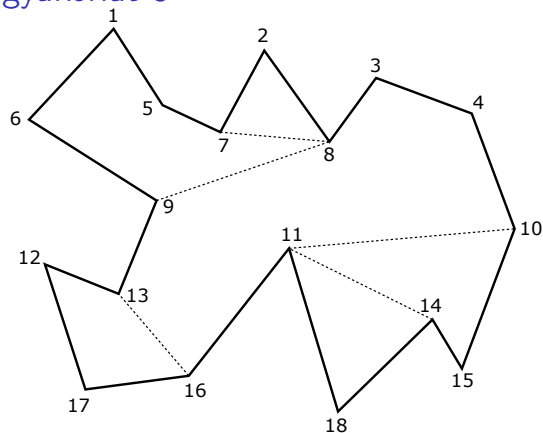
- ▶ 8 [merge]: mivel $\text{helper}(6 - 9) = 7$ merge csúcs
- ▶ 9 [regular]: mivel $\text{helper}(6 - 9) = 8$ merge csúcs

Ujjgyakorlat 3



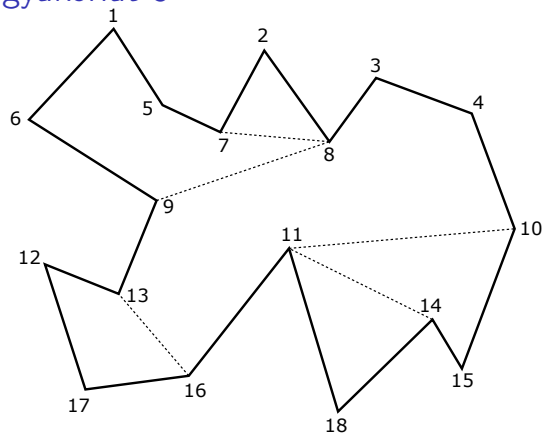
- ▶ 8 [merge]: mivel $\text{helper}(6 - 9) = 7$ merge csúcs
- ▶ 9 [regular]: mivel $\text{helper}(6 - 9) = 8$ merge csúcs
- ▶ 11 [split]: $\text{helper}(9 - 13) = 10$

Ujjgyakorlat 3



- ▶ 8 [merge]: mivel $\text{helper}(6 - 9) = 7$ merge csúcs
- ▶ 9 [regular]: mivel $\text{helper}(6 - 9) = 8$ merge csúcs
- ▶ 11 [split]: $\text{helper}(9 - 13) = 10$
- ▶ 14 [split]: $\text{helper}(11 - 18) = 11$

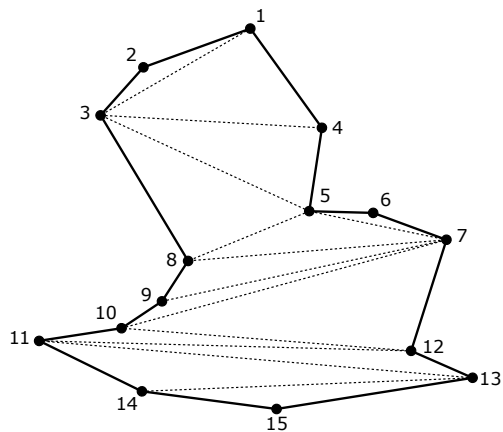
Ujjgyakorlat 3



- ▶ 8 [merge]: mivel $\text{helper}(6 - 9) = 7$ merge csúcs
- ▶ 9 [regular]: mivel $\text{helper}(6 - 9) = 8$ merge csúcs
- ▶ 11 [split]: $\text{helper}(9 - 13) = 10$
- ▶ 14 [split]: $\text{helper}(11 - 18) = 11$
- ▶ 16 [regular]: mivel $\text{helper}(12 - 17) = 13$ merge csúcs

Ujjgyakorlat 4

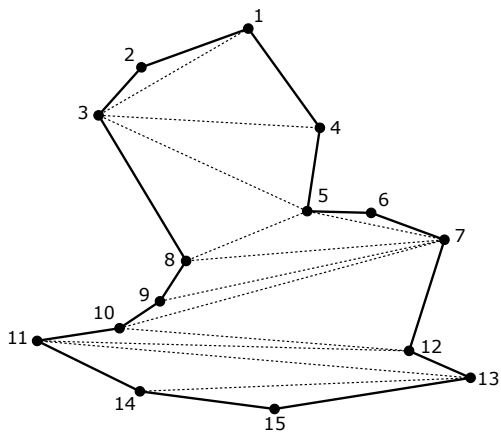
► 1,2



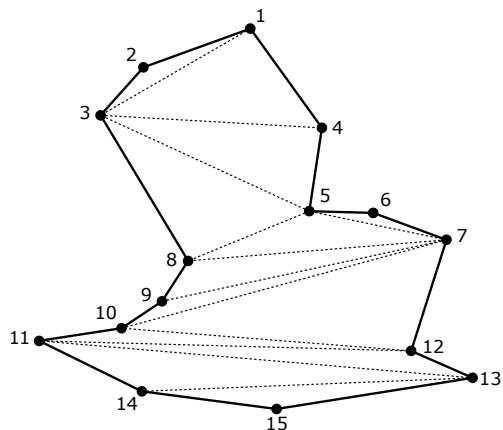
Ujjgyakorlat 4

▶ 1,2

▶ 1,3



Ujjgyakorlat 4

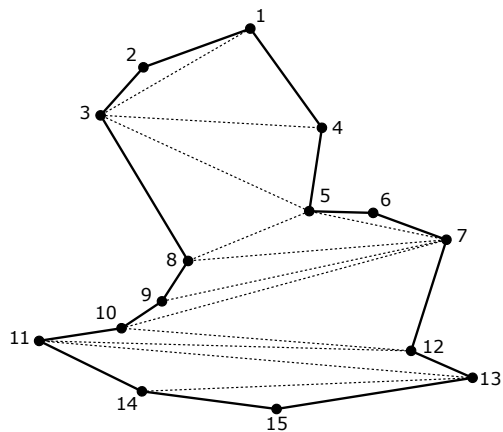


▶ 1,2

▶ 1,3

▶ 3,4

Ujjgyakorlat 4



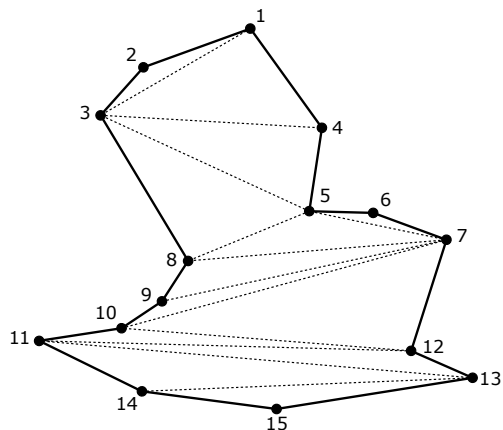
▶ 1,2

▶ 1,3

▶ 3,4

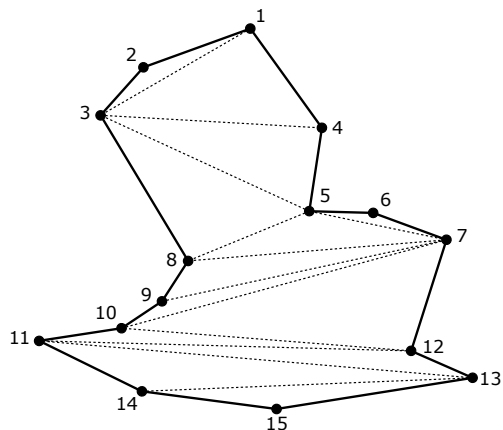
▶ 3,5

Ujjgyakorlat 4



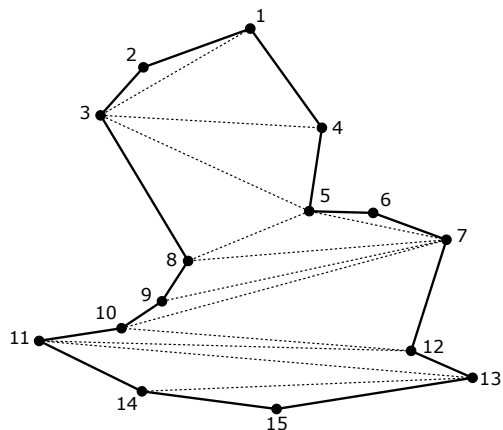
- ▶ 1,2
- ▶ 1,3
- ▶ 3,4
- ▶ 3,5
- ▶ 3,5,6

Ujjgyakorlat 4



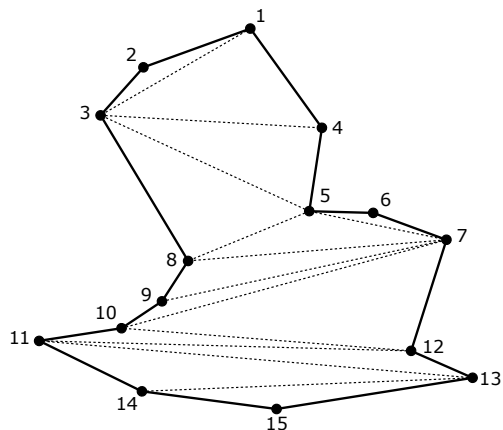
- ▶ 1,2
- ▶ 1,3
- ▶ 3,4
- ▶ 3,5
- ▶ 3,5,6
- ▶ 3,5,7

Ujjgyakorlat 4



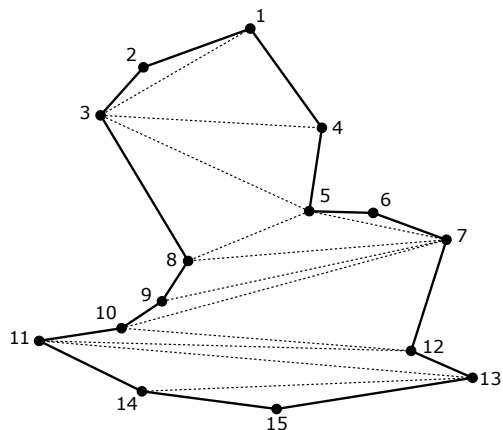
- ▶ 1,2
- ▶ 1,3
- ▶ 3,4
- ▶ 3,5
- ▶ 3,5,6
- ▶ 3,5,7
- ▶ 7,8

Ujjgyakorlat 4



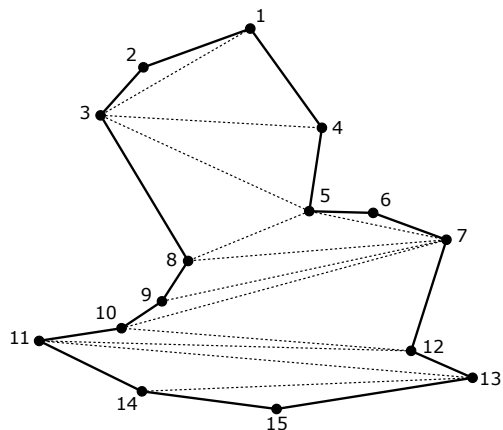
- ▶ 1,2
- ▶ 1,3
- ▶ 3,4
- ▶ 3,5
- ▶ 3,5,6
- ▶ 3,5,7
- ▶ 7,8
- ▶ 7,9

Ujjgyakorlat 4



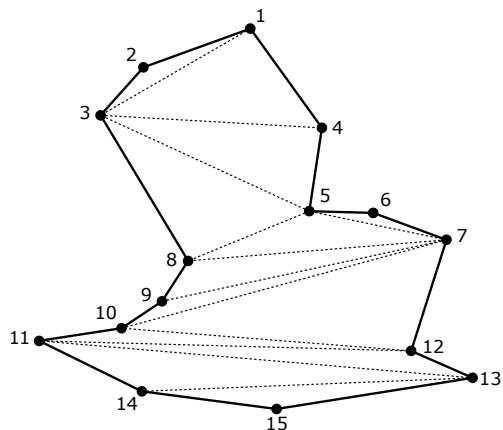
- ▶ 1,2
- ▶ 1,3
- ▶ 3,4
- ▶ 3,5
- ▶ 3,5,6
- ▶ 3,5,7
- ▶ 7,8
- ▶ 7,9
- ▶ 7,10

Ujjgyakorlat 4



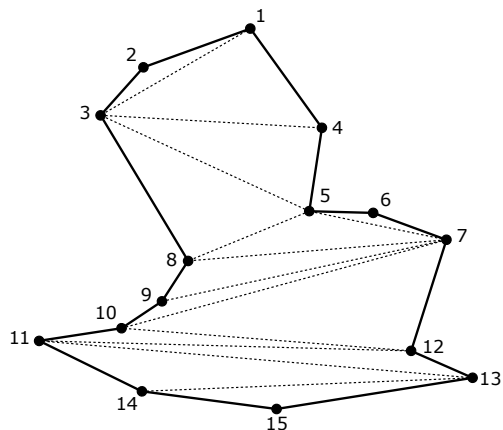
- ▶ 1,2
- ▶ 1,3
- ▶ 3,4
- ▶ 3,5
- ▶ 3,5,6
- ▶ 3,5,7
- ▶ 7,8
- ▶ 7,9
- ▶ 7,10
- ▶ 7,10,11

Ujjgyakorlat 4



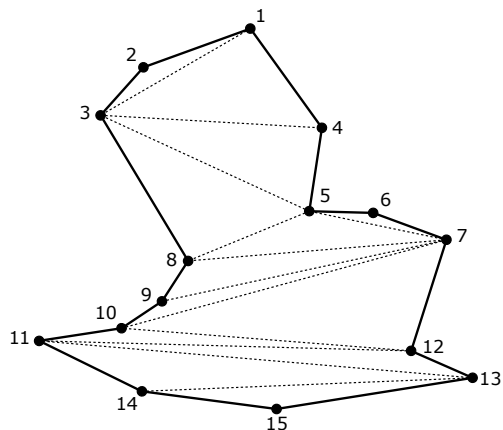
- ▶ 1,2
- ▶ 1,3
- ▶ 3,4
- ▶ 3,5
- ▶ 3,5,6
- ▶ 3,5,7
- ▶ 7,8
- ▶ 7,9
- ▶ 7,10
- ▶ 7,10,11
- ▶ 11,12

Ujjgyakorlat 4



- ▶ 1,2
- ▶ 1,3
- ▶ 3,4
- ▶ 3,5
- ▶ 3,5,6
- ▶ 3,5,7
- ▶ 7,8
- ▶ 7,9
- ▶ 7,10
- ▶ 7,10,11
- ▶ 11,12
- ▶ 11,13

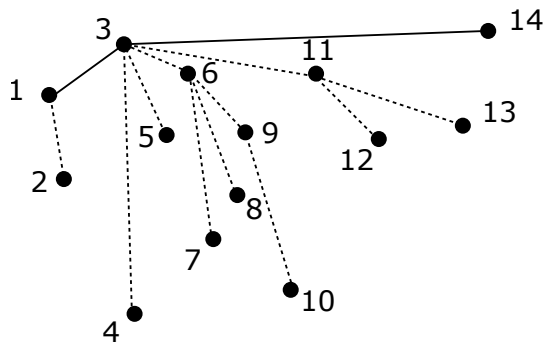
Ujjgyakorlat 4



- ▶ 1,2
- ▶ 1,3
- ▶ 3,4
- ▶ 3,5
- ▶ 3,5,6
- ▶ 3,5,7
- ▶ 7,8
- ▶ 7,9
- ▶ 7,10
- ▶ 7,10,11
- ▶ 11,12
- ▶ 11,13
- ▶ 13,14

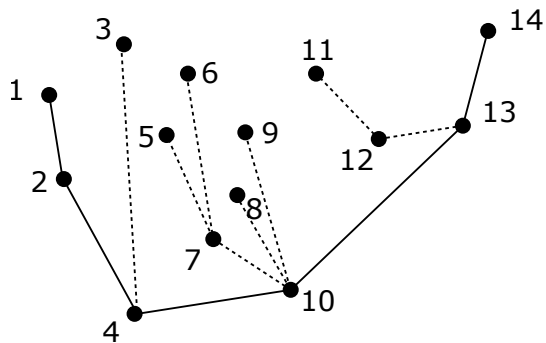
Ujjgyakorlat 5(a)

Felső burok:



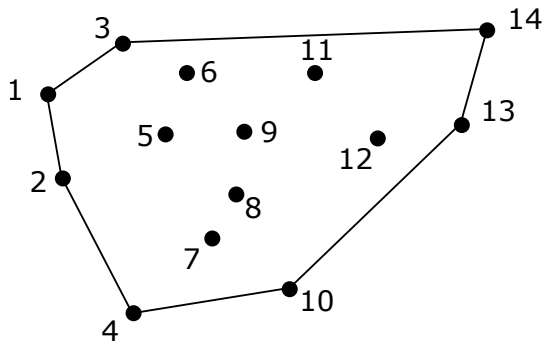
Ujjgyakorlat 5(b)

Alsó burok:



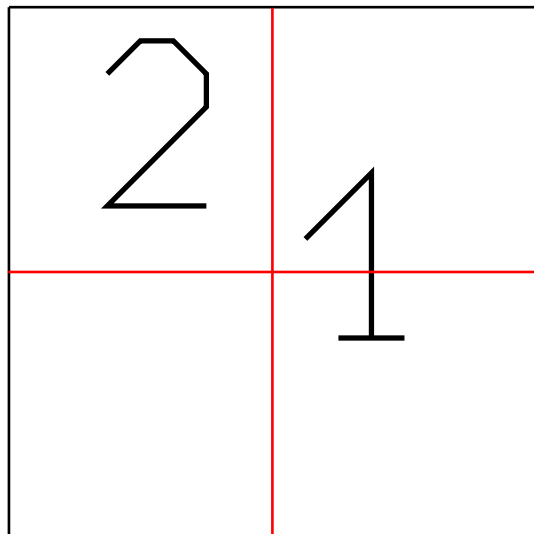
Ujjgyakorlat 5(c)

Teljes burok:



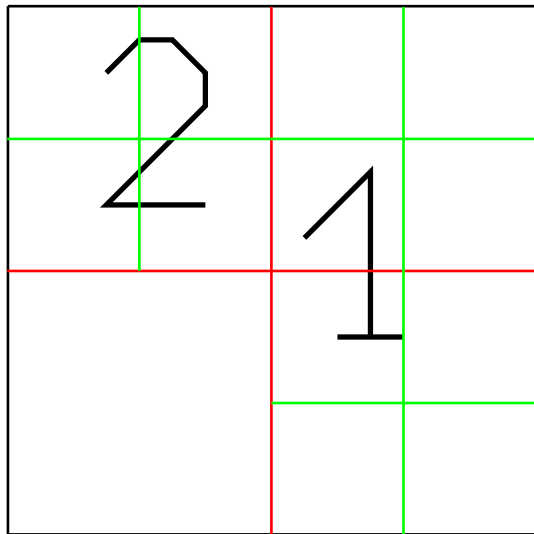
Ujjgyakorlat 6(a)

1. osztás:



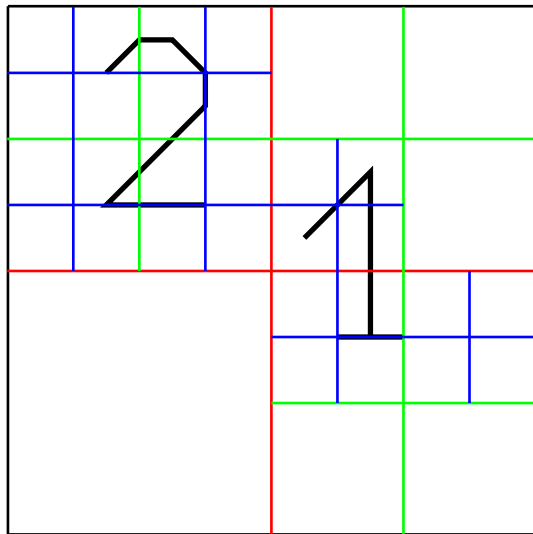
Ujjgyakorlat 6(b)

2. osztás:



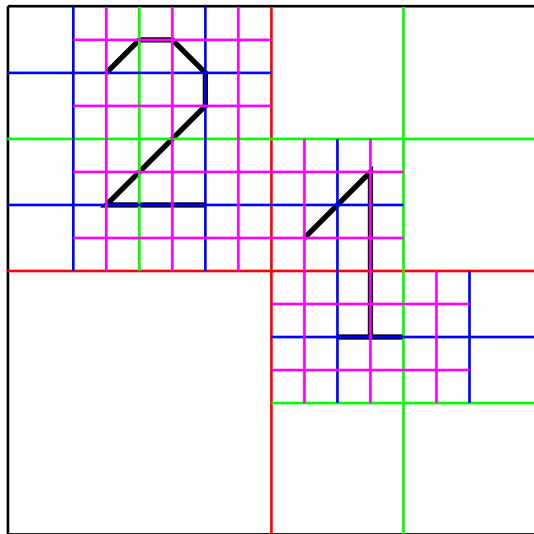
Ujjgyakorlat 6(c)

3. osztás:



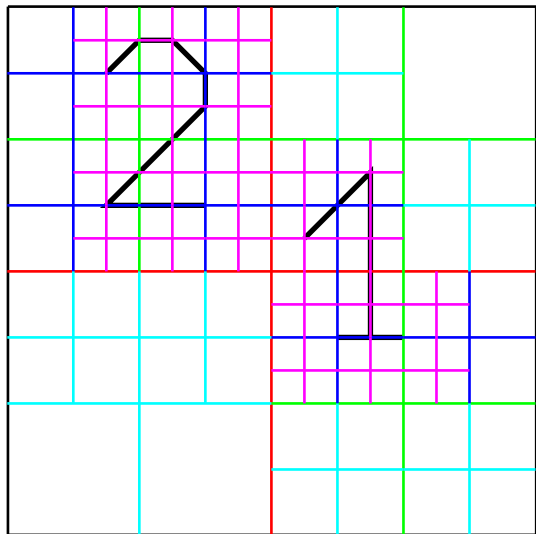
Ujjgyakorlat 6(d)

4. osztás:



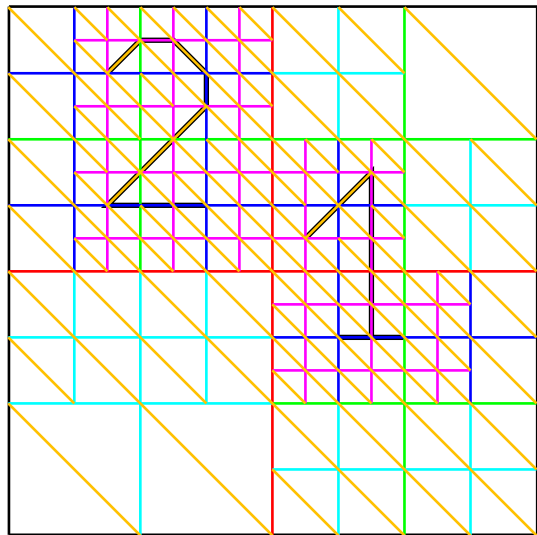
Ujjgyakorlat 6(e)

Kiegyensúlyozás:



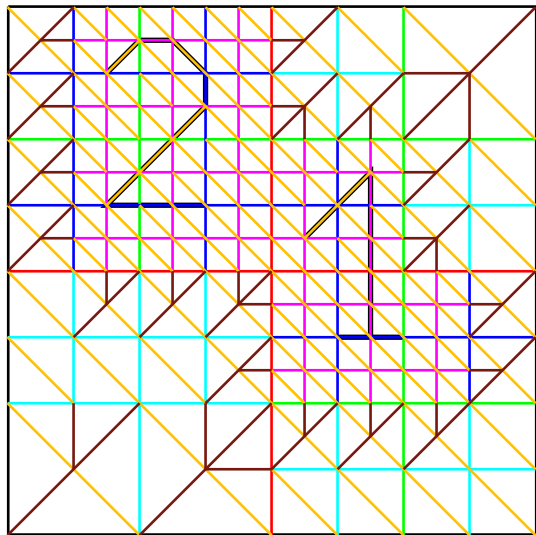
Ujjgyakorlat 6(f)

Átlók (az éleken kívül lehetett volna más irányokban):



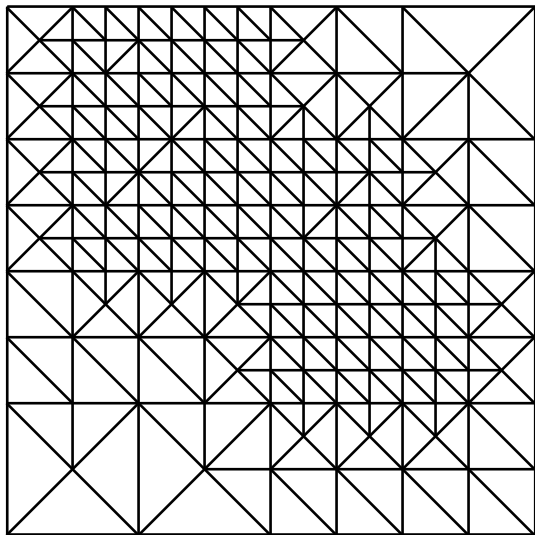
Ujjgyakorlat 6(g)

Steiner-pontok:



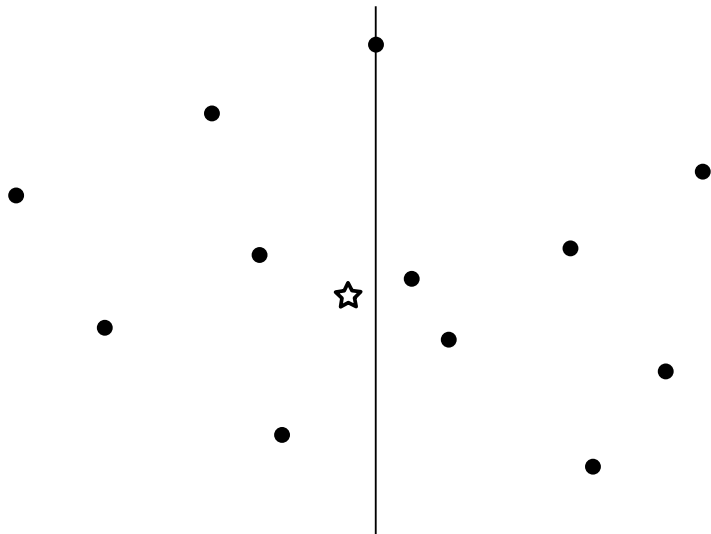
Ujjgyakorlat 6(h)

A végeredmény (kb. feleannyi \triangle , mint uniform esetben):



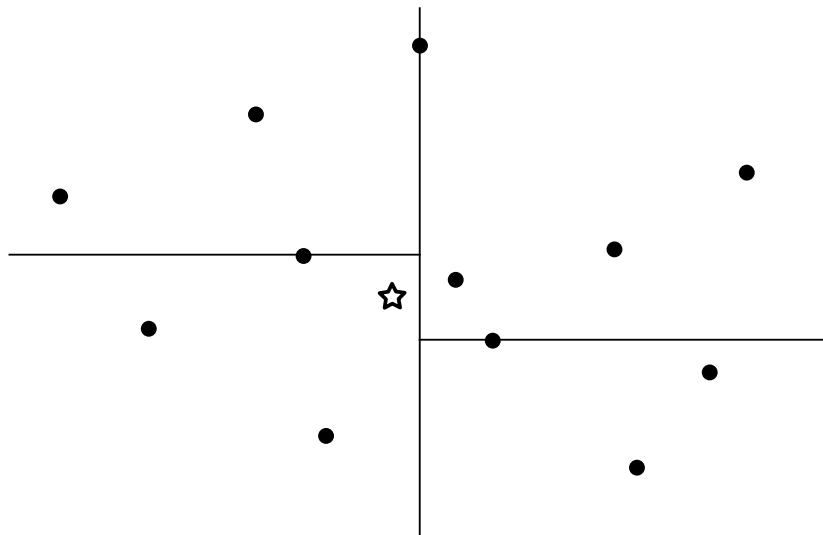
Ujjgyakorlat 7(a)

1. osztás:



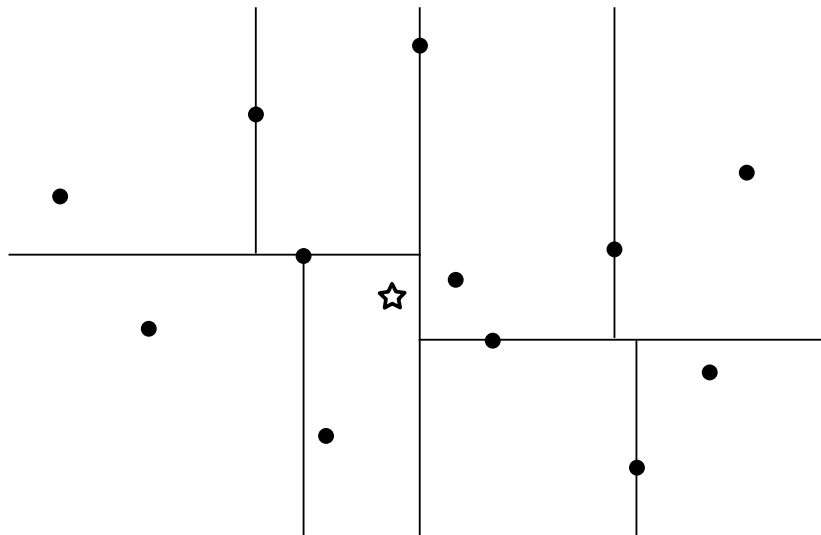
Ujjgyakorlat 7(b)

2. osztás:



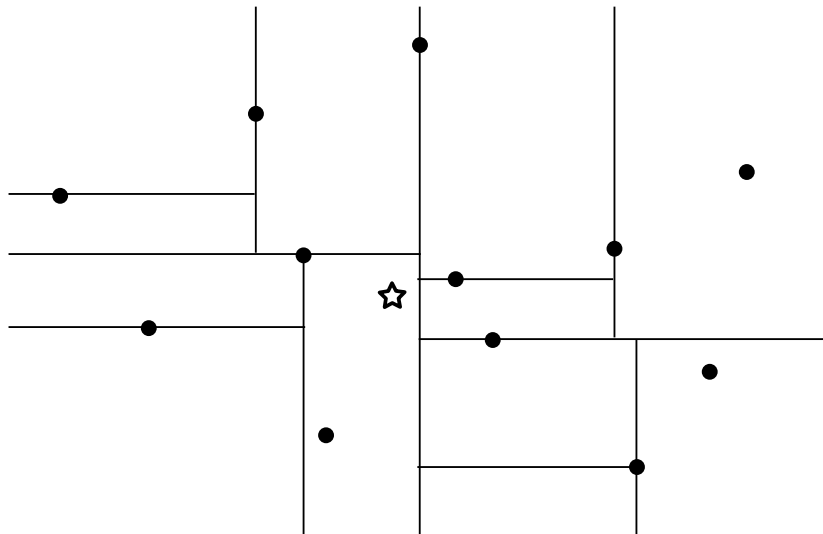
Ujjgyakorlat 7(c)

3. osztás:



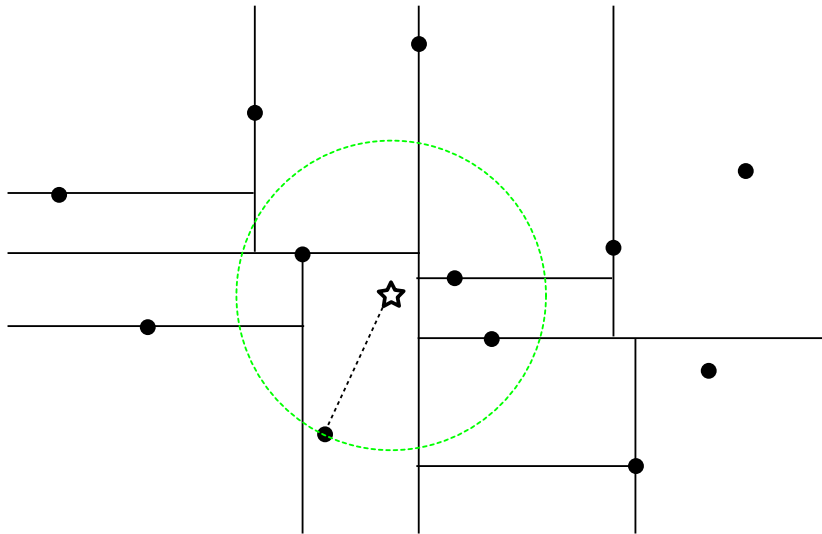
Ujjgyakorlat 7(d)

4. (utolsó) osztás:



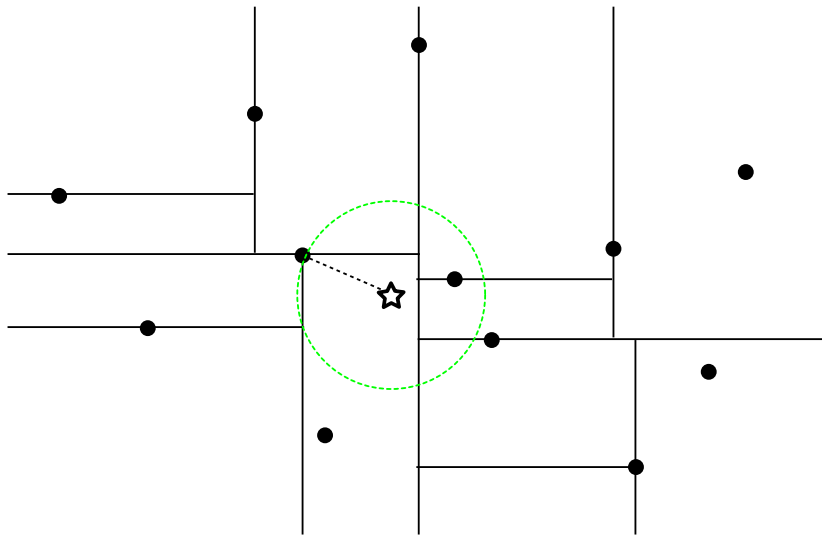
Ujjgyakorlat 7(e)

Legjobb cella pontja – a szomszéd is esélyes



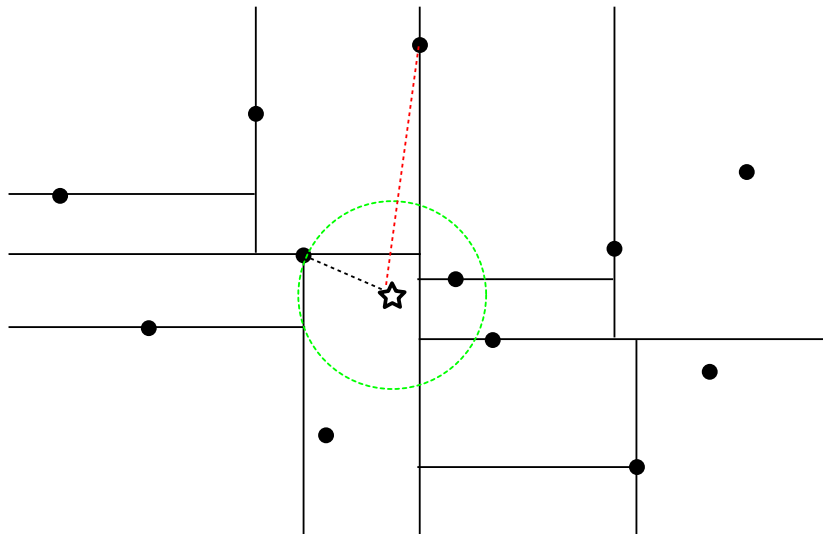
Ujjgyakorlat 7(f)

Jobb – szomszéd épp távoli – vissza a fő szálra, szülő szomszédja



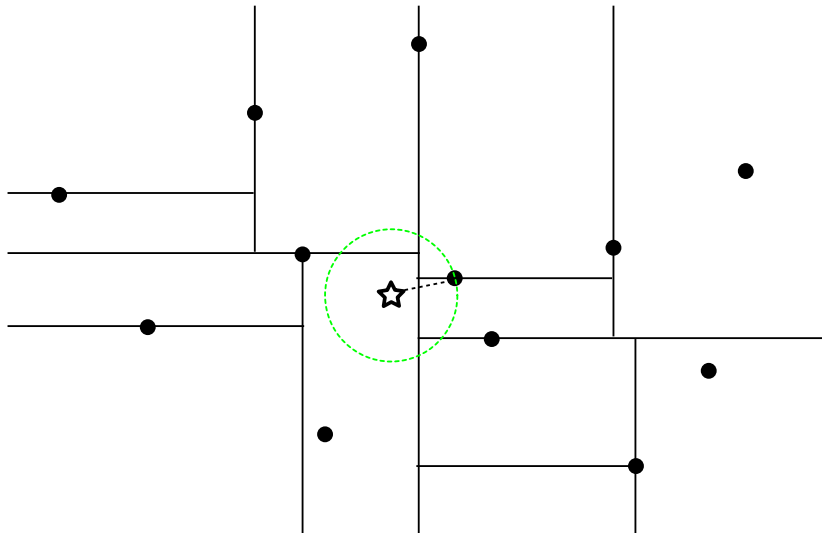
Ujjgyakorlat 7(g)

Nem jó – szomszéd távoli – vissza a fő szálra, szülő szomszédja



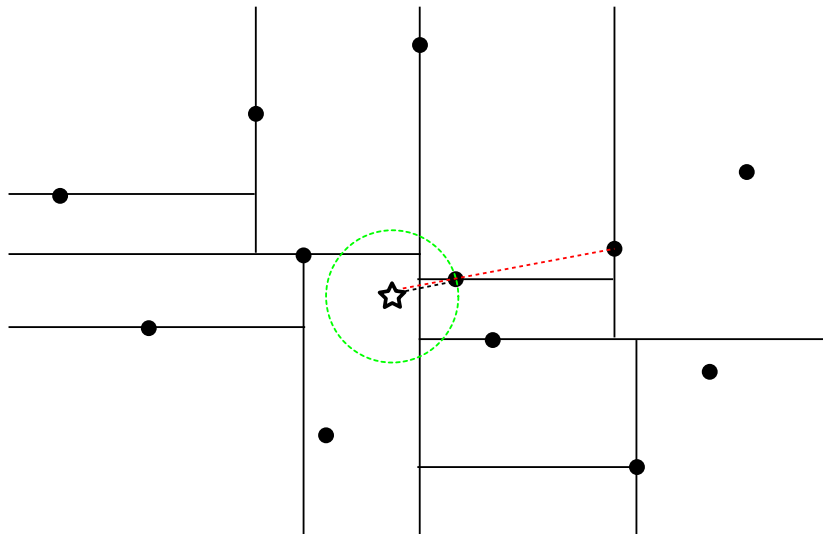
Ujjgyakorlat 7(h)

Új aktuális legjobb – a szomszéd esélyes



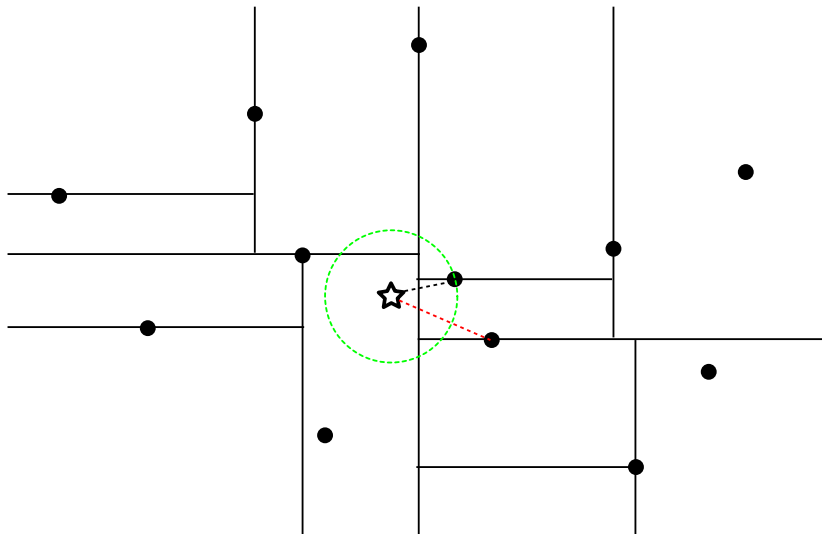
Ujjgyakorlat 7(i)

Nem jó – vissza az előző szálra, szülő szomszédja



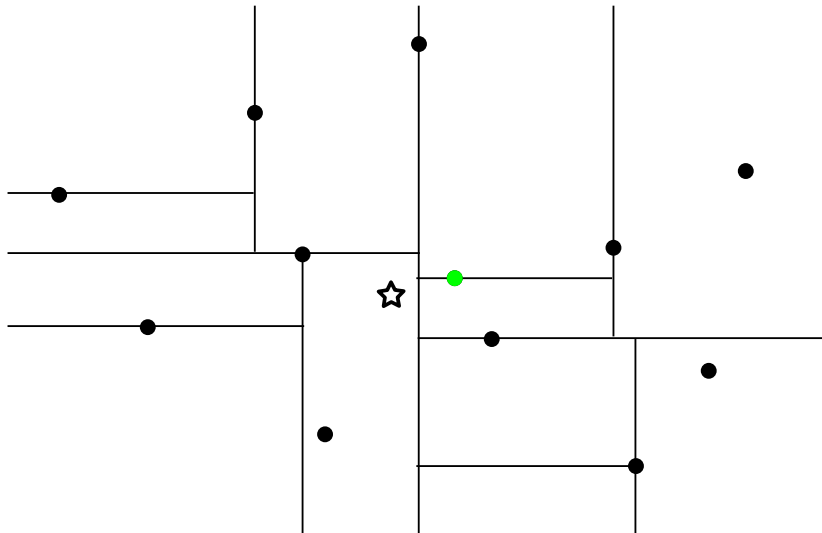
Ujjgyakorlat 7(j)

Nem jó – szomszéd távoli, szülőé szintén – vissza az előző szálra



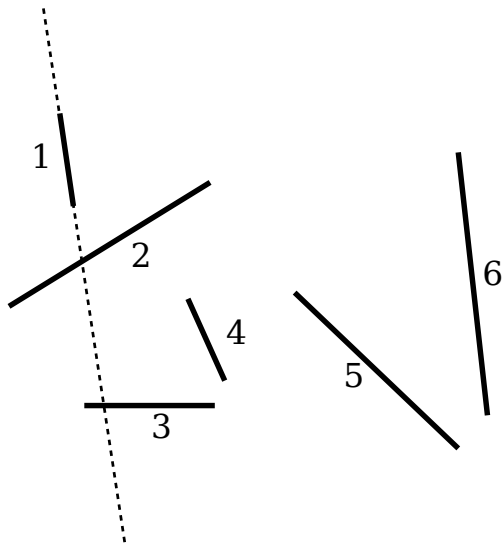
Ujjgyakorlat 7(k)

Megvan a legjobb pont:



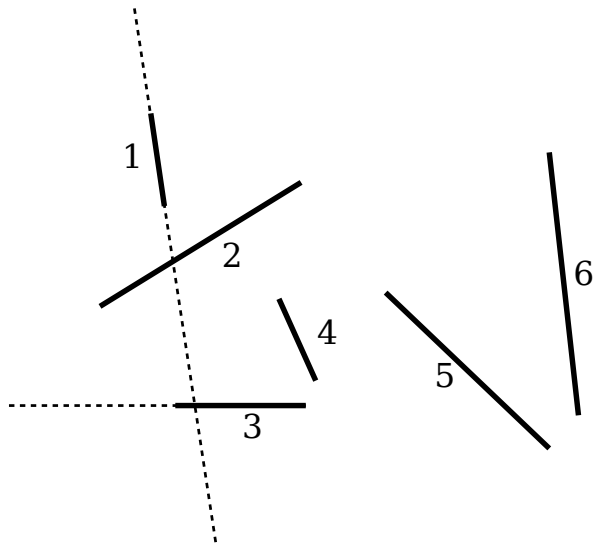
Ujjgyakorlat 8(a)

$[1,5,3,4,2,6] \Rightarrow$ 1-essel kezdünk



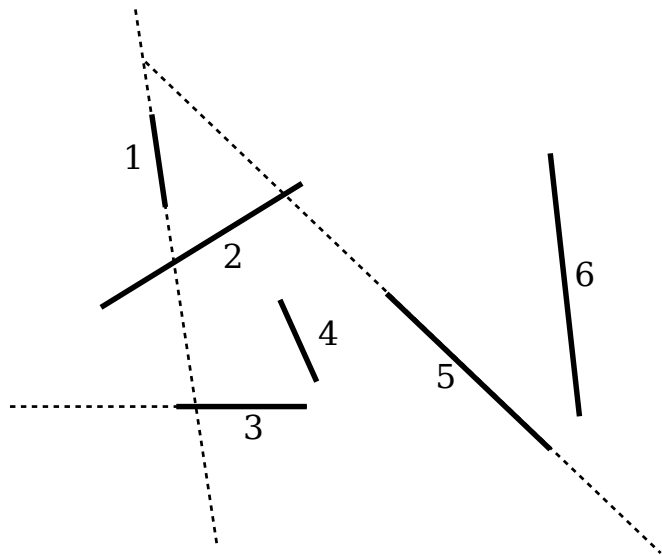
Ujjgyakorlat 8(b)

1-es baloldalán [3,2] \Rightarrow 3-as, és ezzel ez a rész kész



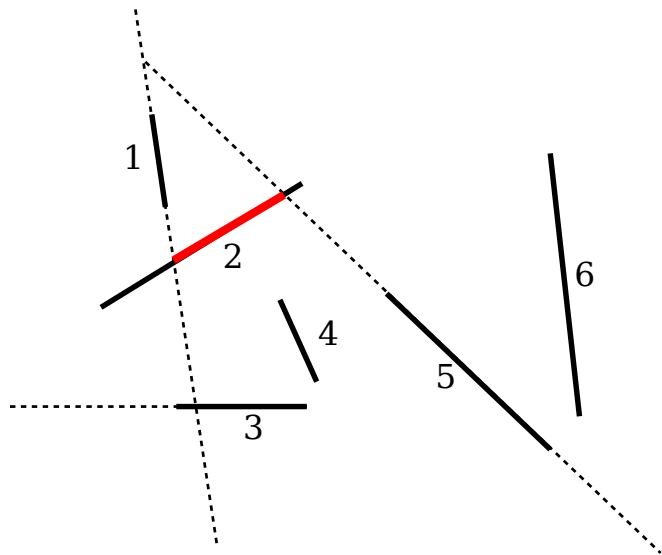
Ujjgyakorlat 8(c)

1-es jobboldalán [5,3,4,2,6] \Rightarrow 5-ös



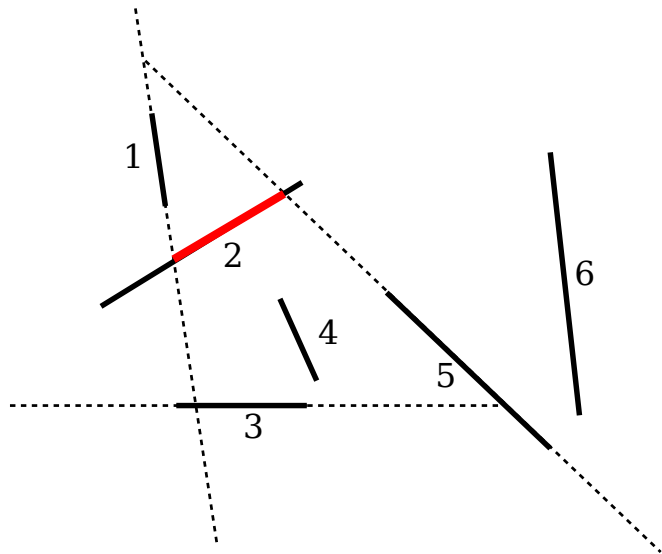
Ujjgyakorlat 8(d)

5-ös baloldalán [3,4,2], de a 2-es *free split*



Ujjgyakorlat 8(e)

2-es alsó részén [3,4] \Rightarrow 3-as; ezzel 2-es kész



Ujjgyakorlat 8(f)

5-ös jobboldalán [2,6] \Rightarrow 2-es, és ezzel készen vagyunk

