Tema:

Folosind metodele de sortare: Selection Sort, Bubble Sort, Insertion Sort si Shell

Sort, aratati pas cu pas sortarea in ordine crescatoare a urmatorului sir de numere

(nu necesita cod):

4, 78, 13, 45, 2, 90, 66, 34, 21, 32, 10, 7, 5, 102, 56, 11, 19, 23, 75, 88

La 20 de numere necesită cod: <https://github.com/alin-c/CS/tree/master/Structuri%20de%20date%20si%20tehnici%20de%20elaborare%20a%20algoritmilor/Sortari>

# 1. Selection sort

// căutarea va avea un număr de iterații egal cu numărul de elemente din listă

iterația 0:

- reținem primul element din listă: 4

- căutăm în restul listei un element mai mic decât 4

- dacă găsim un element mai mic decât 4, îi schimbăm locul în listă cu primul element

- lista devine:

2, 78, 13, 45, 4, 90, 66, 34, 21, 32, 10, 7, 5, 102, 56, 11, 19, 23, 75, 88

iterația 1:

- reținem al doilea element din listă: 78

- căutăm în restul din dreapta al listei un element mai mic decât 78 (cu condiția să fie cel mai mic)

- dacă găsim elementul, îi schimbăm locul în listă cu al doilea element (78)

- lista devine:

2, 4, 13, 45, 78, 90, 66, 34, 21, 32, 10, 7, 5, 102, 56, 11, 19, 23, 75, 88

iterațiile următoare sunt:

#2:

2, 4, 5, 45, 78, 90, 66, 34, 21, 32, 10, 7, 13, 102, 56, 11, 19, 23, 75, 88

#3:

2, 4, 5, 7, 78, 90, 66, 34, 21, 32, 10, 45, 13, 102, 56, 11, 19, 23, 75, 88

#4:

2, 4, 5, 7, 10, 90, 66, 34, 21, 32, 78, 45, 13, 102, 56, 11, 19, 23, 75, 88

#5:

2, 4, 5, 7, 10, 11, 66, 34, 21, 32, 78, 45, 13, 102, 56, 90, 19, 23, 75, 88

#6:

2, 4, 5, 7, 10, 11, 13, 34, 21, 32, 78, 45, 66, 102, 56, 90, 19, 23, 75, 88

#7:

2, 4, 5, 7, 10, 11, 13, 19, 21, 32, 78, 45, 66, 102, 56, 90, 34, 23, 75, 88

#8:

2, 4, 5, 7, 10, 11, 13, 19, 21, 32, 78, 45, 66, 102, 56, 90, 34, 23, 75, 88

#9:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 78, 45, 66, 102, 56, 90, 34, 32, 75, 88

#10:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 45, 66, 102, 56, 90, 34, 78, 75, 88

#11:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 66, 102, 56, 90, 45, 78, 75, 88

#12:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 102, 56, 90, 66, 78, 75, 88

#13:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 102, 90, 66, 78, 75, 88

#14:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 90, 102, 78, 75, 88

#15:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 102, 78, 90, 88

#16:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 102, 90, 88

#17:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 90, 102

#18:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 90, 102

#19:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 90, 102

# 2. Bubble sort

// căutarea va avea (cel mult) un număr de iterații principale egal cu numărul de elemente din listă

// fiecare iterație principală va avea un număr descrescător de iterații secundare

// sortarea va ordona corect elementele începând cu cel mai mare, avansând spre stânga cu ordonarea

iterația 0:

- în prima pereche de elemente (4, 78) comparăm elementele; dacă al doilea este mai mic îi schimbăm locul cu primul

- continuăm cu perechea formată din elementul al doilea și al treilea (78, 13) ș.a.m.d. până la ultimul element

- la sfârșitul iterației ultimul element va fi cel mai mare din listă (plasat la locul corect)

- lista devine:

4, 13, 45, 2, 78, 66, 34, 21, 32, 10, 7, 5, 90, 56, 11, 19, 23, 75, 88, 102

iterația 1:

- pornim de la forma curentă a listei

- în prima pereche de elemente (4, 13) comparăm elementele; dacă al doilea este mai mic îi schimbăm locul cu primul

- continuăm cu perechea formată din elementul al doilea și al treilea (13, 45) ș.a.m.d. până la penultimul element (care este deja în poziția corectă)

- la sfârșitul iterației penultimul element va fi al doilea cel mai mare din listă (plasat la locul corect)

- lista devine:

4, 13, 2, 45, 66, 34, 21, 32, 10, 7, 5, 78, 56, 11, 19, 23, 75, 88, 90, 102

iterațiile următoare sunt:

#2:

4, 2, 13, 45, 34, 21, 32, 10, 7, 5, 66, 56, 11, 19, 23, 75, 78, 88, 90, 102

#3:

2, 4, 13, 34, 21, 32, 10, 7, 5, 45, 56, 11, 19, 23, 66, 75, 78, 88, 90, 102

#4:

2, 4, 13, 21, 32, 10, 7, 5, 34, 45, 11, 19, 23, 56, 66, 75, 78, 88, 90, 102

#5:

2, 4, 13, 21, 10, 7, 5, 32, 34, 11, 19, 23, 45, 56, 66, 75, 78, 88, 90, 102

#6:

2, 4, 13, 10, 7, 5, 21, 32, 11, 19, 23, 34, 45, 56, 66, 75, 78, 88, 90, 102

#7:

2, 4, 10, 7, 5, 13, 21, 11, 19, 23, 32, 34, 45, 56, 66, 75, 78, 88, 90, 102

#8:

2, 4, 7, 5, 10, 13, 11, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 90, 102

#9:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 90, 102

#10:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 90, 102

#11:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 90, 102

#12:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 90, 102

#13:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 90, 102

#14:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 90, 102

#15:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 90, 102

#16:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 90, 102

#17:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 90, 102

#18:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 90, 102

# 3. Insertion sort

// căutarea va avea un număr de iterații egal cu n-1 (n=numărul de elemente din listă)

iterația 1:

- pornim de la al doilea element (78)

- scoatem elementul din listă și îl reținem

- comparăm elementul scos cu fiecare din elementele din stânga poziției lui (doar primul, în această iterație)

- dacă elementul scos este mai mic decât primul, îl mutăm pe primul în locul său și inserăm elementul scos în locul primului

- lista devine (în cazul dat, rămâne aceeași):

4, 78, 13, 45, 2, 90, 66, 34, 21, 32, 10, 7, 5, 102, 56, 11, 19, 23, 75, 88

iterația 2:

- pornim de la al treilea element al listei în forma curentă (13)

- scoatem elementul din listă și îl reținem

- comparăm elementul scos cu fiecare din elementele din stânga poziției lui

- dacă elementul scos este mai mic decât primul element (de la dreapta la stânga), mutăm cu o poziție spre dreapta elementul din listă

- repetăm pasul anterior până când nu mai e îndeplinită condiția (comparația) și inserăm elementul scos în locul rămas liber

- lista devine:

4, 13, 78, 45, 2, 90, 66, 34, 21, 32, 10, 7, 5, 102, 56, 11, 19, 23, 75, 88

iterațiile următoare sunt:

#3:

4, 13, 45, 78, 2, 90, 66, 34, 21, 32, 10, 7, 5, 102, 56, 11, 19, 23, 75, 88

#4:

2, 4, 13, 45, 78, 90, 66, 34, 21, 32, 10, 7, 5, 102, 56, 11, 19, 23, 75, 88

#5:

2, 4, 13, 45, 78, 90, 66, 34, 21, 32, 10, 7, 5, 102, 56, 11, 19, 23, 75, 88

#6:

2, 4, 13, 45, 66, 78, 90, 34, 21, 32, 10, 7, 5, 102, 56, 11, 19, 23, 75, 88

#7:

2, 4, 13, 34, 45, 66, 78, 90, 21, 32, 10, 7, 5, 102, 56, 11, 19, 23, 75, 88

#8:

2, 4, 13, 21, 34, 45, 66, 78, 90, 32, 10, 7, 5, 102, 56, 11, 19, 23, 75, 88

#9:

2, 4, 13, 21, 32, 34, 45, 66, 78, 90, 10, 7, 5, 102, 56, 11, 19, 23, 75, 88

#10:

2, 4, 10, 13, 21, 32, 34, 45, 66, 78, 90, 7, 5, 102, 56, 11, 19, 23, 75, 88

#11:

2, 4, 7, 10, 13, 21, 32, 34, 45, 66, 78, 90, 5, 102, 56, 11, 19, 23, 75, 88

#12:

2, 4, 5, 7, 10, 13, 21, 32, 34, 45, 66, 78, 90, 102, 56, 11, 19, 23, 75, 88

#13:

2, 4, 5, 7, 10, 13, 21, 32, 34, 45, 66, 78, 90, 102, 56, 11, 19, 23, 75, 88

#14:

2, 4, 5, 7, 10, 13, 21, 32, 34, 45, 56, 66, 78, 90, 102, 11, 19, 23, 75, 88

#15:

2, 4, 5, 7, 10, 11, 13, 21, 32, 34, 45, 56, 66, 78, 90, 102, 19, 23, 75, 88

#16:

2, 4, 5, 7, 10, 11, 13, 19, 21, 32, 34, 45, 56, 66, 78, 90, 102, 23, 75, 88

#17:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 78, 90, 102, 75, 88

#18:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 90, 102, 88

#19:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 90, 102

# 4. Shell sort

// căutarea folosește o distanță (gap) mai mică sau egală cu numărul de elemente din listă

// în exemplul dat, gap este jumătate din numărul de elemente al listei

iterația 0:

- pornim de la elementul cu indexul egal cu gap (10)

- scoatem elementul din listă și îl reținem

- comparăm elementul scos cu fiecare din elementele din stânga poziției lui dar la o distanță egală cu gap (doar primul, în această iterație)

- dacă elementul scos este mai mic decât primul, îl mutăm pe primul în locul său și inserăm elementul scos în locul primului

- lista devine (în cazul dat, rămâne aceeași):

4, 78, 13, 45, 2, 90, 66, 34, 21, 32, 10, 7, 5, 102, 56, 11, 19, 23, 75, 88

iterația 1:

- pornim de la elementul cu indexul egal cu gap+1 (7)

- scoatem elementul din listă și îl reținem

- comparăm elementul scos cu fiecare din elementele din stânga poziției lui dar la o distanță egală cu gap (4, 78)

- dacă elementul scos este mai mic decât cel din listă, le schimbăm pozițiile celor două elemente

- lista devine:

4, 7, 13, 45, 2, 90, 66, 34, 21, 32, 10, 78, 5, 102, 56, 11, 19, 23, 75, 88

iterațiile următoare sunt:

#2:

4, 7, 5, 45, 2, 90, 66, 34, 21, 32, 10, 78, 13, 102, 56, 11, 19, 23, 75, 88

#3:

4, 7, 5, 45, 2, 90, 66, 34, 21, 32, 10, 78, 13, 102, 56, 11, 19, 23, 75, 88

#4:

4, 7, 5, 45, 2, 90, 66, 34, 21, 32, 10, 78, 13, 102, 56, 11, 19, 23, 75, 88

#5:

4, 7, 5, 45, 2, 11, 66, 34, 21, 32, 10, 78, 13, 102, 56, 90, 19, 23, 75, 88

#6:

4, 7, 5, 45, 2, 11, 19, 34, 21, 32, 10, 78, 13, 102, 56, 90, 66, 23, 75, 88

#7:

4, 7, 5, 45, 2, 11, 19, 23, 21, 32, 10, 78, 13, 102, 56, 90, 66, 34, 75, 88

#8:

4, 7, 5, 45, 2, 11, 19, 23, 21, 32, 10, 78, 13, 102, 56, 90, 66, 34, 75, 88

#9:

4, 7, 5, 45, 2, 11, 19, 23, 21, 32, 10, 78, 13, 102, 56, 90, 66, 34, 75, 88

#10:

4, 7, 5, 45, 2, 11, 19, 23, 21, 32, 10, 78, 13, 102, 56, 90, 66, 34, 75, 88

#11:

4, 7, 5, 45, 2, 11, 19, 23, 21, 32, 10, 78, 13, 102, 56, 90, 66, 34, 75, 88

#12:

4, 7, 5, 45, 2, 11, 19, 23, 21, 32, 10, 78, 13, 102, 56, 90, 66, 34, 75, 88

#13:

4, 7, 5, 21, 2, 11, 19, 23, 45, 32, 10, 78, 13, 102, 56, 90, 66, 34, 75, 88

#14:

4, 7, 5, 21, 2, 11, 19, 23, 45, 32, 10, 78, 13, 102, 56, 90, 66, 34, 75, 88

#15:

4, 7, 5, 21, 2, 10, 19, 23, 45, 32, 11, 78, 13, 102, 56, 90, 66, 34, 75, 88

#16:

4, 7, 5, 21, 2, 10, 19, 23, 45, 32, 11, 78, 13, 102, 56, 90, 66, 34, 75, 88

#17:

4, 7, 5, 21, 2, 10, 19, 13, 45, 32, 11, 78, 23, 102, 56, 90, 66, 34, 75, 88

#18:

4, 7, 5, 21, 2, 10, 19, 13, 45, 32, 11, 78, 23, 102, 56, 90, 66, 34, 75, 88

#19:

4, 7, 5, 21, 2, 10, 19, 13, 45, 32, 11, 78, 23, 102, 56, 90, 66, 34, 75, 88

#20:

4, 7, 5, 21, 2, 10, 19, 13, 45, 32, 11, 78, 23, 102, 56, 90, 66, 34, 75, 88

#21:

4, 7, 5, 21, 2, 10, 19, 13, 45, 32, 11, 66, 23, 102, 56, 90, 78, 34, 75, 88

#22:

4, 7, 5, 21, 2, 10, 19, 13, 45, 32, 11, 66, 23, 102, 56, 90, 78, 34, 75, 88

#23:

4, 7, 5, 21, 2, 10, 19, 13, 45, 32, 11, 66, 23, 75, 56, 90, 78, 34, 102, 88

#24:

4, 7, 5, 21, 2, 10, 19, 13, 45, 32, 11, 66, 23, 75, 56, 90, 78, 34, 102, 88

#25:

4, 7, 5, 21, 2, 10, 19, 13, 45, 32, 11, 66, 23, 75, 56, 90, 78, 34, 102, 88

#26:

4, 7, 5, 21, 2, 10, 19, 13, 45, 32, 11, 66, 23, 75, 56, 90, 78, 34, 102, 88

#27:

2, 7, 4, 21, 5, 10, 19, 13, 45, 32, 11, 66, 23, 75, 56, 90, 78, 34, 102, 88

#28:

2, 7, 4, 10, 5, 21, 19, 13, 45, 32, 11, 66, 23, 75, 56, 90, 78, 34, 102, 88

#29:

2, 7, 4, 10, 5, 21, 19, 13, 45, 32, 11, 66, 23, 75, 56, 90, 78, 34, 102, 88

#30:

2, 7, 4, 10, 5, 13, 19, 21, 45, 32, 11, 66, 23, 75, 56, 90, 78, 34, 102, 88

#31:

2, 7, 4, 10, 5, 13, 19, 21, 45, 32, 11, 66, 23, 75, 56, 90, 78, 34, 102, 88

#32:

2, 7, 4, 10, 5, 13, 19, 21, 45, 32, 11, 66, 23, 75, 56, 90, 78, 34, 102, 88

#33:

2, 7, 4, 10, 5, 13, 11, 21, 19, 32, 45, 66, 23, 75, 56, 90, 78, 34, 102, 88

#34:

2, 7, 4, 10, 5, 13, 11, 21, 19, 32, 45, 66, 23, 75, 56, 90, 78, 34, 102, 88

#35:

2, 7, 4, 10, 5, 13, 11, 21, 19, 32, 23, 66, 45, 75, 56, 90, 78, 34, 102, 88

#36:

2, 7, 4, 10, 5, 13, 11, 21, 19, 32, 23, 66, 45, 75, 56, 90, 78, 34, 102, 88

#37:

2, 7, 4, 10, 5, 13, 11, 21, 19, 32, 23, 66, 45, 75, 56, 90, 78, 34, 102, 88

#38:

2, 7, 4, 10, 5, 13, 11, 21, 19, 32, 23, 66, 45, 75, 56, 90, 78, 34, 102, 88

#39:

2, 7, 4, 10, 5, 13, 11, 21, 19, 32, 23, 66, 45, 75, 56, 90, 78, 34, 102, 88

#40:

2, 7, 4, 10, 5, 13, 11, 21, 19, 32, 23, 34, 45, 66, 56, 75, 78, 90, 102, 88

#41:

2, 7, 4, 10, 5, 13, 11, 21, 19, 32, 23, 34, 45, 66, 56, 75, 78, 90, 102, 88

#42:

2, 7, 4, 10, 5, 13, 11, 21, 19, 32, 23, 34, 45, 66, 56, 75, 78, 88, 102, 90

#43:

2, 7, 4, 10, 5, 13, 11, 21, 19, 32, 23, 34, 45, 66, 56, 75, 78, 88, 102, 90

#44:

2, 4, 7, 10, 5, 13, 11, 21, 19, 32, 23, 34, 45, 66, 56, 75, 78, 88, 102, 90

#45:

2, 4, 7, 10, 5, 13, 11, 21, 19, 32, 23, 34, 45, 66, 56, 75, 78, 88, 102, 90

#46:

2, 4, 5, 7, 10, 13, 11, 21, 19, 32, 23, 34, 45, 66, 56, 75, 78, 88, 102, 90

#47:

2, 4, 5, 7, 10, 13, 11, 21, 19, 32, 23, 34, 45, 66, 56, 75, 78, 88, 102, 90

#48:

2, 4, 5, 7, 10, 11, 13, 21, 19, 32, 23, 34, 45, 66, 56, 75, 78, 88, 102, 90

#49:

2, 4, 5, 7, 10, 11, 13, 21, 19, 32, 23, 34, 45, 66, 56, 75, 78, 88, 102, 90

#50:

2, 4, 5, 7, 10, 11, 13, 19, 21, 32, 23, 34, 45, 66, 56, 75, 78, 88, 102, 90

#51:

2, 4, 5, 7, 10, 11, 13, 19, 21, 32, 23, 34, 45, 66, 56, 75, 78, 88, 102, 90

#52:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 66, 56, 75, 78, 88, 102, 90

#53:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 66, 56, 75, 78, 88, 102, 90

#54:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 66, 56, 75, 78, 88, 102, 90

#55:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 66, 56, 75, 78, 88, 102, 90

#56:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 102, 90

#57:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 102, 90

#58:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 102, 90

#59:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 102, 90

#60:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 102, 90

#61:

2, 4, 5, 7, 10, 11, 13, 19, 21, 23, 32, 34, 45, 56, 66, 75, 78, 88, 90, 102