Ανάπτυξη Λογισμικού για Αλγοριθμικά Προβλήματα 2022-2023

Project 3

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Compile:

cmake -DCGAL_DIR=/usr/local/lib/cmake/CGAL.

Make

Run(sample):

./evaluate -i instances/data/images -o output.txt -preprocess -threshold 300000 -L 7

Η εργασία τρέχει με οποιαδήποτε σειρά των preprocess ορισμάτων L,threshold και τρέχει χωρίς αυτά με default τιμές L=7, threshold = 300000.

Η εργασία υλοποιεί μόνο τον Incremental algorithm σε βελτιστοποίηση local_search.

Το πρόγραμμα αθροίζει 5 εφικτές λύσεις σε min και max score αντίστοιχα.

Τιμές 1 εμφανίζονται εάν η εκτέλεση ξεπεράσει τη χρονική διάρκεια cut off ή τα δείγματα δεν είναι αρκετά.

Παρακάτω τα συμπεράσματα.

Report Steady threshold, variable L L = 10 Threshold = 300000

Incremental Algorithm

Size	min score	max sco	re min bound max bound	
10	1 1	1	0.677443	
15	3.39578	2.37267	0.679592 0.423452	
20	3.49481	3.49372	0.699576 0.698743	
50	2.33874	2.33874	0.467748 0.467748	
60	2.61807	2.61807	0.523618 0.523613	
70	2.95506	2.79835	0.591013 0.551835	
100	2.51037	2.44074	0.502075 0.467259	
200	2.69681	2.64433	0.539361 0.526243	
500	2.19933	2.16245	0.439867 0.425578	
800	2.07404	2.04723	0.414808 0.407165	
600	1.87989	1.87986	0.375985 0.375972	
10	2.63867	1	0.539491 1	
10	3.66899	1	0.733799 1	
20	2.75398	1	0.550796 1	
90	2.99771	2.89446	0.599541 0.573729	
300	2.44101	2.4402	0.488319 0.488041	

L = 9 Threshold = 300000

```
Size || min score | max score | min bound | max bound ||
    | 1
                             | 0.677443 ||
10
            | 1
                     | 1
15
    || 3.39578
              2.37267
                          0.679592
                                     0.423452
                         0.699576
20
    | 3.49481 | 3.49372
                                     0.698743
50
    | 2.8246 | 2.43591
                        | 0.56492 | 0.467748
             | 2.61807
                                     0.523613
60
    || 2.61807
                         0.523618
                                                 \parallel
70
    || 2.95506 | 2.79835
                         0.591013
                                     0.551835
100
    || 2.33654 | 2.3363
                         | 0.467499 | 0.467259
200
                 2.63121
                         | 0.526243 | 0.526243
    || 2.63121
500
    | 2.12789 | 1
                          0.425578
                                  0.425578
800
    || 2.03582
               | 1
                        0.407165
                                   | 1
600
              1.87986
    || 1.87988
                         0.375978
                                       0.375972
    | 2.63867 | 1
                         0.539491
10
                                   | 1
                                            || 3.66899
10
                1
                         0.733799
                                     1
                                            \parallel
20
    | 2.75398 | 1
                         0.550796
                                     1
                                     0.573729
90
    | 2.99771 | 2.89446
                          0.599541
300
    || 2.47735 | 2.4476
                         0.495488
                                     0.488041
```

L = 7 Threshold = 300000

Incremental Algorithm

```
Size || min score | max score | min bound | max bound ||
10
    | 1
             | 1
                      | 1
                               | 0.677443 ||
    || 3.10675
15
                 2.70835
                           0.622652
                                       0.423452
20
                           0.699576
    || 3.49481
              | 3.49372
                                          0.698743
                                                    \parallel
50
    || 2.8246 | 2.43591
                          | 0.56492 | 0.467748
                          0.523618
60
    || 2.61807
                                       0.523613
               | 2.61807
70
    || 2.95506
              | 2.79835
                          0.591013
                                       0.551835
100
    || 2.33641
               | 2.3363
                           0.467371
                                      0.467259
200
    || 2.77652
                  2.7184
                           0.555303
                                      0.526243
                                                   \parallel
                                    | 0.425578 ||
500
     || 2.12794
               | 1
                           0.425615
800
    || 2.03583
                         0.407166
                                    | 1
               | 1
               | 1.88789
600
    || 1.89993
                          0.379987
                                          0.375972
10
    || 2.63867
                          0.539491
                                      1
                | 1
                                              \|
10
    | 3.66899
                 1
                          0.733799
                                       1
                                              \parallel
20
    | 2.75398 | 1
                          0.550796
                                    | 1
90
    || 2.99771 | 2.89446
                           0.599541
                                       0.573729
                          | 0.499532 | 0.488041
300
    || 2.49725 | 2.46298
```

L = 4 Threshold = 300000

```
Size || min score | max score | min bound | max bound ||
10
    \parallel 1
            | 1
                     | 1
                            | 0.677443 ||
15
    || 3.10675
             2.70835
                          0.622652
                                     0.423452
                                                  20
             3.49372
                         0.699576
                                     0.698743
    || 3.49481
                         | 0.56492 | 0.467748 ||
50
    || 2.8246 | 2.53308
    || 2.61807
60
               2.61807
                          | 0.523618
                                     0.523613
70
    || 2.95506
               | 2.79835
                          0.591013
                                     0.551835
100
    || 2.48485
                 2.42543
                           | 0.49697 | 0.467259
200
                 2.70362
    || 2.83069
                            0.566139 | 0.526243
500
    || 2.19354
                 2.14102
                          | 0.438716 | 0.425578
800
    || 2.03582
                        0.407165
                                   | 1
                 1
600
                         0.381509
    | 1.90755
                1.90017
                                        0.375972
10
    || 2.63867
               | 1
                         0.539491
                                     1
                                            10
    || 3.66899
              | 1
                         0.733799
                                     1
                                            20
              | 1
    || 2.75398
                       0.550796
                                   | 1
90
    | 2.99771 | 2.89446
                          | 0.599541 | 0.573729
    | 2.48067 | 2.44824 | 0.496169 | 0.488041
300
```

L = 1 Threshold = 300000

```
Size || min score | max score | min bound | max bound ||
10
    | 1
            | 1
                     | 1
                              | 0.677443 ||
15
    | 2.9845 | 2.635 | 0.598202 | 0.423452 ||
                          0.699576
                                     0.698743
20
    || 3.49481 | 3.49372
                                                  \parallel
50
    || 2.75047
              | 2.58572
                            0.550166
                                        0.467748
60
    || 2.78663
              2.68549
                          0.557327
                                      0.523613
70
    || 2.75918
              | 2.75918
                          0.551835
                                      0.551835
                          | 0.480663 | 0.467259 ||
100
    || 2.4024 | 2.37559
200
    || 2.73033 | 2.68788
                          | 0.546082 | 0.526243
500
    || 2.12792
               | 1
                        | 0.425602 | 0.425578 ||
800
    || 2.03582
               | 1
                        0.407165
                                   | 1
                                             \parallel
600
    || 1.89501 | 1.88894
                          | 0.379014 | 0.375972
10
    | 2.6888 | 1
                       | 0.549648 | 1
                                            10
    || 3.70793
                       0.753266
              | 1
                                   | 1
                                            || 2.75563
20
              | 1
                          0.552445
                                   | 1
    | 3.07613 | 2.97622
                         | 0.615227 | 0.573729
90
300
    || 2.44025 | 2.4402
                         | 0.488088 | 0.488041
```

Steady L, variable threshold

L = 7

Threshold = 200000

Incremental Algorithm

```
Size || min score | max score | min bound | max bound ||
10
    \parallel 1
                      | 1
                               0.677443
               1
                                       0.423452
15
    | 3.11298
               2.70835
                           0.623598
20
    | 1
                        0.699576
                                    | 0.698743 ||
             3.49372
50
    | 2.8246 | 2.43591
                          | 0.56492 | 0.467748 ||
60
    | 2.61807
                           0.523618
                                       0.523613
               2.61807
70
    | 2.95506
                 2.79835
                           0.591013
                                         0.551835
100
    | 2.53359 | 2.49237
                            | 0.50701 | 0.467259
200
    || 2.74402
                  2.70996
                            0.548808
                                       0.526243
500
    || 2.15959
                  2.14057
                              0.431929
                                          0.425578
800
    || 2.07293 |
                  2.04808
                            0.414594
                                       0.407165
600
               | 1.8931
                           0.380398
    || 1.90195
                                      | 0.375972
10
    || 2.63867
                1
                          0.539491
                                       1
                                       1
10
    || 3.66899
               1 1
                          0.733799
                                              \parallel
20
    || 2.75398
                          0.550796
                                       1
                 1
                                              \parallel
                 2.89446
90
    || 2.99771
                           0.599541
                                       0.573729
300
    || 2.48236 | 2.44863
                          | 0.496473 | 0.488041
```

L = 7 Threshold = 250000

```
Size || min score | max score | min bound | max bound ||
                              | 0.677443 ||
10
    | 1
            | 1
                     | 1
15
              2.70835
                           | 0.623598 | 0.423452
    || 3.11298
20
                       0.699576
            | 3.49372
                                   0.698743
50
                         | 0.56492 | 0.467748
    | 2.8246 | 2.43591
                           0.523618
60
    || 2.61807
               | 2.61807
                                       0.523613
70
    | 2.95506
                 2.79835
                           0.591013
                                      0.551835
100
    || 2.48392
               | 2.39534
                           0.496784
                                      | 0.467259
200
    || 2.69361
                  2.65604
                             0.538824 | 0.526243
500
               | 2.13408
                           | 0.43177 | 0.425578
     || 2.15885
800
    || 2.03582
               | 1
                        | 0.407165 | 0.407165
                          0.382705
                                      | 0.375972 ||
600
    || 1.9135
                1.88841
10
    || 2.63867
                 1
                          0.539491
                                      1
                                             10
    | 3.66899
                 1
                          0.733799
                                      1
                                             \|
    || 2.75398
20
                 1
                          0.550796
                                      1
                 2.89446
90
    || 2.99771
                          0.599541
                                        0.573729
300
    || 2.44035 | 2.4402
                         0.488116
                                     0.488041
```

L = 7 Threshold = 350000

Incremental Algorithm

```
Size || min score | max score | min bound | max bound ||
10
    | 1
            | 1
                    | 1
                             0.677443
15
    || 3.10675
                2.70835
                          0.622652
                                     0.423452
    || 3.49481 | 3.49372
                         0.699576
20
                                     0.698743
50
    | 2.8246 | 2.43591
                         | 0.56492 | 0.467748 ||
                         0.523618
60
    || 2.61807
              | 2.61807
                                    0.523613
70
    | 2.95506 | 2.79835
                         0.591013
                                    0.551835
    || 2.46788 | 2.41524
                         0.493576
100
                                    0.467259
200
    || 2.77652 |
                 2.7184
                        | 0.555303 | 0.526243 ||
500
    || 2.12791
               | 1
                        0.425592 | 0.425578
               | 1
800
    || 2.03584
                       0.407178
                                  0.407165
              1.89595
                         0.383445
600
    | 1.91716
                                     0.375972
10
    || 2.63867
               1
                         0.539491
                                    1
10
    | 3.66899 |
               1
                         0.733799
                                    1
                                           \parallel
20
    || 2.75398
             | 1
                         0.550796
                                    1
90
    | 2.99771 | 2.89446
                        0.599541
                                    0.573729
    || 2.44052 | 2.4402
300
                        | 0.488148 | 0.488041
```

L = 7 Threshold = 450000

```
Size || min score | max score | min bound | max bound ||
    | 1
10
           | 1
                  | 1
                           | 0.677443 ||
15
                          | 0.622652 | 0.423452
    | 3.10675 | 2.70835
                         | 0.698872 | 0.698743 ||
20
    || 3.4941 | 3.49372
50
    || 2.8246 | 2.43591
                         | 0.56492 | 0.467748 ||
                         | 0.523618 | 0.523613
60
    | 2.61807
                 2.61807
70
    || 2.95506
               2.79835
                          0.591013
                                     0.551835
100
    || 2.50354
                 2.40269
                           0.500878
                                      0.467259
200
    || 2.68488
                 2.66342
                           0.536977
                                      0.526243
500
    || 2.12789
              | 1
                          0.425578
                                   | 0.425578 ||
800
    || 2.03582
                 1
                          0.407165
                                      1
600
    | 1.98822
              1.94216
                         | 0.397643 | 0.375972
10
    || 2.63867
               | 1
                         0.539491
                                     1
                                            10
                 1
                         0.733799
                                     1
    || 3.66899
                                            \parallel
20
    || 2.75398
                       0.550796
                 1
                                     1
    || 2.99771 | 2.94608
90
                         0.599541
                                     | 0.573729
300
    | 2.47267 | 2.45318
                         | 0.494547 | 0.488041
```

Παρατηρούμε ότι όσο μειώνεται το L τόσο μειώνεται η βελτιστοποίηση του πολυγώνου και όσο μεγαλώνει το threshold τόσο βελτιώνεται το εμβαδόν του πολυγώνου.