

ΠΟΛΥΜΕΣΑ

ΚΩΝΣΤΑΝΤΙΝΟΣ ΓΚΙΟΥΛΗΣ, ΑΜ:4654

Κωδικοποίηση: IDR P P P P P P . . .

Bitrate: 83772

```
-----
Total Frames: 300
Leaky BucketRateFile does not have valid entries.
Using rate calculated from avg. rate
Number Leaky Buckets: 8
  Rmin  Bmin  Fmin
  83820 36220 36220
  104760 29940 29940
  125700 29242 29242
  146640 28544 28544
  167580 28280 28280
  188520 28280 28280
  209460 28280 28280
  230400 28280 28280
----- Average data all frames -----

Total encoding time for the seq. : 41.418 sec (7.24 fps)
Total ME time for sequence      : 19.833 sec

Y { PSNR (dB), cSNR (dB), MSE } : { 34.574, 34.155, 24.97843 }
U { PSNR (dB), cSNR (dB), MSE } : { 39.498, 39.244, 7.73873 }
V { PSNR (dB), cSNR (dB), MSE } : { 40.143, 39.787, 6.82935 }

Total bits                      : 838792 (I 28280, P 810192, NVB 320)
Bit rate (kbit/s) @ 30.00 Hz   : 83.88
Bits to avoid Startcode Emulation : 2418
Bits for parameter sets        : 320
Bits for filler data           : 0
-----
```

Bitrate:176852

```
-----
Total Frames: 300
Leaky BucketRateFile does not have valid entries.
Using rate calculated from avg. rate
Number Leaky Buckets: 8
  Rmin  Bmin  Fmin
  176670 39644 39644
  220830 28366 28366
  264990 28280 28280
  309150 28280 28280
  353310 28280 28280
  397470 28280 28280
  441630 28280 28280
  485790 28280 28280
----- Average data all frames -----

Total encoding time for the seq. : 40.531 sec (7.40 fps)
Total ME time for sequence      : 17.685 sec

Y { PSNR (dB), cSNR (dB), MSE } : { 38.457, 38.186, 9.87455 }
U { PSNR (dB), cSNR (dB), MSE } : { 41.633, 41.456, 4.64984 }
V { PSNR (dB), cSNR (dB), MSE } : { 42.574, 42.284, 3.84304 }

Total bits                      : 1767216 (I 28280, P 1738616, NVB 320)
Bit rate (kbit/s) @ 30.00 Hz   : 176.72
Bits to avoid Startcode Emulation : 2131
Bits for parameter sets        : 320
Bits for filler data           : 0
-----
```

Bitrate: 269932

```
Total Frames: 300
Leaky BucketRateFile does not have valid entries.
Using rate calculated from avg. rate
Number Leaky Buckets: 8
  Rmin   Bmin   Fmin
270210  57179  57179
337740  44792  44792
405270  44792  44792
472800  44792  44792
540330  44792  44792
607860  44792  44792
675390  44792  44792
742920  44792  44792
----- Average data all frames -----

Total encoding time for the seq. : 42.208 sec (7.11 fps)
Total ME time for sequence      : 17.331 sec

Y { PSNR (dB), cSNR (dB), MSE } : { 40.738, 40.520, 5.76933 }
U { PSNR (dB), cSNR (dB), MSE } : { 43.129, 42.956, 3.29238 }
V { PSNR (dB), cSNR (dB), MSE } : { 44.196, 43.888, 2.65604 }

Total bits                      : 2702440 (I 44792, P 2657328, NVB 320)
Bit rate (kbit/s) @ 30.00 Hz   : 270.24
Bits to avoid Startcode Emulation : 2037
Bits for parameter sets        : 320
Bits for filler data           : 0
```

Bitrate : 363012

```
Total Frames: 300
Leaky BucketRateFile does not have valid entries.
Using rate calculated from avg. rate
Number Leaky Buckets: 8
  Rmin   Bmin   Fmin
362940  71184  71184
453660  44792  44792
544380  44792  44792
635100  44792  44792
725820  44792  44792
816540  44792  44792
907260  44792  44792
997980  44792  44792
----- Average data all frames -----

Total encoding time for the seq. : 45.224 sec (6.63 fps)
Total ME time for sequence      : 17.673 sec

Y { PSNR (dB), cSNR (dB), MSE } : { 42.341, 42.150, 3.96359 }
U { PSNR (dB), cSNR (dB), MSE } : { 44.264, 44.124, 2.51598 }
V { PSNR (dB), cSNR (dB), MSE } : { 45.381, 45.123, 1.99895 }

Total bits                      : 3630000 (I 44792, P 3584888, NVB 320)
Bit rate (kbit/s) @ 30.00 Hz   : 363.00
Bits to avoid Startcode Emulation : 2243
Bits for parameter sets        : 320
Bits for filler data           : 0
```

Κωδικοποίηση: IDR BBPBBPBBP...

Bitrate: 83772

```
Total Frames: 300
Leaky BucketRateFile does not have valid entries.
Using rate calculated from avg. rate
Number Leaky Buckets: 8
  Rmin    Bmin    Fmin
  83370   37396   37396
  104190  35407   35407
  125010  34713   34713
  145830  34019   34019
  166650  33325   33325
  187470  32631   32631
  208290  31937   31937
  229110  31243   31243
----- Average data all frames -----

Total encoding time for the seq. : 47.225 sec (6.35 fps)
Total ME time for sequence      : 23.096 sec

Y { PSNR (dB), cSNR (dB), MSE } : { 34.717, 34.050, 25.59082 }
U { PSNR (dB), cSNR (dB), MSE } : { 39.860, 39.537, 7.23478 }
V { PSNR (dB), cSNR (dB), MSE } : { 40.497, 40.107, 6.34432 }

Total bits                      : 834224 (I 28488, P 485824, B 319592 NVB 320)
Bit rate (kbit/s) @ 30.00 Hz   : 83.42
Bits to avoid Startcode Emulation : 2015
Bits for parameter sets        : 320
Bits for filler data           : 0
```

Bitrate:176852

```
Total Frames: 300
Leaky BucketRateFile does not have valid entries.
Using rate calculated from avg. rate
Number Leaky Buckets: 8
  Rmin    Bmin    Fmin
  176460  66918   66918
  220560  31528   31528
  264660  30058   30058
  308760  28588   28588
  352860  28488   28488
  396960  28488   28488
  441060  28488   28488
  485160  28488   28488
----- Average data all frames -----

Total encoding time for the seq. : 50.319 sec (5.96 fps)
Total ME time for sequence      : 22.851 sec

Y { PSNR (dB), cSNR (dB), MSE } : { 38.421, 37.948, 10.42931 }
U { PSNR (dB), cSNR (dB), MSE } : { 41.788, 41.532, 4.56956 }
V { PSNR (dB), cSNR (dB), MSE } : { 42.824, 42.449, 3.69959 }

Total bits                      : 1765168 (I 28488, P 957224, B 779136 NVB 320)
Bit rate (kbit/s) @ 30.00 Hz   : 176.52
Bits to avoid Startcode Emulation : 2132
Bits for parameter sets        : 320
Bits for filler data           : 0
```

Bitrate: 269932

```
Total Frames: 300
Leaky BucketRateFile does not have valid entries.
Using rate calculated from avg. rate
Number Leaky Buckets: 8
  Rmin   Bmin   Fmin
269970  113110  113110
337440  52696   52696
404910  50447   50447
472380  48198   48198
539850  45949   45949
607320  45088   45088
674790  45088   45088
742260  45088   45088
----- Average data all frames -----

Total encoding time for the seq. : 50.764 sec (5.91 fps)
Total ME time for sequence      : 21.537 sec

Y { PSNR (dB), cSNR (dB), MSE } : { 40.539, 40.247, 6.14298 }
U { PSNR (dB), cSNR (dB), MSE } : { 43.071, 42.858, 3.36727 }
V { PSNR (dB), cSNR (dB), MSE } : { 44.149, 43.772, 2.72837 }

Total bits                      : 2700176 (I 45088, P 1280024, B 1374744 NVB 320)
Bit rate (kbit/s) @ 30.00 Hz   : 270.02
Bits to avoid Startcode Emulation : 1870
Bits for parameter sets        : 320
Bits for filler data            : 0
```

Bitrate : 363012

```
Total Frames: 300
Leaky BucketRateFile does not have valid entries.
Using rate calculated from avg. rate
Number Leaky Buckets: 8
  Rmin   Bmin   Fmin
363210  168165  168165
453990  48811   48811
544770  45785   45785
635550  45088   45088
726330  45088   45088
817110  45088   45088
907890  45088   45088
998670  45088   45088
----- Average data all frames -----

Total encoding time for the seq. : 52.070 sec (5.76 fps)
Total ME time for sequence      : 20.931 sec

Y { PSNR (dB), cSNR (dB), MSE } : { 42.281, 42.042, 4.06319 }
U { PSNR (dB), cSNR (dB), MSE } : { 44.239, 44.057, 2.55514 }
V { PSNR (dB), cSNR (dB), MSE } : { 45.379, 45.056, 2.02981 }

Total bits                      : 3632600 (I 45088, P 1693824, B 1893368 NVB 320)
Bit rate (kbit/s) @ 30.00 Hz   : 363.26
Bits to avoid Startcode Emulation : 1838
Bits for parameter sets        : 320
Bits for filler data            : 0
```

Ερωτημα 8:

Bitrate: 74464

Lowdelay:

```
SUMMARY -----
      Total Frames | Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
            300   a      74.9928  36.0325  40.7465  41.5723  36.6313

I Slices-----
      Total Frames | Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
            1     i      734.1600  40.4830  43.1869  45.4909  41.4051

P Slices-----
      Total Frames | Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
            0     p          -nan    -nan    -nan    -nan    -nan

B Slices-----
      Total Frames | Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
            299    b      72.7882  36.0176  40.7384  41.5592  36.6216

RVM: 0.000
Bytes written to file: 93741 (74.993 kbps)

Total Time:      186.022 sec.
```

Randomness:

```
SUMMARY -----
      Total Frames | Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
            300   a      76.4608  36.3789  41.6416  42.4537  37.0395

I Slices-----
      Total Frames | Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
            10    i      873.3840  39.7243  42.5131  43.6881  40.3379

P Slices-----
      Total Frames | Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
            0     p          -nan    -nan    -nan    -nan    -nan

B Slices-----
      Total Frames | Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
            290    b      48.9807  36.2636  41.6115  42.4111  36.9605

RVM: 0.000
Bytes written to file: 95576 (76.461 kbps)

Total Time:      146.356 sec.
```


Bitrate: 167544

Lowdelay:

```
SUMMARY -----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
        300      a    167.7568   40.4522   43.5225   44.5664   40.8956

I Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
         1      i    993.6000   42.7918   44.8321   46.9582   43.5764

P Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
         0      p         -nan         -nan         -nan         -nan         -nan

B Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
        299      b    164.9948   40.4443   43.5181   44.5584   40.8889

RVM: 0.000
Bytes written to file: 209696 (167.757 kbps)

Total Time:      296.383 sec.
```

Randomness:

```
SUMMARY -----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
        300      a    168.7128   40.6124   44.0751   45.1369   41.2243

I Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
        10      i   1266.5520   43.0765   44.9317   46.2532   43.4228

P Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
         0      p         -nan         -nan         -nan         -nan         -nan

B Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
        290      b    130.8563   40.5274   44.0456   45.0984   41.1653

RVM: 0.000
Bytes written to file: 210891 (168.713 kbps)

Total Time:      202.219 sec.
```

Bitrate: 260624

Lowdelay:

```
SUMMARY -----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
           300    a      259.1368  42.8150  45.0672  46.2272  43.2242

I Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
           1     i      1110.7200  43.7483  45.5341  47.6120  44.4766

P Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
           0     p          -nan    -nan    -nan    -nan    -nan

B Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
          299    b      256.2887  42.8119  45.0656  46.2226  43.2206

RVM: 0.000
Bytes written to file: 323921 (259.137 kbps)

Total Time:      375.543 sec.
```

Randomness:

```
SUMMARY -----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
           300    a      261.7680  43.0825  45.7009  46.7786  43.5939

I Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
          10     i      1517.9280  44.8231  46.2006  47.4763  45.1025

P Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
           0     p          -nan    -nan    -nan    -nan    -nan

B Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
          290    b      218.4521  43.0225  45.6837  46.7545  43.5502

RVM: 0.000
Bytes written to file: 327210 (261.768 kbps)

Total Time:      242.945 sec.
```

Bitrate:353704

Lowdelay:

```
SUMMARY -----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
        300      a    351.5960   44.4322   46.1993   47.3066   44.7917

I Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
         1      i    1213.9200   44.4842   46.2727   48.3588   45.2137

P Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
         0      p         -nan         -nan         -nan         -nan         -nan

B Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
        299      b    348.7120   44.4321   46.1990   47.3031   44.7904

RVM: 0.000
Bytes written to file: 439495 (351.596 kbps)

Total Time:      397.129 sec.
```

Randomness:

```
SUMMARY -----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
        300      a    354.9400   44.8107   46.9775   47.9745   45.2525

I Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
        10      i    1701.1440   46.0306   47.0501   48.2444   46.2579

P Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
         0      p         -nan         -nan         -nan         -nan         -nan

B Slices-----
      Total Frames |   Bitrate   Y-PSNR   U-PSNR   V-PSNR   YUV-PSNR
        290      b    308.5192   44.7687   46.9750   47.9652   45.2217

RVM: 0.000
Bytes written to file: 443675 (354.940 kbps)

Total Time:      279.884 sec.
```


Ερώτημα 10:

```
R1=[83.88,176.72,270.24,363];
PSNR1=[34.574,38.457,40.738,42.341];
R2=[83.42,176.52,270.02,363.26];
PSNR2=[34.717,38.421,40.539,42.281];
R3=[74.9928,167.7568,259.1368,351.5960];
PSNR3=[36.0325,40.4522,42.8150,44.4322];
R4=[76.4608,168.7128,261.7680,354.9400];
PSNR4=[36.3789,40.6124,43.0825,44.8107];

>> % For H.264 comparison 1
>> bd_psnr_h264_1 = bjontegaard2(R1, PSNR1, R2, PSNR2, 'dsnr')
bd_psnr_h264_1 = 0.0029833
>> bd_rate_h264_1 = bjontegaard2(R1, PSNR1, R2, PSNR2, 'rate')
bd_rate_h264_1 = 0.12108
>>
>>
>> bd_psnr_h265_2 = bjontegaard2(R1, PSNR1, R3, PSNR3, 'dsnr')
bd_psnr_h265_2 = 2.2396
>> bd_psnr_h265_2 = bjontegaard2(R1, PSNR1, R3, PSNR3, 'rate')
bd_psnr_h265_2 = -34.036
>>
>> % For H.265 comparison
>> bd_psnr_h265_1 = bjontegaard2(R1, PSNR1, R4, PSNR4, 'dsnr')
bd_psnr_h265_1 = 2.4168
>> bd_rate_h265_1 = bjontegaard2(R1, PSNR1, R4, PSNR4, 'rate')
bd_rate_h265_1 = -35.944
```

Παρατηρώ ότι η καλύτερη μέθοδος είναι η δεύτερη με κωδικοποίηση I P B B P, έπειτα είναι η πρώτη με I P P P P, έπειτα η lowdelay και τελευταία η randomaccess. Οποτε σε αυξουσα: randomaccess > lowdelay > I P P P P > I P B B P