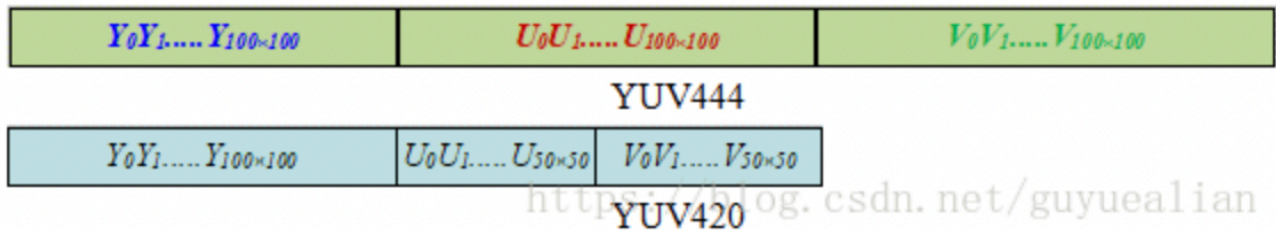H.263 :CIF分辨率（352×288）

YUYUV在存储时是以数组的形式存储的，可以看做连续的三个一维数组。三个数组分别单独存储Y、U、V分量。以一幅100×100的YUV444图像为例，下图表示的**YUV444的存储格式**和**YUV420的存储格式**。

用psnr_read.m绘制psnr和mse绘制不同Q的结果

用psnr_new.m绘制5个固定比特率下每帧的MSE

其余m文件也可以load视频文件和计算psnr，参考代码使用

- Encode:

.\tmn.exe -i ..\football_cif.yuv -a 0 -b 149 -x 3 -O 0 -S 0 -I 1 -q 1 -B QP1.bits -o QP1.yuv

-a start at frame 0

-b stop at frame 149

-x coding format x3--cfi

-O 0 skip 0 frame

-S 0 skip 0 frame

-q 1 quantization parameter

-B output bitstream

-o reconstruct yuv

-l loop sequence

-I 1 qp for first frame

- Fix bitrate:

./tmn -i ../football_cif.yuv -a 0 -b 149 -x 3 -O 0 -S 0 -I 1 -q 1 -r 29000000 -o dec_bit_29000k.yuv -B dec_bit_29000k.bits

- Decode:

 ./tmndec -o5 -l .\QP19.bits .\decode_qp1.yuv

-o5 output format YUV concatenated

QP1.   10901.63 (10833.82) kbit/sec

```
==============
Total  : 361127

Mean quantizer   : 1.00
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Obtained bit rate: 10901.63 (10833.82) kbit/sec
```

QP2 5355.12 (5302.44) kbit/sec

```
==============
Total  : 176747

Mean quantizer   : 2.00
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Obtained bit rate: 5355.12 (5302.44) kbit/sec
==========================================
```

QP3 3784.63 (3744.56) kbit/sec

```
==============
Total  : 124818

Mean quantizer   : 3.00
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Obtained bit rate: 3784.63 (3744.56) kbit/sec
==========================================
```

QP4 2718.93 (2685.28) kbit/sec

```
==============
Total  : 89509

Mean quantizer   : 4.00
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Obtained bit rate: 2718.93 (2685.28) kbit/sec
==========================================
```

QP5   2211.47 (2183.36) kbit/sec

```
==============
Total  : 72778

Mean quantizer   : 5.00
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Obtained bit rate: 2211.47 (2183.36) kbit/sec
==========================================
```

QP6   1763.82 (1739.08) kbit/sec

```
==============
Total  : 57969

Mean quantizer   : 6.00
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Obtained bit rate: 1763.82 (1739.08) kbit/sec
==========================================
```

QP7   1522.87 (1501.34) kbit/sec

```
==============
Total  : 50044

Mean quantizer   : 7.00
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Obtained bit rate: 1522.87 (1501.34) kbit/sec
==========================================
```

QP8   1283.76 (1264.21) kbit/sec

```
==============
Total  : 42140

Mean quantizer   : 8.00
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Obtained bit rate: 1283.76 (1264.21) kbit/sec
==========================================
```

QP9   1147.70 (1130.14) kbit/sec

```
==============
Total  : 37671

Mean quantizer   : 9.00
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Obtained bit rate: 1147.70 (1130.14) kbit/sec
============================================
```

QP10   1000.27 (984.11) kbit/sec

```
==============
Total  : 32803

Mean quantizer   : 10.00
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Obtained bit rate: 1000.27 (984.11) kbit/sec
============================================
```

QP11.   913.09 (898.31) kbit/sec

```
==============
Total  : 29943

Mean quantizer   : 11.00
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Obtained bit rate: 913.09 (898.31) kbit/sec
============================================
```

QP12 817.12 (803.30) kbit/sec

```
==============
Total  : 26776

Mean quantizer   : 12.00
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Obtained bit rate: 817.12 (803.30) kbit/sec
============================================
```

QP13 758.08 (745.31) kbit/sec

```
==============
Total  : 24843

Mean quantizer   : 13.00
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Obtained bit rate: 758.08 (745.31) kbit/sec
============================================
```

QP14   689.69 (677.68) kbit/sec

```
==============
Total  : 22589

Mean quantizer   : 14.00
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Obtained bit rate: 689.69 (677.68) kbit/sec
==============================================
```

QP15 648.08 (636.84) kbit/sec

```
==============
Total  : 21227

Mean quantizer   : 15.00
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Obtained bit rate: 648.08 (636.84) kbit/sec
==========================================
```

QP16   599.02 (588.36) kbit/sec

```
==============
Total  : 19611

Mean quantizer   : 16.00
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Obtained bit rate: 599.02 (588.36) kbit/sec
===========================================
```

QP17   567.63 (557.60) kbit/sec

```
==============
Total  : 18586

Mean quantizer   : 17.00
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Obtained bit rate: 567.63 (557.60) kbit/sec
==========================================
```

QP18   529.91 (520.33) kbit/sec

```
==============
Total   : 17344

Mean quantizer    : 18.00
Encoded frames    : 150 (149)
Mean frame rate   : 30.00 Hz
Obtained bit rate: 529.91 (520.33) kbit/sec
==========================================
```

QP19.   506.87 (497.72) kbit/sec

```
==============
Total   : 16590

Mean quantizer    : 19.00
Encoded frames    : 150 (149)
Mean frame rate   : 30.00 Hz
Obtained bit rate: 506.87 (497.72) kbit/sec
==========================================
```

QP20   477.66 (468.90) kbit/sec

```
==============
Total   : 15630

Mean quantizer    : 20.00
Encoded frames    : 150 (149)
Mean frame rate   : 30.00 Hz
Obtained bit rate: 477.66 (468.90) kbit/sec
==========================================
```

QP21 459.59 (451.20) kbit/sec

```
Mean quantizer    : 21.00
Encoded frames    : 150 (149)
Mean frame rate   : 30.00 Hz
Obtained bit rate: 459.59 (451.20) kbit/sec
==========================================
```

Decode:

```
===============
Total   : 360589

Original seq time: 5.00 (4.97) sec
Mean quantizer    : 1.03
Encoded frames    : 150 (149)
Mean frame rate   : 30.00 Hz
Target bit rate   : 29000.00 kbit/sec
Obtained bit rate: 10768.30 (10817.70) kbit/sec
-----------------------------------------------
```

```
===============
Total   : 360641

Original seq time: 5.00 (4.97) sec
Mean quantizer    : 1.03
Encoded frames    : 150 (149)
Mean frame rate   : 30.00 Hz
Target bit rate   : 39000.00 kbit/sec
Obtained bit rate: 10769.85 (10819.25) kbit/sec
==================================================
```

```
Original seq time: 5.00 (4.97) sec
Mean quantizer    : 1.03
Encoded frames    : 150 (149)
Mean frame rate   : 30.00 Hz
Target bit rate   : 19000.00 kbit/sec
Obtained bit rate: 10765.64 (10815.02) kbit/sec
==================================================
```

```
===============
Total   : 360454

Original seq time: 5.00 (4.97) sec
Mean quantizer    : 1.03
Encoded frames    : 150 (149)
Mean frame rate   : 30.00 Hz
Target bit rate   : 15000.00 kbit/sec
Obtained bit rate: 10764.26 (10813.63) kbit/sec
==================================================
```

```
Original seq time: 5.00 (4.97) sec
Mean quantizer    : 1.03
Encoded frames    : 150 (149)
Mean frame rate   : 30.00 Hz
Target bit rate   : 20000.00 kbit/sec
Obtained bit rate: 10765.64 (10815.02) kbit/sec
==================================================
```

.\tmn.exe -i ..\football_cif.yuv -x 3 -S 0 -O 0 -b 149 -I 30 -r 1500000 -R 30 -o dec_bit_1500k.yuv -B dec_bit_1500k.bits

I:30 1500k

```
Original seq time: 5.00 (4.97) sec
Mean quantizer   : 7.07
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Target bit rate  : 1500.00 kbit/sec
Obtained bit rate: 1503.25 (1504.84) kbit/sec
==========================================
```

I:30 2000k

```
Original seq time: 5.00 (4.97) sec
Mean quantizer   : 5.57
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Target bit rate  : 2000.00 kbit/sec
Obtained bit rate: 1980.24 (1985.03) kbit/sec
==========================================
```

I:30 2500k

```
Original seq time: 5.00 (4.97) sec
Mean quantizer   : 4.59
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Target bit rate  : 2500.00 kbit/sec
Obtained bit rate: 2460.49 (2468.50) kbit/sec
==========================================
```

I:30 3000k

```
Original seq time: 5.00 (4.97) sec
Mean quantizer   : 3.90
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Target bit rate  : 3000.00 kbit/sec
Obtained bit rate: 2992.87 (3004.45) kbit/sec
==========================================
```

I:30 3500k

```
Original seq time: 5.00 (4.97) sec
Mean quantizer   : 3.36
Encoded frames   : 150 (149)
Mean frame rate  : 30.00 Hz
Target bit rate  : 3500.00 kbit/sec
Obtained bit rate: 3505.24 (3520.26) kbit/sec
==========================================
```