



Open-source Video Encoder/Decoder

March, 2010



Outline

1. Introduction
2. Encoder Features
3. Encoder Usage
4. Performance Results
5. Future Plan



Introduction



What is XAVS?

XAVS is an open-source project which is registered at [Sourceforge.net](http://sourceforge.net) aims to implement high quality AVS encoder and decoder.
<http://xavs.sourceforge.net/>

Features:

1. Open-source with GPL License
2. Free for reference and usage
3. Support different Operation System (Windows/Linux)
4. Good coding style and code structure
5. High Performance Encoding
 - High Coding Efficiency
 - High Coding Speed
 - Easy for usage



Encoder Features

JiZhun Profile Encoder Features

8x8 transform

B-frame

C2DVLC entropy coding

Intra: all macroblock types (8x8 with all 5 prediction modes)

Inter P: all partitions (from 16x16 down to 8x8)

Inter B: partitions from 16x16 down to 8x8 (including skip/direct)

Multiple reference frames

Ratecontrol: constant quantizer, constant quality, single or multipass ABR, optional VBV

Scenecut detection

Spatial and temporal direct mode in B-frames, adaptive mode selection

Parallel encoding on multiple CPUs

Usage of SIMD optimization for different platform (X86, Power and so on)

The features in blue are not implemented now.

Encoder Features

Mobile Profile Encoder Features

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Parallel encoding on multiple CPUs

Usage of SIMD optimization for different platform (X86, Power and so on)

Adaptive block size transform and prediction selection for Intra Frame

Adaptive block size transform selection for Inter Frame

1/8 Interpolation

Weighted Quantization and user defined quantization matrix

Constrained DCL Slice Support

The features in blue are not implemented now.

Encoder Usage

XAVS Encoding from YUV files

How to use Rate Control

For Fixed QP coding

```
./xavs -q 35 -I 60 -b 2 -m 7 -o test.avc --dump-yuv test_rec.yuv /mnt/sequences/ak.yuv 352x288
```

For CBR testing (single pass coding)

```
./xavs -B 250 -I 60 -b 2 -m 7 -o test.avc --dump-yuv test_rec.yuv /mnt/sequences/ak.yuv 352x288
```

For 2 pass coding

First Pass Coding:

```
./xavs -B 250 -I 60 -b 2 -m 7 --pass 1 -o test.avc /mnt/sequences/ak.yuv 352x288
```

Second Pass coding:

```
./xavs -B 250 -I 60 -b 2 -m 7 --pass 2 -o test.avc /mnt/sequences/ak.yuv 352x288
```

For more information of usage, please use `-help` or `-longhelp` options.

Encoder Usage

XAVS Trans-coding from multiple media formats to AVS (On Windows Platform)

Steps of XAVS trans-coding (from other video formats to AVS):

(1) **AVS script support:** install AviSynth software, <http://avisynth.org/warpenterprises/> download decoding libraries (DirectShowSource.dll , FFMpegSource.dll and etc.) and post processing libraries (not necessary at this stage), decompress those libraries to the AviSynth Installing DIR/plugins, then XAVS encoder can use AVS scripts.

(2) **AVS scripts coding:** for example

```
FFMpegSource("D:\video\sonydemo.2(H264).2(mp2).720x576.25fps.ts")  
or directshowsource("D:\video\sonydemo.2(H264).2(mp2).720x576.25fps.ts")  
#deinterlace  
#crop  
#LanczosResize(720,576)  
#Lanczos (Sharp)  
#denoise  
ConvertToYV12()
```

Copy the above scripts to a txt file and change the input source file path to the right URL. And change the file name with .avs extention (eg. hash.avs)

(3) **Generate the AVS streams and the timestamp file:** run xavs, for example: `xavs -o test.avs hash.avs` (or more complex commands), then we can generate the AVS stream `test.avs` and the timestamp file `test.dat`

(4) **Generate the audio file mp3:** download some audio Converter and get the mp3 format audio from the input file, name the file as `test.mp3`

(5) **AVS video and mp3 audio package:** Download [AVS transcoder package tools](#) to package video and audio to container, support asm and ts formats output

(6) **AVS video media file player:** download the latest [Baofeng player](#), which can support media file with AVS video.

(5) How to use AVStranscoder package the AVS video and mp3

Step1:

AVSCreator.exe

AvsCreator.exe test.avs test.asm -f

AvsCreator.exe test.mp3 test.asm

Step2:

avs2ts.exe test.avs test.mp3 test.dat test.avsts

XAVS Performance

Testing Platform

Platform: R710 Server Xeon 4x 5520*2, 16G memory

OS: Windows 32 bits

Building Tool: MS Visual Studio 2008

Software: XAVS-svn-r31

Anchor: AVS reference software RM9.02

Testing Conditions

Resolution	Frame Rate	Sequences	Frames (Frame to Be coded)	Conditions
720p(1280' 720)	60	City	241 (81)	Progressive Coding Hadama T: ON Ref: 2 Fast ME: ON Search Range: ± 32 Entropy Coding: VLC B frames: 2 RDO: ON Loopfile: ON Jizhun profile ON Intra frame refresh: 1s
	60	Crew	202 (68)	
	60	Harbour	241 (81)	
1080p	24	Kimono	97 (33)	
	24	Sunflower	202 (68)	
	24	pedestrian_area	241 (81)	



XAVS Performance

Target Bitrate Range

Resolution	Frame Rate (fps)	Target Bitrate (bps)	
720p	60	1.6M, 2.5M, 4M, 6M	
1080p	24	1.6M, 2.5M, 4M, 6M	

Testing Quantization Parameters

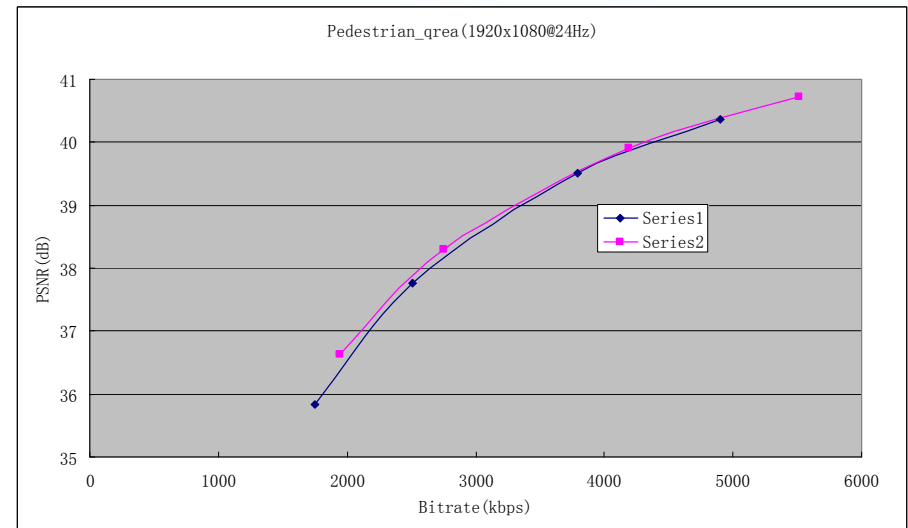
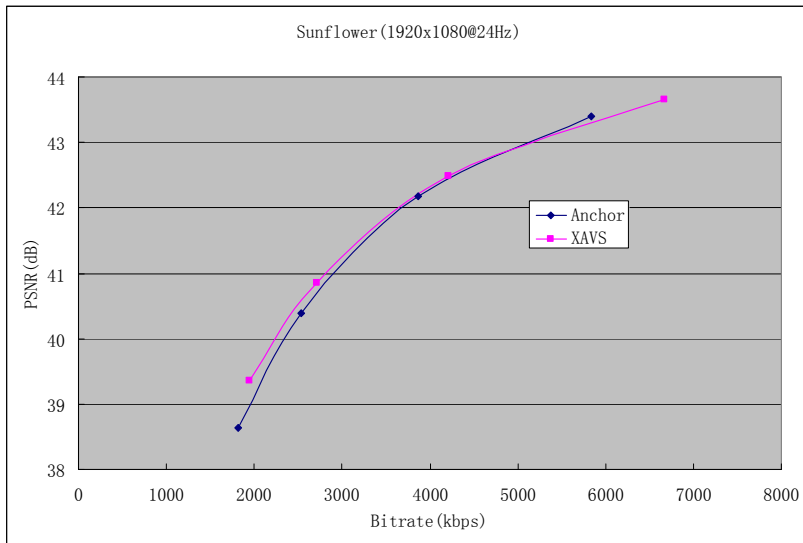
Resolution	Sequences	QP
720p	City	32, 35, 38, 41
	Crew	31, 34, 38, 42
	Harbour	38, 41, 45, 49
	Kimono	31, 35, 40, 44
1080P	Sunflower	25, 29, 34, 38
	Pedestrian_area	29, 32, 37, 42



XAVS Performance

Coding Efficiency

PSNR vs Bitrate (1080P)



For 1080P HD sequences, XAVS has almost the same even better coding efficiency

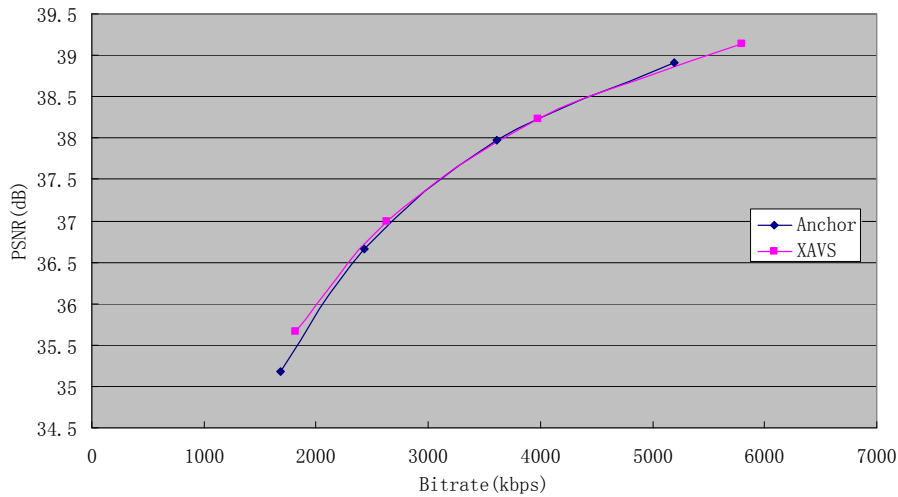


XAVS Performance

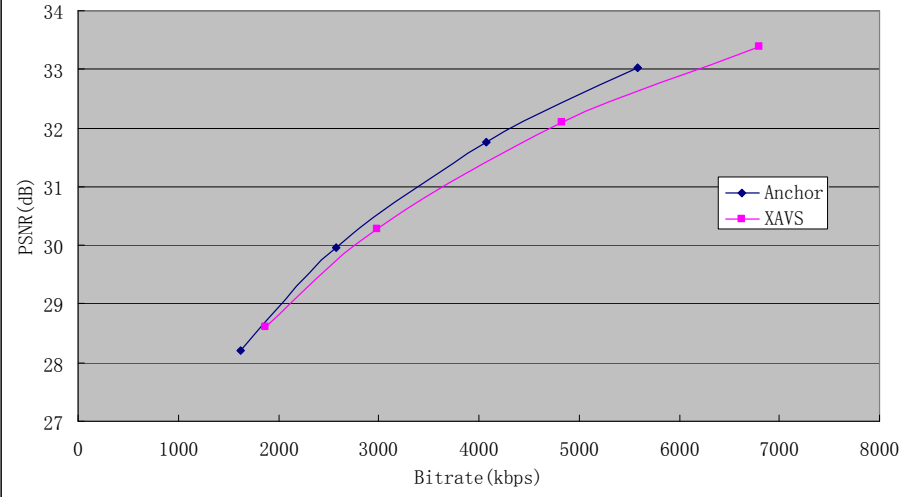
Coding Efficiency

PSNR vs. Bitrate (720P)

Crew (1280x720@60Hz)

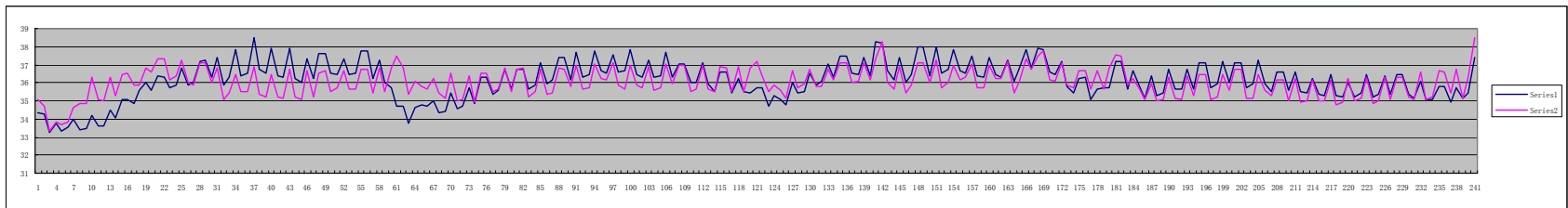


Harbour (1280x720@60Hz)



XAVS Performance

Rate Control (CBR)



- Accurate Rate Control Mechanism
- Better subjective visual quality
- Smooth PSNR and visual quality variation



XAVS Performance

Encoding Speed for fixed qp

Sequences	RM52 (fps)	XAVS (fps)	Speed Up (x)	Future Target (stage 1)
City	0.13	0.59	4x	10fps
Crew	0.15	0.66	4x	10fps
Harbour	0.10	0.49	4x	10fps
Kimono	0.05	0.15	3x	5fps
Sunflower	0.04	0.17	4x	5fps
Pedestrian_qrea	0.04	0.19	4x	5fps

Stage1 target has not been achieved by now.



Demo

XAVS Encoding Streams



Future Plan

1. Coding Speed

- Multithread Encoding
- Instruction Level Optimization

2. Coding Efficiency

- Rate Control algorithm
- Two Pass Rate Control algorithm
- Rate Distortion Optimization

3. Transcoding Support for Linux

- Support FFMPEG transcoding framework



How to join XAVS

XAVS Web Pages

<http://xavs.sourceforge.net/>

XAVS Mail list

If you want to subscribe to this mail list .

General information about the mailing list is at:

<https://lists.sourceforge.net/lists/listinfo/xavs-develop>

Call for volunteers with the following aspects

SIMD optimization modules

New Rate Control algorithms



Thank You!

