digital video. It is further appreciated that newer standards, such as HEVC, should allow for backward compatibility with existing standards.

[0005] As used herein, the term "coding standard" denotes compression (coding) and decompression (decoding) algorithms that may be both standard-based, open-source, or proprietary, such as the MPEG standards, Windows Media Video (WMV), flash video, VP8, and the like.

[0006] The approaches described in this section are approaches that could be pursued, but not necessarily approaches that have been previously conceived or pursued. Therefore, unless otherwise indicated, it should not be assumed that any of the approaches described in this section qualify as prior art merely by virtue of their inclusion in this section. Similarly, issues identified with respect to one or more approaches should not assume to have been recognized in any prior art on the basis of this section, unless otherwise indicated.

SUMMARY

[0006a] According to a first aspect of the present invention, there is provided a method for decoding a video stream by a decoder, the method comprising:

accessing a base layer picture;

receiving a picture cropping flag in the video stream indicating that offset cropping parameters are present; and

in response to receiving the picture cropping flag indicating that the offset cropping parameters are present:

accessing the offset cropping parameters;

cropping one or more regions of the base layer picture according to the accessed offset cropping parameters to generate a cropped reference picture; and

generating a reference picture for an enhancement layer according to the cropped reference picture.

[0006b] According to a second aspect of the present invention, there is provided a decoder for decoding a video stream, comprising:

one or more processors configured to:

access a base layer picture;

receive a picture cropping flag in the video stream indicating that offset cropping parameters are present; and

in response to receiving the picture cropping flag indicating that the offset cropping parameters are present:

access the offset cropping parameters;

crop one or more regions of the base layer picture according to the accessed offset cropping parameters to generate a cropped reference picture; and

generate a reference picture for an enhancement layer according to the cropped reference picture.

[0006c] According to a third aspect of the present invention, there is provided a computer-readable medium coupled to one or more processors having instructions stored thereon which, when executed by the one or more processors, cause the one or more processors to perform operations comprising:

accessing a base layer picture;

receiving a picture cropping flag in a video stream indicating that offset cropping parameters are present; and

in response to receiving the picture cropping flag indicating that the offset cropping parameters are present:

accessing the offset cropping parameters;

cropping one or more regions of the base layer picture according to the accessed offset cropping parameters to generate a cropped reference picture; and

generating a reference picture for an enhancement layer according to the cropped reference picture.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] An embodiment of the present invention is illustrated by way of example, and not in way by limitation, in the figures of the accompanying drawings and in which like reference numerals refer to similar elements and in which:

[0008] FIG. 1 depicts an example implementation of a coding system supporting coding-standard scalability according to an embodiment of this invention;

[0009] FIG. 2A and FIG. 2B depict example implementations of a coding system supporting AVC/H.264 and HEVC codec scalability according to an embodiment of this invention;

[0010] FIG. 3 depicts an example of layered coding with a cropping window according to an embodiment of this invention;

[0011] FIG. 4 depicts an example of inter-layer processing for interlaced pictures according to an embodiment of this invention;

[0012] FIG. 5A and FIG. 5B depict examples of inter-layer processing supporting coding-standard scalability according to an embodiment of this invention;

[0013] FIG. 6 depicts an example of RPU processing for signal encoding model scalability according to an embodiment of this invention;

[0014] FIG. 7 depicts an example encoding process according to an embodiment of this invention;

[0015] FIG. 8 depicts an example decoding process according to an embodiment of this invention; and

CLAIMS

1. A method for encoding an input progressive high resolution video signal (EL, EL1) in a coding-standard layered stream, the method comprising:

applying temporal and spatial down-sampling to the input signal for generating a progressive signal having a lower spatial resolution and frame rate [page 14, lines 29-31];

applying a progressive-to-deinterlacing technique to generate an interlaced signal (BL, EL0); [page 14, lines 31-33];

encoding the interlaced signal into a first coded stream using a first encoder (530; 540), the first encoder being compliant to a first coding standard;

in response to the interlaced signal and the progressive high resolution video signal, determining reference processing unit (RPU) processing parameters using a reference processing unit;

in response to the RPU processing parameters and the interlaced signal, generating an inter-layer reference signal using the RPU [previous claim 1, figures 5A & 5B], said generating an inter-layer reference signal comprising deinterlacing and upsampling the interlaced signal into a signal having the same spatial resolution as the progressive high resolution video signal [figures 5A & 5B];

encoding the progressive high resolution video signal using a second encoder into a second coded stream, the second encoder being compliant to a second coding standard, the encoding of the progressive high resolution video signal being based at least in part on the inter-layer reference signal [previous claim 1, page 15, lines 20-25, page 15, line 32 –page 16, line 2];

multiplexing the first and second coded streams into a coded scalable bitstream [figure 5B];

wherein determining the RPU processing parameters comprises resolving with the RPU one or more differences between the first and the second coding standard, wherein the differences are related to high-level syntax or coding tools, wherein the RPU resolves differences in the coding tools related to coding interlaced and progressive pictures [previous claims 3,8].

2. The method of claim 1, wherein said encoding by the second encoder comprises using interlayer processing to compress the progressive high resolution video signal using reference

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frames from both the deinterlaced and upsampled signal and the progressive high resolution video signal [page 15, lines 15-17].

3. The method of claim 1 or 2, wherein said applying a progressive-to-deinterlacing technique comprises using a complementary progressive to deinterlacing technique to generate a pair of complimentary interlaced signals;

said encoding the interlaced signal comprising using the first encoder to encode a first signal of said complimentary interlaced signals into said first coded stream and using the first encoder to encode a second signal of said complimentary interlaced signals into a third coded stream using interlayer processing to compress the second interlaced signal using reference frames from both the first and second interlaced signals;

said deinterlacing and upsampling the interlaced signal comprising producing a deinterlaced signal that is based on the first and third coded streams;

4. The method of any of the previous claims, wherein the first coding standard comprises encoding according to the H.264 standard and the second coding standard comprises encoding according to the HEVC standard.

5. The method of claim 1, wherein the RPU processing parameters comprise one or more parameters related to picture order count (POC), cropping windows, in-loop deblocking filter, sample adaptive offset (SAO), adaptive loop filter (ALF), interlaced and progressive scanning, or signal encoding model.

6. The method of claim 1, wherein the RPU processing parameters related to cropping window comprise a variable that indicates that one or more picture cropping offset parameters follow next, followed by the one or more picture cropping offset parameters.

7. The method of claim 1, wherein the RPU processing parameters related to the in-loop deblocking filter comprise a variable that indicates whether to perform no filtering, weak filtering, or strong filtering.

8. The method of claim 1, where the RPU resolves differences in the syntax of a picture order count (POC) variable and translates the syntax of the POC variable from a first value defined in the first coded stream to a second value compliant with the second coding standard.

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9. The method of claim 1, wherein the RPU resolves differences to the coding tools related to inner-loop deblocking filtering.

10. An apparatus comprising a processor and configured to perform the method recited in claim 1.

11. A non-transitory computer-readable storage medium having stored thereon computer-executable instructions for executing a method in accordance with claim 1.

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CLAIMS:

1. A method for decoding a video stream by a decoder, the method comprising:

accessing a base layer picture;

receiving a picture cropping flag in the video stream indicating that offset cropping parameters are present; and

in response to receiving the picture cropping flag indicating that the offset cropping parameters are present:

accessing the offset cropping parameters;

cropping one or more regions of the base layer picture according to the accessed offset cropping parameters to generate a cropped reference picture; and

generating a reference picture for an enhancement layer according to the cropped reference picture.

2. The method of claim 1,

wherein the base layer picture is in a first spatial resolution, and

wherein generating the reference picture comprises scaling the cropped reference picture from the first spatial resolution to a second spatial resolution such that the reference picture for the enhancement layer is in the second spatial resolution.

3. The method of claim 1, wherein the offset cropping parameters are updated on a frame-by-frame basis in the video stream.

4. The method of claim 1, further comprising detecting that the picture cropping flag is set to a predetermined value.

5. The method of claim 4, wherein the predetermine value is 1.

6. The method of claim 1, wherein the offset cropping parameters comprise a left offset, a right offset, a top offset, and a bottom offset.

7. A decoder for decoding a video stream, comprising:

one or more processors configured to:

access a base layer picture;

receive a picture cropping flag in the video stream indicating that offset cropping parameters are present; and

in response to receiving the picture cropping flag indicating that the offset cropping parameters are present:

access the offset cropping parameters;

crop one or more regions of the base layer picture according to the accessed offset cropping parameters to generate a cropped reference picture; and

generate a reference picture for an enhancement layer according to the cropped reference picture.

8. The decoder of claim 7,

wherein the base layer picture is in a first spatial resolution, and

wherein generating the reference picture comprises scaling the cropped reference picture from the first spatial resolution to a second spatial resolution such that the reference picture for the enhancement layer is in the second spatial resolution.

9. The decoder of claim 7, wherein the offset cropping parameters are updated on a frame-by-frame basis in the video stream.

10. The decoder of claim 7, further comprising detecting that the picture cropping flag is set to a predetermined value.

11. The decoder of claim 10, wherein the predetermine value is 1.

12. The decoder of claim 7, wherein the offset cropping parameters comprise a left offset, a right offset, a top offset, and a bottom offset.

13. A computer-readable medium coupled to one or more processors having instructions stored thereon which, when executed by the one or more processors, cause the one or more processors to perform operations comprising:

accessing a base layer picture;

receiving a picture cropping flag in a video stream indicating that offset cropping parameters are present; and

in response to receiving the picture cropping flag indicating that the offset cropping parameters are present:

accessing the offset cropping parameters;

cropping one or more regions of the base layer picture according to the accessed offset cropping parameters to generate a cropped reference picture; and

generating a reference picture for an enhancement layer according to the cropped reference picture.

14. The computer-readable medium of claim 13,

wherein the base layer picture is in a first spatial resolution, and

wherein generating the reference picture comprises scaling the cropped reference picture from the first spatial resolution to a second spatial resolution such that the reference picture for the enhancement layer is in the second spatial resolution.

15. The computer-readable medium of claim 13, wherein the offset cropping parameters are updated on a frame-by-frame basis in the video stream.

16. The computer-readable medium of claim 13, further comprising detecting that the picture cropping flag is set to a predetermined value.

17. The computer-readable medium of claim 16, wherein the predetermine value is 1.

18. The computer-readable medium of claim 13, wherein the offset cropping parameters comprise a left offset, a right offset, a top offset, and a bottom offset.