A METHOD, AN APPARATUS AND A COMPUTER PROGRAM PRODUCT FOR ENCODING AND DECODING OF DIGITAL MEDIA CONTENT

Technical Field

The present solution generally relates to encoding and decoding of digital media content, such as video or still image data.

Background

This section is intended to provide a background or context to the invention that is recited in the claims. The description herein may include concepts that could be pursued but are not necessarily ones that have been previously conceived or pursued. Therefore, unless otherwise indicated herein, what is described in this section is not prior art to the description and claims in this application and is not admitted to be prior art by inclusion in this section.

A video coding system may comprise an encoder that transforms an input video into a compressed representation suited for storage/transmission and a decoder that can uncompress the compressed video representation back into a viewable form. The encoder may discard some information in the original video sequence in order to represent the video in a more compact form, for example, to enable the storage/transmission of the video information at a lower bitrate than otherwise might be needed.

Summary

The scope of protection sought for various embodiments of the invention is set out by the independent claims. The embodiments and features, if any, described in this specification that do not fall under the scope of the independent claims are to be interpreted as examples useful for understanding various embodiments of the invention.

Various aspects include a method, an apparatus and a computer readable medium comprising a computer program stored therein, which are

characterized by what is stated in the following aspects. Various examples are disclosed in the present disclosure.

According to a first aspect, there is provided an apparatus comprising means for encoding/decoding a picture comprising a number of samples, wherein a phase of the encoding/decoding comprises a division operation; means for determining a numerator and a denominator; means for determining an approximated output for the division operation between the numerator and the denominator, wherein the means for determining comprises

- means for deriving a scale parameter using a piecewise approximation,
- means for deriving a shift parameter and a rounding parameter, and
- means for applying the scale parameter, the shift parameter, and the rounding parameter to the numerator;

means for using the approximated output for the division operation in said phase of the encoding/decoding.

According to a second aspect, there is provided a method, comprising: encoding/decoding a picture comprising a number of samples, wherein a phase of the encoding/decoding comprises a division operation; determining a numerator and a denominator; determining an approximated output for the division operation between the numerator and the denominator, wherein the determining comprises

- deriving a scale parameter using a piecewise approximation,
- deriving a shift parameter and a rounding parameter, and
- applying the scale parameter, the shift parameter, and the rounding parameter to the numerator;

using the approximated output for the division operation in said phase of the encoding/decoding.

According to a third aspect, there is provided a computer program comprising instructions stored thereon for performing at least the following: encoding/decoding

a picture comprising a number of samples, wherein a phase of the encoding/decoding comprises a division operation; determining a numerator and a denominator; determining an approximated output for the division operation between the numerator and the denominator, wherein determining comprises:

- deriving a scale parameter using a piecewise approximation,
- deriving a shift parameter and a rounding parameter, and

- applying the scale parameter, the shift parameter, and the rounding parameter to the numerator;

using the approximated output for the division operation in said phase of the encoding/decoding.

According to an example, there is provided computer program product comprising computer program code configured to, when executed on at least one processor, cause an apparatus or a system to:

encode/decode a picture comprising a number of samples, wherein a phase of the encoding/decoding comprises a division operation; determine a numerator and a denominator; determine an approximated output for the division operation between the numerator and the denominator, wherein the apparatus is further caused to

- derive a scale parameter using a piecewise approximation,
- derive a shift parameter and a rounding parameter, and
- apply the scale parameter, the shift parameter, and the rounding parameter to the numerator;

use the approximated output for the division operation in said phase of the encoding/decoding.

According to an example, said phase of the encoding/decoding comprises predicting at least one sample of the picture.

According to an example, said phase of the encoding/decoding comprises filtering.

According to an example, an additional shift parameter is applied to the numerator.

According to an example, it is determined when the numerator, denominator, scale parameter and output parameter have different bit precision, whereupon the bit precision of the output and the scale parameter are used when determining the approximated output.

According to an example, the scale parameter is determined using one of the following: an interpolation operation; a polynomial process; a linear interpolation.

According to an example, the scale parameter is determined using the interpolation operation between at least two values which are determined based on a table look-up.

According to the example, the scale parameter is adjusted with a value to reduce a range of the denominator.

According to an example, the computer program product is embodied on a non-transitory computer readable medium.

Description of the Drawings

In the following, various embodiments will be described in more detail with reference to the appended drawings, in which

Fig. 1 shows an example of an encoding process;

Fig. 2 shows an example of a decoding process;

Fig. 3 shows an example of a look-up table with values M=14 and N=8;

Fig. 4 shows an example of a look-up table with values M=12 and N=8;

Fig. 5 shows an example of a look-up table with values M=14 and N=6;

Fig. 6 shows an example of a look-up table with values M=14 and N=2;

Figs. 7a, 7b show an example of a linear regression model calculated for values M=14 and N=2;

Fig. 8 is a flowchart illustrating a method according to an embodiment;

Fig. 9 is a flowchart illustrating a method according to another embodiment; and

Fig. 10 shows an apparatus according to an embodiment.

Description of Example Embodiments

In the following, several embodiments will be described in the context of one video coding arrangement. It is to be noted, however, that the present embodiments are not necessarily limited to this particular arrangement. The embodiments discussed in this

Claims:

1. An apparatus, comprising
   - means for encoding/decoding a picture comprising a number of samples, wherein a phase of the encoding/decoding comprises a division operation;
   - means for determining a numerator and a denominator;
   - means for determining an approximated output for the division operation between the numerator and the denominator, wherein the means for determining comprises:
     - means for deriving a scale parameter using a piecewise approximation,
     - means for deriving a shift parameter and a rounding parameter, and
     - means for applying the scale parameter, the shift parameter, and the rounding parameter to the numerator;
   - means for using the approximated output for the division operation in said phase of the encoding/decoding.

2. The apparatus according to claim 1, wherein said phase of the encoding/decoding comprises predicting at least one sample of the picture.

3. The apparatus according to claim 1, wherein said phase of the encoding/decoding comprises filtering.

4. The apparatus according to claim 1 or 2 or 3, further comprising means for applying an additional shift parameter to the numerator.

5. The apparatus according to any of the claims 1 to 4, further comprising means for determining when the numerator, denominator, scale parameter and output parameter have different bit precision, whereupon the bit precision of the output and the scale parameter are used when determining the approximated output.

6. The apparatus according to any of the claims 1 to 5, further comprising means for determining the scale parameter using one of the following: an interpolation operation; a polynomial process; a linear interpolation.

7. The apparatus according to claim 6, further comprising means for determining the scale parameter using the interpolation operation between at least two values which are determined based on a table look-up.

8. The apparatus according to claim 7, further comprising means for adjusting the scale parameter with a value to reduce a range of the denominator.

9. A method, comprising
- encoding/decoding a picture comprising a number of samples, wherein a phase of the encoding/decoding comprises a division operation;
- determining a numerator and a denominator;
- determining an approximated output for the division operation between the numerator and the denominator, wherein the determining comprises:
    - deriving a scale parameter using a piecewise approximation,
    - deriving a shift parameter and a rounding parameter, and
    - applying the scale parameter, the shift parameter, and the rounding parameter to the numerator;
- using the approximated output for the division operation in said phase of the encoding/decoding.

10. The method according to claim 9, wherein said phase of the encoding/decoding comprises predicting at least one sample of the picture.

11. The method according to claim 9 or 10, wherein said phase of the encoding/decoding comprises filtering.

12. The method according to any of the claims 9 to 11, further comprising determining when the numerator, denominator, scale parameter and

output parameter have different bit precision, whereupon the bit precision of the output and the scale parameter are used when determining the approximated output.

13. The method according to any of the claims 9 to 12, further comprising determining the scale parameter using one of the following: an interpolation operation; a polynomial process; a linear interpolation.

14. The method according to claim 13, further comprising determining the scale parameter using the interpolation operation between at least two values which are determined based on a table look-up.

15. A computer program comprising instructions stored thereon for performing at least the following:

- encoding/decoding a picture comprising a number of samples, wherein a phase of the encoding/decoding comprises a division operation;
- determining a numerator and a denominator;
- determining an approximated output for the division operation between the numerator and the denominator, wherein determining comprises:
    - deriving a scale parameter using a piecewise approximation,
    - deriving a shift parameter and a rounding parameter, and
    - applying the scale parameter, the shift parameter, and the rounding parameter to the numerator;
- using the approximated output for the division operation in said phase of the encoding/decoding.