SCANNING ORDERS FOR NON-TRANSFORM CODING

RELATED APPLICATIONS

This application is a continuation application of U.S. patent application Ser. No. 16/210,839, filed Dec. 5, 2018, which is a continuation application of U.S. patent application Ser. No. 14/906,513, filed on Jan. 20, 2016, which is a 371 National Stage Application of International Application No. PCT/CN2013/079964, filed Jul. 24, 2013, and published as WO 2015/010268 on Jan. 29, 2015, the entire contents of which are incorporated herein by reference.

BACKGROUND

[0001] Video compression techniques are utilized to efficiently delivery and store video content. These techniques generally seek to reduce the amount of data that represents the video content. In one example, a video frame is divided into blocks of pixels (e.g., coding units) that are subjected to various coding techniques, such as prediction, transform, quantization, and entropy coding. During coding of a block of pixels, a scanning process may be performed on a two-dimensional array of data associated with the block (e.g., transform coefficients) to rearrange the data into a one-dimensional array that is subjected to entropy coding. The scanning process may be performed according to a particular order (e.g., horizontal, zig-zag, vertical, etc.) to arrange particular data (e.g., non-zero coefficients) at one end of the one-dimensional array.

SUMMARY

[0002] This disclosure is directed to coding non-transform blocks of video content according to an optimum scanning order. In some implementations, an encoder or decoder may perform a scanning process during coding to change a two-dimensional array of data associated with a block of pixels into a one-dimensional array of data, or vice-versa. The scanning process may be performed according to an order (e.g., horizontal, vertical, zig-zag, etc.) to rearrange the data for entropy coding. When a coding block that has been transformed is to be coded, the encoder or decoder may

CLAIMS

WHAT IS CLAIMED IS:

1. A method implemented by a computing device, the method comprising:

identifying a first transform block, the first transform block being associated with a transform coding mode and having an associated size and an associated prediction mode;

identifying a second transform block that is associated with a non-transform coding mode, the second transform block being part of a same image as the first transform block and having the same associated size and the same associated prediction mode as the first transform block;

determining whether to scan the second transform block according to a scanning order inverse to a scanning order for scanning the first transform block, the determining comprising :

when the prediction mode is an intra-prediction mode and the size is equal to a predetermined size, the second transform block is scanned according to the inverse scanning order; and

otherwise, the second transform block is scanned according to the scanning order for scanning the first transform block; and

scanning the second transform block according to the inverse scanning order, based at least in part on determining that the prediction mode is the intra-prediction mode and the size of the second transform block is equal to the predetermined size.

2. The method of claim 1, wherein the scanning order for scanning the first transform block comprises a default scanning order for transform blocks that are associated with at least one of the prediction mode of the first transform block or the size of the first transform block.

3. The method of claim 1, wherein, when the first scanning order is a horizontal scanning order, the inverse scanning order is an inverse horizontal scanning order.

4. The method of claim 1, wherein, the first scanning order is a vertical scanning order, the inverse scanning order is an inverse vertical scanning order.

5. The method of claim 1, wherein, when the first scanning order is a diagonal scanning order, the inverse scanning order is an inverse diagonal scanning order.

6. The method of claim 1, further comprising :

identifying a third transform block having the same associated prediction mode as the first transform block; and

scanning the third transform block according to the scanning order for scanning the first transform block based at least in part on determining that the prediction mode for the third transform block is an intra-prediction mode and a size of the third transform block is different than the predetermined size.

7. The method of claim 1, wherein when the predetermined size is 4x4.

8. The method of claim 1, wherein the first transform block and the second transform block are part of a same coding unit (CU).

9. The method of claim 1, wherein the first transform block and the second transform block are coded according to the High Efficiency Video Coding (HEVC) standard.

10. The method of claim 1, wherein the first transform block and the second transform block are luma transform blocks.

11. The method of claim 1, wherein scanning the second transform block according to the inverse scanning order comprises :

scanning an array of residual information of the second transform block according to the inverse scanning order.

12. A system comprising:

one or more processors; and

a decoder implemented at least in part by the one or more processors and configured to perform decoding operations to decode a bitstream, the operations comprising :

identifying a first transform block, the first transform block being associated with a transform coding mode and having an associated size and an associated prediction mode;

identifying a second transform block that is associated with a non-transform coding mode, the second transform block being part of a same image as the first transform block and having the same associated size and the same associated prediction mode as the first transform block;

determining whether to scan the second transform block, according to a scanning order inverse to a scanning order for scanning the first transform block, the determining comprising:

when the prediction mode is an intra-prediction mode and the size is equal to a predetermined size, the second transform block is scanned according to the inverse scanning order; and

otherwise, the second transform block is scanned according to the scanning order for scanning the first transform block; and

scanning the second transform block according to the inverse scanning order, based at least in part on determining that the prediction mode is the intra prediction mode and the size of the second transform block is equal to the predetermined size.

13. The system of claim 12, wherein, when the fist scanning order is a horizontal scanning order, the inverse scanning order is an inverse horizontal scanning order.

14. The system of claim 12, wherein, when the fist scanning order is a vertical scanning order, the inverse scanning order is an inverse vertical scanning order.

15. The system of claim 12, wherein, when the fist scanning order is a diagonal scanning order, the inverse scanning order is an inverse diagonal scanning order.

16. The system of claim 12, wherein when the predetermined size is 4x4.

17. The system of claim 12, wherein the first transform block and the second transform block are part of a same coding unit (CU).

18. One or more computer-readable storage media storing a bitstream organized to facilitate decoding operations by a video decoder, the operations comprising:

identifying a first transform block, the first transform block being associated with a transform coding mode, wherein the first transform block is a 4x4 intra predicted block ;

based at least in part on determining that the first transform block is a 4x4 intra predicted block that is associated with the transform coding mode, scanning the first transform block according to a scanning order for scanning the first transform block ;

identifying a second transform block that is associated with a non-transform coding mode, wherein the second transform block is a 4x4 intra predicted block and is part of a same image as the first transform block;

based at least in part on determining that the second transform block is a 4x4 intra predicted block that is associated with the non-transform coding mode, scanning the second transform block according to an inverse scanning order, wherein the inverse scanning order is inverse to the scanning order for scanning the first transform block.

19. The one or more computer readable storage media of claim 18, wherein the first transform block and the second transform block are luma transform blocks.

20. The one or more computer readable storage media of claim 18, wherein the first transform block and the second transform block are part of a same coding unit (CU).