

CLAIMS

1. A method of processing video data, comprising:

determining, for a conversion between a picture of a video comprising one or more coding tree blocks and a bitstream of the video, that a first set of samples for a current sample of a current coding tree block is unavailable in a first filtering process based on that the first set of samples are located in a different video region of the picture from the current sample and it is disallowed to use samples across video regions in the first filtering process;

applying a padding process for the first set of samples, wherein values of the first set of samples are padded from a second set of samples which are nearest available samples located within a same video region with the current sample, and wherein positions of the second set of samples are determined based on:

clipping vertical coordinates of each of the first set of samples to obtain nearest positions whose horizontal coordinates are same with that of the first set of samples and vertical coordinates are located within the same video region with the current sample; and

selectively clipping horizontal coordinates of each of the first set of samples to obtain nearest positions whose vertical coordinates are same with that of the first set of samples and horizontal coordinates are located within the same video region with the current sample; and

performing the conversion by applying the first filtering process based on the values of the first set of samples padded from the second set of samples, wherein the first filtering process comprises:

determining a filtering coefficient set for the current sample;

determining a clipping value set for the current sample; and

applying a filter on the current sample based on the filtering coefficient set and the clipping value set.

2. The method of claim 1, wherein a classification operation is utilized to determine the filtering coefficient set, and wherein the values of the first set of samples padded from the second set of samples are used to determine a classification filter index in the classification operation.

3. The method of claim 1 or 2, wherein the values of the first set of samples padded from the second set of samples are used in the filter of the first filtering process.
4. The method of any one of claims 1-3, wherein the video region comprises at least one of: a slice, a tile, or a sub-picture.
5. The method of claim 4, wherein the padding process is applied in a uniform manner in case the current coding tree block coincides with at least one type of boundary of the video region, and wherein in the uniform manner, if one of the first set of samples is outside the boundary, it is copied from an available sample inside the video region where the current sample located in.
6. The method of any one of claims 1-5, wherein the padding process is invoked only once for the first filtering process.
7. The method of any one of claims 1-6, wherein the method further comprises determining whether a virtual boundary is enabled for the current coding tree block based on a relationship between a bottom boundary of the current coding tree block and a bottom boundary of the picture.
8. The method of claim 7, wherein the virtual boundary is enabled in case the bottom boundary of the current coding tree block is not the bottom boundary of the picture.
9. The method of any one of claims 1-8, wherein the conversion includes encoding the video into the bitstream.
10. The method of any one of claims 1-8, wherein the conversion includes decoding the bitstream into the video.
11. An apparatus for processing video data comprising a processor and a non-transitory memory with instructions thereon, wherein the instructions upon execution by the processor, cause the processor to:

determine, for a conversion between a picture of a video comprising one or more coding tree blocks and a bitstream of the video, that a first set of samples for a current sample of a current coding tree block is unavailable in a first filtering process based on that the first set of samples are located in a different video region of the picture from the current sample and it is disallowed to use samples across video regions in the first filtering process;

apply a padding process for the first set of samples, wherein values of the first set of samples are padded from a second set of samples which are nearest available samples located within a same video region with the current sample, and wherein positions of the second set of samples are determined based on:

clipping vertical coordinates of each of the first set of samples to obtain nearest positions whose horizontal coordinates are same with that of the first set of samples and vertical coordinates are located within the same video region with the current sample; and

selectively clipping horizontal coordinates of each of the first set of samples to obtain nearest positions whose vertical coordinates are same with that of the first set of samples and horizontal coordinates are located within the same video region with the current sample; and

perform the conversion by applying the first filtering process based on the values of the first set of samples padded from the second set of samples, wherein the first filtering process comprises:

determining a filtering coefficient set for the current sample;

determining a clipping value set for the current sample; and

applying a filter on the current sample based on the filtering coefficient set and the clipping value set.

12. The apparatus of claim 11, wherein a classification operation is utilized to determine the filtering coefficient set, and wherein the values of the first set of samples padded from the second set of samples are used to determine a classification filter index in the classification operation; and

wherein the values of the first set of samples padded from the second set of samples are used in the filter of the first filtering process.

13. The apparatus of claim 11 or 12, wherein the video region comprises at least one of: a slice, a tile, or a sub-picture; and

wherein the padding process is applied in a uniform manner in case the current coding tree block coincides with at least one type of boundary of the video region, and wherein in the uniform manner, if one of the first set of samples is outside the boundary, it is copied from an available sample inside the video region where the current sample located in.

14. The apparatus of any one of claims 11-13, wherein the padding process is invoked only once for the first filtering process;

wherein the method further comprises determining whether a virtual boundary is enabled for the current coding tree block based on a relationship between a bottom boundary of the current coding tree block and a bottom boundary of the picture; and

wherein the virtual boundary is enabled in case the bottom boundary of the current coding tree block is not the bottom boundary of the picture.

15. A non-transitory computer-readable storage medium storing instructions that cause a processor to:

determine, for a conversion between a picture of a video comprising one or more coding tree blocks and a bitstream of the video, that a first set of samples for a current sample of a current coding tree block is unavailable in a first filtering process based on that the first set of samples are located in a different video region of the picture from the current sample and it is disallowed to use samples across video regions in the first filtering process;

apply a padding process for the first set of samples, wherein values of the first set of samples are padded from a second set of samples which are nearest available samples located within a same video region with the current sample, and wherein positions of the second set of samples are determined based on:

clipping vertical coordinates of each of the first set of samples to obtain nearest positions whose horizontal coordinates are same with that of the first set of samples and vertical coordinates are located within the same video region with the current sample; and

selectively clipping horizontal coordinates of each of the first set of samples to obtain nearest positions whose vertical coordinates are same with that of the first set of samples and horizontal coordinates are located within the same video region with the current sample; and

perform the conversion by applying the first filtering process based on the values of the first set of samples padded from the second set of samples, wherein the first filtering process comprises:

determining a filtering coefficient set for the current sample;

determining a clipping value set for the current sample; and

applying a filter on the current sample based on the filtering coefficient set and the clipping value set.

16. The non-transitory computer-readable storage medium of claim 15, wherein a classification operation is utilized to determine the filtering coefficient set, and wherein the values of the first set of samples padded from the second set of samples are used to determine a classification filter index in the classification operation; and

wherein the values of the first set of samples padded from the second set of samples are used in the filter of the first filtering process;

wherein the video region comprises at least one of: a slice, a tile, or a sub-picture; and

wherein the padding process is applied in a uniform manner in case the current coding tree block coincides with at least one type of boundary of the video region, and wherein in the uniform manner, if one of the first set of samples is outside the boundary, it is copied from an available sample inside the video region where the current sample located in.

17. The non-transitory computer-readable storage medium of claim 15 or 16, wherein the padding process is invoked only once for the first filtering process;

wherein the process is further caused to determine whether a virtual boundary is enabled for the current coding tree block based on a relationship between a bottom boundary of the current coding tree block and a bottom boundary of the picture; and

wherein the virtual boundary is enabled in case the bottom boundary of the current coding tree block is not the bottom boundary of the picture.

18. A non-transitory computer-readable recording medium storing a bitstream of a video which is generated by a method performed by a video processing apparatus, wherein the method comprises:

- determining, for a picture of a video comprising one or more coding tree blocks, that a first set of samples for a current sample of a current coding tree block is unavailable in a first filtering process based on that the first set of samples are located in a different video region of the picture from the current sample and it is disallowed to use samples across video regions in the first filtering process;

- applying a padding process for the first set of samples, wherein values of the first set of samples are padded from a second set of samples which are nearest available samples located within a same video region with the current sample, and wherein positions of the second set of samples are determined based on:

 - clipping vertical coordinates of each of the first set of samples to obtain nearest positions whose horizontal coordinates are same with that of the first set of samples and vertical coordinates are located within the same video region with the current sample; and

 - selectively clipping horizontal coordinates of each of the first set of samples to obtain nearest positions whose vertical coordinates are same with that of the first set of samples and horizontal coordinates are located within the same video region with the current sample; and

- generating the bitstream by applying the first filtering process based on the values of the first set of samples padded from the second set of samples, wherein the first filtering process comprises:

 - determining a filtering coefficient set for the current sample;

 - determining a clipping value set for the current sample; and

 - applying a filter on the current sample based on the filtering coefficient set and the clipping value set.

19. The non-transitory computer-readable storage medium of claim 18, wherein a classification operation is utilized to determine the filtering coefficient set, and wherein the values of the first set of samples padded from the second set of samples are used to determine a classification filter index in the classification operation; and

wherein the values of the first set of samples padded from the second set of samples are used in the filter of the first filtering process;

wherein the video region comprises at least one of: a slice, a tile, or a sub-picture; and

wherein the padding process is applied in a uniform manner in case the current coding tree block coincides with at least one type of boundary of the video region, and wherein in the uniform manner, if one of the first set of samples is outside the boundary, it is copied from an available sample inside the video region where the current sample located in.

20. The non-transitory computer-readable storage medium of claim 18 or 19, wherein the padding process is invoked only once for the first filtering process;

wherein the method further comprises determining whether a virtual boundary is enabled for the current coding tree block based on a relationship between a bottom boundary of the current coding tree block and a bottom boundary of the picture; and

wherein the virtual boundary is enabled in case the bottom boundary of the current coding tree block is not the bottom boundary of the picture.