CLAIMS

1. A video coder for predictive coding a video stream of subsequent frames according to motion compensation into an encoded video bit stream, comprising:

- a frame buffer configured to store at least one reference frame of the video stream,

- a prediction unit configured to generate a prediction block of a current block of a current frame from a reference block of the reference frame according to a motion vector having fractional-pel resolution,

wherein the prediction unit is configured to interpolate the reference block according to the fractional-pel resolution via one of the at least three following interpolation filters:

- a blurring interpolation filter,

- a tap filter, and

- the tap filter followed by a sharpening filter

wherein the sharpening filter is a non-linear filter and the non-linear filter is used for processing a motion interpolation result generated by the tap filter.

2. The video coder according to claim 1, wherein the sharpening filter is an adaptive filter configured to be controlled by at least one adaptive parameter, wherein the adaptive parameter includes a sharpening strength coefficient.

3. The video coder according to claim 2, wherein the sharpening filter is configured to be controlled by a single adaptive parameter.

4. The video coder according to any of the preceding claims, wherein the adaptive sharpening filter comprises:

- an edge map calculation unit adapted to generate an edge map of a source block, said source block being the reference block or the prediction block,

- a blurring filter adapted to blur the edge map of the source block,

- a high-pass filter adapted to generate, by high-pass filtering the blurred edge map, a derivative vector for each position of the source block,

- a scaling unit adapted to generate a displacement vector by scaling the derivative vector with a sharpening strength coefficient, and

- a warping unit adapted to warp the prediction block based on the displacement vector.

5. The video coder according to claim 4, wherein the prediction unit is configured to select the sharpening strength coefficient that minimizes a residual block, said residual block being the difference between the current block and the prediction block outputted by the adaptive sharpening filter, or based on a cost criterion like, for example, a rate distortion optimization.

6. The video coder according to any of the preceding claims 2 to 5, wherein the blurring interpolation filter comprises a single adaptive parameter.

7. The video coder according to claim 6, wherein the adaptive parameter of the blurring interpolation filter includes a blurring coefficient.

8. The video coder according to claim 7, wherein the blurring interpolation filter is a Gaussian filter or a bi-linear filter, and if the blurring interpolation filter is a Gaussian filter, the blurring coefficient is the standard deviation of the Gaussian distribution.

9. The video coder according to claim 8, wherein the blurring interpolation filter comprises:

- a calculation unit configured to calculate Gaussian filter coefficients based on the standard deviation,
- a filtering unit configured to generate, as an output of the blurring interpolation filter, a prediction block by using the calculated Gaussian filter coefficients.

10. The video coder according to claim 8 comprises:

- a unit configured to store pre-calculated set of Gaussian filters coefficients based on different standard deviations,
- a filtering unit configured to generate, as an output of the blurring interpolation filter, a prediction block by using one of the pre-calculated set of Gaussian filters.

11. The video coder according to any of the claims 7 to 10, wherein the prediction unit is configured to select the blurring coefficient that minimizes a residual block, said residual block being the difference between the current block and the prediction block outputted by the blurring interpolation filter, or based on a cost criterion like, for example, a rate distortion optimization.

12. The video coder according to any of the preceding claims, wherein the tap filter is a fixed long tap filter with sharp step response.

13. The video coder according to any of the preceding claims 2 to 12, wherein an integer-pel position and each of fractional-pel positions are associated with said one of the at least three interpolation filters and/or, if present, with given value of the adaptive parameter of the sharpening filter and/or of the blurring interpolation filter.

14. The video coder according to claim 13, comprising an encoding unit configured to generate the encoded video bit stream, and to specify, as signalling information in the encoded video bit stream, interpolation filter type and said given value of the adaptive parameter and the associated integer-pel position or fractional-pel position.

15. The video coder according to claims 1 to 12, wherein the choice of the interpolation filter among the three interpolation filters depends on an integer-pel position or a fractional-pel position, so that a given integer-pel position or fractional-pel position implies the choice of a given interpolation filter and choice of adaptive parameters if any.

16. The video coder according to any of the preceding claims 2 to 12, comprising at least one interpolation filter pattern defining, for each one of an integer-pel position and of fractional-pel positions, the associated interpolation filter type and/or, if present, the value of the adaptive parameter.

17. The video coder according to any of the preceding claims 2 to 12, comprising a plurality of interpolation filter patterns, wherein the prediction unit is configured to select one of the plurality of interpolation filter patterns, wherein the interpolation filter

pattern defines, for each one of an integer-pel position and a fractional-pel position, the associated interpolation filter type and/or, if present, the value of the adaptive parameter.

18. The video coder according to claim 16 or 17, comprising an encoding unit configured to generate the encoded video bit stream and to add, as signalling information in the encoded video bit stream, said interpolation filter pattern(s).

19. The video coder according to any of the claims 16 to 18, wherein, in case a plurality of interpolation filter patterns is provided, the encoding unit is configured to add, as signalling information in the encoded video bit stream, selection information about the interpolation filter pattern to be selected.

20. The video coder according to any of the claims 16 to 19, wherein the encoding unit is configured to add the signalling information about the interpolation filter pattern to be selected for each prediction block, for an arbitrary or regular region of the frame, at a frame level, at a GOP (group of pictures) level, at a PPS (picture parameter set) level or at an SPS (sequence parameter set) level.

21. A method for predictive coding a video stream of subsequent frames according to motion compensation into an encoded video bit stream, comprising:

- storing at least one reference frame of the video stream,
- a prediction step comprising generating a prediction block of a current block of a current frame from a reference block of the reference frame according to a motion vector having fractional-pel resolution,

wherein the prediction step further comprises interpolating the reference block according to the fractional-pel resolution via one of the at least following three interpolation filters:

- a blurring interpolation filter,
- a tap filter, and
- the tap filter followed by a sharpening filter,

wherein the sharpening filter is a non-linear filter and the non-linear filter is used for processing a motion interpolation result generated by the tap filter.

22. A video decoder for decoding an encoded video bit stream obtained by predictive coding a video stream of subsequent frames according to motion compensation, comprising:

- a frame buffer configured to store at least one reference frame obtained from the encoded video bit stream,

- a prediction unit configured to generate a prediction block of a current block of a current frame from a reference block of the reference frame according to a motion vector having fractional-pel resolution,

wherein the prediction unit is configured to interpolate the reference block according to the fractional-pel resolution via one of the at least three following interpolation filters:

- a blurring interpolation filter,

- a tap filter, and

- the tap filter followed by a sharpening filter,

wherein the sharpening filter is a non-linear filter and the non-linear filter is used for processing a motion interpolation result generated by the tap filter.

23. The video decoder according to claim 22, wherein the sharpening filter is an adaptive filter configured to be controlled by at least one adaptive parameter, and the adaptive parameter includes a sharpening strength coefficient.

24. The video decoder according to claim 22 or 23, wherein the choice of the interpolation filter among the three interpolation filters depends on an integer-pel position or a fractional-pel position, so that a given integer-pel position or fractional-pel position implies the choice of a given interpolation filter and/or, if present, the value of the adaptive parameter.

25. The video decoder according to any of the claims 22 to 24, wherein the prediction unit is configured to choose the one of the three interpolation filters according to an interpolation filter pattern, and

wherein said interpolation filter pattern defines, for an integer position of the motion vector and its associated fractional positions, the associated interpolation filter type and/or, if present, the value of the adaptive parameter.

26. The video decoder according to claim 25, comprising a decoding unit configured to obtain from the encoded video bit stream, as signalling information, the interpolation filter pattern.

27. The video decoder according to claim 25, comprising a decoding unit configured to obtain from the encoded video bit stream, as signalling information, a plurality of interpolation filter patterns as well as selection information about the interpolation filter pattern to be selected,

wherein the prediction unit is configured to select one of the obtained interpolation filter patterns according to the obtained selection information, and to choose the one of the three interpolation filters according to the selected interpolation filter pattern.

28. The video decoder according to claim 25,

wherein the prediction unit is configured to pre-store a plurality of interpolation filter patterns before the video decoder receives the encoded video bit stream,

the video decoder further comprising a decoding unit configured to obtain from the encoded video bit stream, as signalling information, selection information about the pre-stored interpolation filter pattern to be selected,

wherein the prediction unit is configured to select one of the pre-stored interpolation filter patterns according to the obtained selection information, and to choose the one of the three interpolation filters according to the selected interpolation filter pattern.

29. The video decoder according to any of the claims 26 to 28, wherein the decoding unit is configured to obtain the signalling information about the interpolation filter pattern to be selected for each prediction block, for an arbitrary or regular region of the frame, at a frame level, at a GOP (group of pictures) level, at a PPS (picture parameter set) level or at an SPS (sequence parameter set) level.

30. A method for decoding an encoded video bit stream obtained by predictive coding a video stream of subsequent frames according to motion compensation, comprising:

- storing at least one reference frame obtained from the encoded video bit stream,

- a prediction step comprising generating a prediction block of a current block of a current frame from a reference block of the reference frame according to a motion vector having fractional-pel resolution,

wherein the prediction step further comprises interpolating the reference block according to the fractional-pel resolution via one of the at least following three interpolation filters:

- a blurring interpolation filter,

- a tap filter, and

- the tap filter followed by a sharpening filter,

wherein the sharpening filter is a non-linear filter and the non-linear filter is used for processing a motion interpolation result generated by the tap filter.

31. A computer program having a program code for performing the method according to claim 21 or 20, when the computer program runs on a computing device.