Amended Set of Claims 1 to 45

1. A method of predicting video signals, comprising:

obtaining a block of pixels, wherein the block of pixels includes integer pixel values corresponding to integer pixel positions within the block of pixels;

computing a first sub-pixel value for a first sub-pixel position of the block of pixels, wherein computing the first sub-pixel value comprises applying a first interpolation filter defining a first one-dimensional array of filter coefficients corresponding to filter support positions;

computing a second sub-pixel value for a second sub-pixel position of the block of pixels, wherein computing the second sub-pixel value comprises applying a second interpolation filter defining a second one-dimensional array of filter coefficients corresponding to horizontal filter support positions and applying a third interpolation filter defining a third one-dimensional array of filter coefficients corresponding to vertical filter support positions, wherein:

the first one-dimensional array comprises more filter coefficients than the second one-dimensional array;

the first one-dimensional array comprises more filter coefficients than the third one-dimensional array; and

generating a prediction block based on at least the first sub-pixel value and the second sub-pixel value.

2. The method of claim 1, wherein:

the first interpolation filter comprises an 8-tap filter;

the second interpolation filter comprises a 6-tap filter; and,

the third interpolation filter comprises a 6-tap filter.

3. The method of claim 1, wherein the filter support positions for the first interpolation filter correspond to a set of integer pixel positions.

4. The method of claim 1, wherein the first sub-pixel position is on either a common vertical axis with integer pixel positions or a common horizontal axis with integer pixel positions.

5. The method of claim 1, wherein the second sub-pixel position is not on a common vertical axis with integer pixel positions and not on a common horizontal axis with integer pixel positions.

6. The method of claim 1, wherein the method forms part of a video encoding process, the method further comprises:

encoding signaling bits, wherein the signaling bits identify a particular interpolation filter to be used for a sub-pixel position.

7. The method of claim 6, wherein the signaling bits separately identify the second interpolation filter and the third interpolation filter.

8. The method of claim 6, wherein the signaling bits identify a combination comprising the second interpolation filter and the third interpolation filter.

9. The method of claim 1, wherein the method forms part of a video encoding process, the method further comprises:

encoding a flag, wherein the flag indicates an interpolation filter to be used for a sub-pixel position is the interpolation filter previously used for the sub-pixel position.

10. The method of claim 1, wherein the method forms part of a video decoding process, the method further comprises:

decoding signaling bits, wherein the signaling bits identify a particular interpolation filter to be used for a sub-pixel position.

11. An apparatus for predicting video signals comprising:

a prediction unit configured to:

obtain a block of pixels, wherein the block of pixels includes integer pixel values corresponding to integer pixel positions within the block of pixels;

compute a first sub-pixel value for a first sub-pixel position of the block of pixels and a second sub-pixel value for a second sub-pixel position of the block of pixels, wherein

a first sub-pixel value is computed by applying a first interpolation filter defining a first one-dimensional array of filter coefficients corresponding to filter support positions;

a second sub-pixel value is computed by applying a second interpolation filter defining a second one-dimensional array of filter coefficients corresponding to horizontal filter support positions and applying a third interpolation filter defining a third one-dimensional array of filter coefficients corresponding to vertical filter support positions;

the first one-dimensional array comprises more filter coefficients than the second one-dimensional array;

the first one-dimensional array comprises more filter coefficients than the third one-dimensional array; and

generate a prediction block based on at least the first sub-pixel value and the second sub-pixel value.

12. The apparatus of claim 11, wherein:

the first interpolation filter comprises an 8-tap filter;

the second interpolation filter comprises a 6-tap filter; and,

the third interpolation filter comprises a 6-tap filter.

13. The apparatus of claim 11, wherein the filter support positions for the first interpolation filter correspond to a set of integer pixel positions.

14. The apparatus of claim 11, wherein the first sub-pixel value corresponds to a sub-pixel position on either a common vertical axis with integer pixel positions or a common horizontal axis with integer pixel positions.

15. The apparatus of claim 11, wherein the second sub-pixel value corresponds to a sub-pixel position not on a common vertical axis with integer pixel positions and not on a common horizontal axis with integer pixel positions.

16. The apparatus of claim 11, wherein the prediction unit is further configured to generate signaling bits, wherein the signaling bits identify a particular interpolation filter to be used for a sub-pixel position.

17. The apparatus of claim 16, wherein the signaling bits separately identify the second interpolation filter and the third interpolation filter.

18. The apparatus of claim 16, wherein the signaling bits identify a combination comprising the second interpolation filter and the third interpolation filter.

19. The apparatus of claim 11, wherein the prediction unit is further configured to generate a flag for transmission, wherein the flag indicates an interpolation filter to be used for a sub-pixel position is the interpolation filter previously used for the sub-pixel position.

20. The apparatus of claim 11, wherein the prediction unit is further configured to decode signaling bits, wherein the signaling bits identify a particular interpolation filter to be used for a sub-pixel position.

21. The apparatus of claim 11, wherein the prediction unit is further configured to decode a flag, wherein the flag indicates an interpolation filter to be used for a sub-pixel position is the interpolation filter previously used for the sub-pixel position..

22. The apparatus of claim 11, wherein the prediction unit is a component of a video encoding device.

23. The apparatus of claim 11, wherein the prediction unit is a component of a video decoding device.

24. An apparatus for predicting video signals, comprising:

means for obtaining a block of pixels, wherein the block of pixels includes integer pixel values corresponding to integer pixel positions within the block of pixels;

means for computing a first sub-pixel value for a first sub-pixel position of the block of pixels, wherein computing the first sub-pixel value comprises

applying a first interpolation filter defining a first one-dimensional array of filter coefficients corresponding to filter support positions;

means for computing a second sub-pixel value for a second sub-pixel position of the block of pixels, wherein computing the second sub-pixel value comprises applying a second interpolation filter defining a second one-dimensional array of filter coefficients corresponding to horizontal filter support positions and applying a third interpolation filter defining a third one-dimensional array of filter coefficients corresponding to vertical filter support positions, wherein:

the first one-dimensional array comprises more filter coefficients than the second one-dimensional array;

the first one-dimensional array comprises more filter coefficients than the third one-dimensional array; and

means for generating a prediction block based on at least the first sub-pixel value and the second sub-pixel value.

25. The apparatus of claim 24, wherein:

the first interpolation filter comprises an 8-tap filter;

the second interpolation filter comprises a 6-tap filter; and,

the third interpolation filter comprises a 6-tap filter.

26. The apparatus of claim 24, wherein the filter support positions for the first interpolation filter correspond to a set of integer pixel positions.

27. The apparatus of claim 24, wherein the first sub-pixel position is on either a common vertical axis with integer pixel positions or a common horizontal axis with integer pixel positions.

28. The apparatus of claim 24, wherein the second sub-pixel position is not on a common vertical axis with integer pixel positions and not on a common horizontal axis with integer pixel positions.

29. The apparatus of claim 24, furthering comprising:

means for encoding signaling bits, wherein the signaling bits identify a particular interpolation filter to be used for a sub-pixel position.

30. The apparatus of claim 29, wherein the signaling bits separately identify the second interpolation filter and the third interpolation filter.

31. The apparatus of claim 29, wherein the signaling bits identify a combination comprising the second interpolation filter and the third interpolation filter.

32. The apparatus of claim 24, further comprising:

means for encoding a flag, wherein the flag indicates an interpolation filter to be used for a sub-pixel position is the interpolation filter previously used for the sub-pixel position.

33. The apparatus of claim 24, furthering comprising:

means for decoding signaling bits, wherein the signaling bits identify a particular interpolation filter to be used for a sub-pixel position.

34. The apparatus of claim 24, further comprising:

means for decoding a flag, wherein the flag indicates an interpolation filter to be used for a sub-pixel position is the interpolation filter previously used for the sub-pixel position.

35. A computer readable storage medium tangibly storing one or more instructions, which when executed by one or more processors cause the one or more processors to:

obtain a block of pixels, wherein the block of pixels includes integer pixel values corresponding to integer pixel positions within the block of pixels;

compute a first sub-pixel value for a first sub-pixel position of the block of pixels, wherein computing the first sub-pixel value comprises applying a first interpolation filter defining a first one-dimensional array of filter coefficients corresponding to filter support positions;

compute a second sub-pixel value for a second sub-pixel position of the block of pixels, wherein computing the second sub-pixel value comprises applying a second interpolation filter defining a second one-dimensional array of filter coefficients corresponding to horizontal filter support positions and applying a third interpolation filter defining a third one-dimensional array of filter coefficients corresponding to vertical filter support positions, wherein:

the first one-dimensional array comprises more filter coefficients than the second one-dimensional array;

the first one-dimensional array comprises more filter coefficients than the third one-dimensional array; and

generate a prediction block based on at least the first sub-pixel value and the second sub-pixel value.

36. The computer readable storage medium of claim 35, wherein:

the first interpolation filter comprises an 8-tap filter;

the second interpolation filter comprises a 6-tap filter; and,

the third interpolation filter comprises a 6-tap filter.

37. The computer readable storage medium of claim 35, wherein the filter support positions for the first interpolation filter correspond to a set of integer pixel positions.

38. The computer readable storage medium of claim 35, wherein the first sub-pixel position is on either a common vertical axis with integer pixel positions or a common horizontal axis with integer pixel positions.

39. The computer readable storage medium of claim 35, wherein the second sub-pixel position is not on a common vertical axis with integer pixel positions and not on a common horizontal axis with integer pixel positions.

40. The computer readable storage medium of claim 35, storing one or more additional instructions, which when executed by the one or more processors cause the one or more processors to:

encode signaling bits, wherein the signaling bits identify a particular interpolation filter to be used for a sub-pixel position.

41. The computer readable storage medium of claim 40, wherein the signaling bits separately identify the second interpolation filter and the third interpolation filter.

42. The computer readable storage medium of claim 40, wherein the signaling bits identify a combination comprising the second interpolation filter and the third interpolation filter.

43. The computer readable storage medium of claim 35, storing one or more additional instructions, which when executed by the one or more processors cause the one or more processors to:

encode a flag, wherein the flag indicates an interpolation filter to be used for a sub-pixel position is the interpolation filter previously used for the sub-pixel position.

44. The computer readable storage medium of claim 35, storing one or more additional instructions, which when executed by the one or more processors cause the one or more processors to:

decode signaling bits, wherein the signaling bits identify a particular interpolation filter to be used for a sub-pixel position.

45. The computer readable storage medium of claim 35, storing one or more additional instructions, which when executed by the one or more processors cause the one or more processors to:

decode a flag, wherein the flag indicates an interpolation filter to be used for a sub-pixel position is the interpolation filter previously used for the sub-pixel position.

[Claims]

[Claim 1]

A method of predicting video signals comprising:

computing a first sub-pixel value for a first sub-pixel position of a block of pixels, wherein the first sub-pixel position is on either a common vertical axis with integer pixel positions or a common horizontal axis with integer pixel positions, wherein the block of pixels includes integer pixel values corresponding to integer pixel positions within the block of pixels and wherein computing the first sub-pixel value comprises applying a first interpolation filter defining a first one-dimensional array of filter coefficients corresponding to filter support positions, wherein the first sub-pixel value corresponds to a pixel position and the filter support positions corresponding to integer-pixel positions;

computing a second sub-pixel value for a second sub-pixel position of the block of pixels, wherein the second sub-pixel position is not on a common vertical axis with integer pixel positions and not on a common horizontal axis with integer pixel positions, wherein computing the second sub-pixel value comprises applying a second interpolation filter defining a second one-dimensional array of filter coefficients corresponding to horizontal filter support positions and applying a third interpolation filter defining a third one-dimensional array of filter coefficients corresponding to vertical filter support positions, wherein:

the second sub-pixel position is a quarter-pixel position;

the first one-dimensional array comprises more filter coefficients than the second one-dimensional array;

the first one-dimensional array comprises more filter coefficients than the third one-dimensional array; and

generating a prediction block based on at least the first sub-pixel value and the second sub-pixel value.

[Claim 2]

The method of claim 1, wherein:

the first interpolation filter comprises an 8-tap filter;

the second interpolation filter comprises a 6-tap filter; and,

the third interpolation filter comprises a 6-tap filter.

[Claim 3]

The method of claim 1, wherein filter support positions for the first interpolation filter correspond to a set of integer pixel positions.

[Claim 4]

The method of claim 1, wherein the method forms part of a video encoding process, the method further comprises:

encoding signaling bits, wherein the signaling bits identify a particular interpolation filter to be used for a sub-pixel position.

[Claim 5]

The method of claim 4, wherein the signaling bits separately identify the second interpolation filter and the third interpolation filter.

[Claim 6]

The method of claim 4, wherein the signaling bits identify a combination comprising the second interpolation filter and the third interpolation filter.

[Claim 7]

The method of claim 1, wherein the method forms part of a video encoding process, the method further comprises:

encoding a flag, wherein the flag indicates an interpolation filter to be used for a sub-pixel position is an interpolation filter previously used for the sub-pixel position.

[Claim 8]

The method of claim 1, wherein the method forms part of a video decoding process, the method further comprises:

decoding signaling bits, wherein the signaling bits identify a particular interpolation filter to be used for a sub-pixel position.

[Claim 9]

An apparatus for predicting video signals comprising:

a memory configured to store a block of pixels, wherein the block of pixels includes integer pixel values corresponding to integer pixel positions within the block of pixels;

a processor coupled to the memory and configured to:

compute a first sub-pixel value for a first sub-pixel position of the

block of pixels and a second sub-pixel value for a second sub-pixel position of the block of pixels, wherein the first sub-pixel value corresponds to a sub-pixel position on either a common vertical axis with integer pixel positions or a common horizontal axis with integer pixel positions, and the second sub-pixel value corresponds to a sub-pixel position not on a common vertical axis with integer pixel positions and not on a common horizontal axis with integer pixel positions, and wherein

the second sub-pixel position is a quarter-pixel position;

the first sub-pixel value is computed by applying a first interpolation filter defining a first one-dimensional array of filter coefficients corresponding to filter support positions corresponding to integer-pixel positions;

the second sub-pixel value is computed by applying a second interpolation filter defining a second one-dimensional array of filter coefficients corresponding to horizontal filter support positions corresponding to horizontal integer-pixel positions and applying a third interpolation filter defining a third one-dimensional array of filter coefficients corresponding to vertical filter support positions corresponding to vertical integer-pixel positions;

the first one-dimensional array comprises more filter coefficients than the second one-dimensional array;

the first one-dimensional array comprises more filter coefficients than the third one-dimensional array; and

generate a prediction block based on at least the first sub-pixel value and the second sub-pixel value.

[Claim 10]

The apparatus of claim 9, wherein:

the first interpolation filter comprises an 8-tap filter;

the second interpolation filter comprises a 6-tap filter; and,

the third interpolation filter comprises a 6-tap filter.

[Claim 11]

The apparatus of claim 9, wherein filter support positions for the first interpolation filter correspond to a set of integer pixel positions.

[Claim 12]

The apparatus of claim 9, wherein the processor is further configured to generate signaling bits, wherein the signaling bits identify a particular interpolation filter to be used for a sub-pixel position.

[Claim 13]

The apparatus of claim 12, wherein the signaling bits separately identify the second interpolation filter and the third interpolation filter.

[Claim 14]

The apparatus of claim 12, wherein the signaling bits identify a combination comprising the second interpolation filter and the third interpolation filter.

[Claim 15]

The apparatus of claim 9, wherein the processor is further configured to generate a flag for transmission, wherein the flag indicates an interpolation filter to be used for a sub-pixel position is the interpolation filter previously used for the sub-pixel position.

[Claim 16]

The apparatus of claim 9, wherein the processor is further configured to decode signaling bits, wherein the signaling bits identify a particular interpolation filter to be used for a sub-pixel position.

[Claim 17]

The apparatus of claim 9, wherein the processor is further configured to decode a flag, wherein the flag indicates an interpolation filter to be used for a sub-pixel position is an interpolation filter previously used for the sub-pixel position.

[Claim 18]

The apparatus of claim 9, wherein the processor is a component of a video encoding device.

[Claim 19]

The apparatus of claim 9, wherein the processor is a component of a video decoding device.

[Claim 20]

An apparatus for predicting video signals comprising:

means for computing a first sub-pixel value for a first sub-pixel position of a block of pixels, wherein the first sub-pixel position is on either a common vertical axis with integer pixel positions or a common horizontal axis with integer pixel positions, wherein the block of pixels includes integer pixel values corresponding to integer pixel positions within the block of pixels and wherein computing the first sub-pixel value comprises applying a first interpolation filter defining a first one-dimensional array of filter coefficients corresponding to filter support positions corresponding to integer-pixel positions;

means for computing a second sub-pixel value for a second sub-pixel position of the block of pixels, wherein the second sub-pixel position is not on a common vertical axis with integer pixel positions and not on a common horizontal axis with integer pixel positions, wherein computing the second sub-pixel value comprises applying a second interpolation filter defining a second one-dimensional array of filter coefficients corresponding to horizontal filter support positions corresponding to horizontal integer-pixel positions and applying a third interpolation filter defining a third one-dimensional array of filter coefficients corresponding to vertical filter support positions corresponding to vertical integer-pixel positions, wherein:

the second sub-pixel position is a quarter-pixel position;

the first one-dimensional array comprises more filter coefficients than the second one-dimensional array;

the first one-dimensional array comprises more filter coefficients than the third one-dimensional array; and

means for generating a prediction block based on at least the first sub-pixel value and the second sub-pixel value.

[Claim 21]

The apparatus of claim 20, wherein:

the first interpolation filter comprises an 8-tap filter;

the second interpolation filter comprises a 6-tap filter; and,

the third interpolation filter comprises a 6-tap filter.

[Claim 22]

The apparatus of claim 20, wherein filter support positions for the first interpolation filter correspond to a set of integer pixel positions.

[Claim 23]

The apparatus of claim 20, furthering comprising:

means for encoding signaling bits, wherein the signaling bits identify a particular interpolation filter to be used for a sub-pixel position.

[Claim 24]

The apparatus of claim 23, wherein the signaling bits separately identify the second interpolation filter and the third interpolation filter.

[Claim 25]

The apparatus of claim 23, wherein the signaling bits identify a combination comprising the second interpolation filter and the third interpolation filter.

[Claim 26]

The apparatus of claim 20, further comprising:

means for encoding a flag, wherein the flag indicates an interpolation filter to be used for a sub-pixel position is an interpolation filter previously used for the sub-pixel position.

[Claim 27]

The apparatus of claim 20, furthering comprising:

means for decoding signaling bits, wherein the signaling bits identify a particular interpolation filter to be used for a sub-pixel position.

[Claim 28]

The apparatus of claim 20, further comprising:

means for decoding a flag, wherein the flag indicates an interpolation filter to be used for a sub-pixel position is an interpolation filter previously used for the sub-pixel position.

[Claim 29]

A computer readable storage medium tangibly storing one or more instructions, which when executed by one or more processors cause the one or more processors to:

compute a first sub-pixel value for a first sub-pixel position of a block of pixels, wherein the first sub-pixel position is on either a common vertical axis with integer pixel positions or a common horizontal axis with integer pixel positions, wherein the block of pixels includes integer pixel values corresponding to integer pixel positions within the block of pixels and wherein computing the first sub-pixel value comprises applying a first interpolation filter defining a first one-dimensional array of filter coefficients corresponding to filter support positions corresponding to integer-pixel positions;

compute a second sub-pixel value for a second sub-pixel position of the block of pixels, wherein the second sub-pixel position is not on a common vertical axis with integer pixel positions and not on a common horizontal axis with integer pixel positions, wherein computing the second sub-pixel value comprises applying a second interpolation filter defining a second one-dimensional array of filter coefficients corresponding to horizontal filter support positions corresponding to horizontal integer-pixel positions and applying a third interpolation filter defining a third one-dimensional array of filter coefficients corresponding to vertical filter support positions corresponding to vertical integer-pixel positions, wherein:

the second sub-pixel position is a quarter-pixel position;

the first one-dimensional array comprises more filter coefficients than the second one-dimensional array;

the first one-dimensional array comprises more filter coefficients than the third one-dimensional array; and

generate a prediction block based on at least the first sub-pixel value and the second sub-pixel value.

[Claim 30]

The computer readable storage medium of claim 29, wherein:

the first interpolation filter comprises an 8-tap filter;

the second interpolation filter comprises a 6-tap filter; and,

the third interpolation filter comprises a 6-tap filter.

[Claim 31]

The computer readable storage medium of claim 29, wherein filter support positions for the first interpolation filter correspond to a set of integer pixel positions.

[Claim 32]

The computer readable storage medium of claim 29, storing one or more additional instructions, which when executed by the one or more processors cause the one or more processors to:

encode signaling bits, wherein the signaling bits identify a particular interpolation filter to be used for a sub-pixel position.

[Claim 33]

The computer readable storage medium of claim 32, wherein the signaling bits separately identify the second interpolation filter and the third interpolation filter.

[Claim 34]

The computer readable storage medium of claim 32, wherein the signaling bits identify a combination comprising the second interpolation filter and the third interpolation filter.

[Claim 35]

The computer readable storage medium of claim 29, storing one or more additional instructions, which when executed by the one or more processors cause the one or more processors to:

encode a flag, wherein the flag indicates an interpolation filter to be used for a sub-pixel position is an interpolation filter previously used for the sub-pixel position.

[Claim 36]

The computer readable storage medium of claim 29, storing one or more additional instructions, which when executed by the one or more processors cause the one or more processors to:

decode signaling bits, wherein the signaling bits identify a particular interpolation filter to be used for a sub-pixel position.

[Claim 37]

The computer readable storage medium of claim 29, storing one or more additional instructions, which when executed by the one or more processors cause the one or more processors to:

decode a flag, wherein the flag indicates an interpolation filter to be used for a sub-pixel position is an interpolation filter previously used for the sub-pixel position.