

CLAIMS

1. A method of video coding, the method comprising:

—performing an intra-prediction process of a block comprising samples to be predicted, wherein
5 an interpolation filter is applied to reference samples of the block during the intra-prediction process of the block;

wherein the interpolation filter is selected on the basis of a subpixel offset between the reference samples and the samples to be predicted; and—

wherein a size of a main reference side used in the intra-prediction process is determined according
10 to a length of the interpolation filter and an intra-prediction mode that provides, out of a set of available intra-prediction modes, the greatest non-integer value of said subpixel offset, wherein the main reference side comprises the reference samples.

2. The method of claim 1, wherein the size of the main reference side is determined as a sum of:—

15 an integer part of the greatest non-integer value of said subpixel offset,

a size of a side of the block, and

a portion or a whole of the length of the interpolation filter.

3. The method of claim 2, wherein—

20 the side of the block of predicted samples is a width of the block if the intra-prediction mode is greater than a vertical intra-prediction mode, VER_IDX;—

or

the side of the block is a height of the block if the intra-prediction mode is lesser than a horizontal intra-prediction mode, HOR_IDX.

4. The method of claim 2 or 3, wherein, in the main reference side, values of reference samples with
25 positions greater than a doubled size of said side of the block are set to be equal to a value of a sample located at the doubled size of said size of said side of the block.

5. The method of claim 1, wherein the size of the main reference side is determined as a sum of:—

30 —a size of a side of the block,—

—a half of the length of the interpolation filter minus one

—a maximum of the following two values M:

▪—the size of the side of the block, and

- an integer part of the greatest non-integer value of the subpixel offset plus a half of the length of the interpolation filter.

6. The method of claim 1, wherein the size of the main reference side is determined as a sum of :—

- Ø—a size of a side of the block,—
- Ø—a half of the length of the interpolation filter minus one
- Ø—a maximum of the following two values M:

- the size of the side of the block, and
- an integer part of the greatest non-integer value of the subpixel offset plus a half of the length of the interpolation filter plus one.

7. The method of claim 5, wherein,—

when the maximum of the two values M is equal to the size of a side of the block, right padding is not performed; or

when the maximum of the two values M is equal to the integer part of the greatest value of the subpixel offset plus the half of the length of the interpolation filter or to the integer part of the greatest non-integer value of the subpixel offset plus a half of the length of the interpolation filter plus one, right padding is performed.

8. The method of any of claims 1 to 7, wherein padding is performed by replicating first and/or last reference samples of the main reference side to the left and/or to the right side respectively, in particular as follows: denoting the main reference side as ref, and the size of the main reference side as refS, the padding is represented as:

$\text{ref}[-1] = \text{p}[0]$, and/or

$\text{ref}[\text{refS}+1] = \text{p}[\text{refS}]$,—

wherein $\text{ref}[-1]$ represents a value of the left to the main reference side,

$\text{p}[0]$ represents a value of the first reference sample of the main reference side,—

$\text{ref}[\text{refS}+1]$ represents a value of the right to the main reference side, and

$\text{p}[\text{refS}]$ represents a value of the last reference sample of the main reference side.

9. The method of any one of claims 1 to 8, wherein the interpolation filter used in the intra-prediction processes is a finite impulse response filter and the coefficients of the interpolation filter are fetched from a look-up table.

10. The method of any one of claims 1 to 9, wherein the interpolation filter used in the intra-prediction process is a 4 tap filter.

11. The method of claim 10, wherein coefficients, c_0 , c_1 , c_2 , and c_3 , of the interpolation filter depend on a non-integer part of the subpixel offset as follows:

Non-integer part of the subpixel offset	c_0	c_1	c_2	c_3
0 (integer)	0	64	0	0
1	-1	63	2	0
2	-2	62	4	0
3	-2	60	7	-1
4	-2	58	10	-2
5	-3	57	12	-2
6	-4	56	14	-2
7	-4	55	15	-2
8	-4	54	16	-2
9	-5	53	18	-2
10	-6	52	20	-2
11	-6	49	24	-3
12	-6	46	28	-4
13	-5	44	29	-4
14	-4	42	30	-4
15	-4	39	33	-4
16 (half-pel)	-4	36	36	-4
17	-4	33	39	-4
18	-4	30	42	-4
19	-4	29	44	-5
20	-4	28	46	-6
21	-3	24	49	-6

22	-2	20	52	-6
23	-2	18	53	-5
24	-2	16	54	-4
25	-2	15	55	-4
26	-2	14	56	-4
27	-2	12	57	-3
28	-2	10	58	-2
29	-1	7	60	-2
30	0	4	62	-2
31	0	2	63	-1

wherein “Non-integer part of the subpixel offset” column is defined in 1/32 subpixel resolution.

12. The method of claim 10, wherein coefficients, c_0 , c_1 , c_2 , and c_3 , of the interpolation filter depend on a non-integer part of the subpixel offset as follows:

Non-integer part of the subpixel offset	c_0	c_1	c_2	c_3
0 (integer)	16	32	16	0
1	15	29	17	3
2	15	29	17	3
3	14	29	18	3
4	13	29	18	4
5	13	28	19	4
6	13	28	19	4
7	12	28	20	4
8	11	28	20	5
9	11	27	21	5
10	10	27	22	5
11	9	27	22	6
12	9	26	23	6
13	9	26	23	6
14	8	25	24	7
15	8	25	24	7

16 (half-pel)	8	24	24	8
17	7	24	25	8
18	7	24	25	8
19	6	23	26	9
20	6	23	26	9
21	6	22	27	9
22	5	22	27	10
23	5	21	27	11
24	5	20	28	11
25	4	20	28	12
26	4	19	28	13
27	4	19	28	13
28	4	18	29	13
29	3	18	29	14
30	3	17	29	15
31	3	17	29	15

wherein “Non-integer part of the subpixel offset” column is defined in 1/32 subpixel resolution.

13. The method of claim 10, wherein the coefficients, c_0 , c_1 , c_2 , and c_3 , of the interpolation filter depend on a non-integer part of the subpixel offset as follows:

Non-integer part of the subpixel offset	c_0	c_1	c_2	c_3
0 (integer)	16	32	16	0
1	15	29	17	3
2	15	29	17	3
3	14	29	18	3
4	13	29	18	4
5	13	28	19	4
6	13	28	19	4
7	12	28	20	4
8	11	28	20	5
9	11	27	21	5

10	10	27	22	5
11	9	27	22	6
12	9	26	23	6
13	9	26	23	6
14	8	25	24	7
15	8	25	24	7
16 (half-pel)	8	24	24	8
17	7	24	25	8
18	7	24	25	8
19	6	23	26	9
20	6	23	26	9
21	6	22	27	9
22	5	22	27	10
23	5	21	27	11
24	5	20	28	11
25	4	20	28	12
26	4	19	28	13
27	4	19	28	13
28	4	18	29	13
29	3	18	29	14
30	3	17	29	15
31	3	17	29	15

wherein “Non-integer part of the subpixel offset” column is defined in 1/32 subpixel resolution.

14. The method of claim 10, wherein coefficients, c_0 , c_1 , c_2 , and c_3 , of the interpolation filter depend on a non-integer part of the subpixel offset as follows:

Non-integer part of the subpixel offset	c_0	c_1	c_2	c_3
0 (integer)	16	32	16	0
1	15	29	17	3
2	14	29	18	3
3	14	29	18	3

4	14	28	18	4
5	13	28	19	4
6	12	28	20	4
7	12	27	20	5
8	11	27	21	5
9	11	27	21	5
10	10	26	22	6
11	10	26	22	6
12	9	26	23	6
13	9	26	23	6
14	8	25	24	7
15	8	25	24	7
16 (half-pel)	7	25	25	7
17	7	24	25	8
18	7	24	25	8
19	6	23	26	9
20	6	23	26	9
21	6	22	26	10
22	6	22	26	10
23	5	21	27	11
24	5	21	27	11
25	5	20	27	12
26	4	20	28	12
27	4	19	28	13
28	4	18	28	14
29	3	18	29	14
30	3	18	29	14
31	3	17	29	15

wherein “Non-integer part of the subpixel offset” column is defined in 1/32 subpixel resolution.

15. The method of any one of claims 1 to 14, wherein the interpolation filter is selected from a set of filters used for the intra-prediction process for a given subpixel offset.

16. The method of claim 15, wherein the set of filters comprises a Gauss filter and a Cubic filter.

17. The method of any one of claims 1 to 16, wherein the quantity of the interpolation filter is N, wherein the N interpolation filters are used for intra reference sample interpolation and $N \geq 1$ and is a positive integer.

18. The method of any one of claims 1 to 17, wherein the reference samples include samples not adjacent to the block.

19. An intra-prediction method for predicting a current block included in a picture, the method comprising:

determining a size of a main reference side used in the intra-prediction based on:—

an intra-prediction mode that provides, among available intra-prediction modes, a greatest non-integer value of a subpixel offset between a target sample among target samples in the current block and a reference sample used for predicting said target sample in the current block, the reference sample being a reference sample among reference samples included in the main reference side, and

a size of an interpolation filter to be applied on the reference samples included in the main reference side;—

applying an interpolation filter on the reference samples included in the main reference side to obtain filtered reference samples; and

predicting the target samples included in the current block based on the filtered reference samples.

20. The method of claim 19, wherein the size of the main reference side is determined as a sum of:

an integer part of the greatest non-integer value of the subpixel offset,

a size of a side of the current block, and

a half of the size of the interpolation filter.—

21. The method of claim 20, wherein—

the side of the current block is a width of the current block if the intra-prediction mode is greater than a vertical intra-prediction mode, VER_IDX;—

or

the side of the current block is a height of the current block if the intra-prediction mode is lesser than a horizontal intra-prediction mode, HOR_IDX.—

22. The method according to claim 20 or 21, wherein values of reference samples having positions

in the main reference side that are greater than double the size of the side of the current block are set to be equal to a value of a sample having a sample position that is double the size of the current block.

23. The method according to claim 19, wherein the size of the main reference side is determined as a sum of:

○ a size of a side of the current block,

○ a half of the length of the interpolation filter minus one, and

○ a maximum of the following two values M:

▪ the size of the side of the block, and

▪ an integer part of the greatest non-integer value of the subpixel offset plus a half of the length of the interpolation filter.

24. The method according to claim 19, wherein the size of the main reference side is determined as a sum of:

○ a size of a side of the current block,

○ a half of the length of the interpolation filter minus one, and

○ a maximum of:

▪ the size of the side of the block, and

▪ an integer part of the greatest non-integer value of the subpixel offset plus a half of the length of the interpolation filter plus one.

25. The method of claim 23, wherein,

when the maximum of the two values M is equal to the size of a side of the block, right padding is not performed; or

when the maximum of the two values M is equal to the integer part of the greatest value of the subpixel offset plus the half of the length of the interpolation filter or to the integer part of the greatest non-integer value of the subpixel offset plus a half of the length of the interpolation filter plus one, right padding is performed.

26. The method of any of claims 19 to 25, wherein padding is performed by replicating first and/or last reference samples of the main reference side to the left and/or to the right side respectively, in particular as follows: denoting the main reference side as ref, and the size of the main reference side as refS, the padding is represented as:

ref[-1] = p[0], and/or

~~ref[refS+1] = p[refS],~~

~~wherein ref[-1] represents a value of the left to the main reference side,~~

~~p[0] represents a value of the first reference sample of the main reference side,~~

~~ref[refS+1] represents a value of the right to the main reference side, and~~

5 ~~p[refS] represents a value of the last reference sample of the main reference side.~~

~~27. An encoder comprising processing circuitry configured to carry out the method according to any one of claims 1 to 26.~~

10 ~~28. A decoder comprising processing circuitry configured to carry out the method according to any one of claims 1 to 26.~~

~~29. A computer program product comprising a program code for performing the method according to any one of claims 1 to 26.~~

15 ~~30. A decoder, comprising:~~

~~— one or more processors; and~~

~~— a non-transitory computer-readable storage medium coupled to the processors and storing programming for execution by the processors, wherein the programming, when executed by the~~

20 ~~processors, configures the decoder to carry out the method according to any one of claims 1 to 26.~~

~~31. An encoder, comprising:~~

~~— one or more processors; and~~

~~— a non-transitory computer-readable storage medium coupled to the processors and storing programming for execution by the processors, wherein the programming, when executed by the~~

25 ~~processors, configures the encoder to carry out the method according to any one of claims 1 to 26.~~

~~32. An apparatus for intra-prediction of a current block included in a picture, the apparatus comprising:~~

30 ~~an intra-prediction unit configured to predict target samples included in the current block based on filtered reference samples, the intra-prediction unit comprising:~~

~~a determination unit configured to determine a size of a main reference side used in the intra-prediction based on:~~

~~an intra-prediction mode that provides, among available intra-prediction modes, a greatest~~

35 ~~non-integer value of a subpixel offset between a target sample among the target samples in~~

~~the current block and a reference sample used for predicting said target sample in the current block, the reference sample being a reference sample among reference samples included in the main reference side, and~~

~~a size of an interpolation filter to be applied on the reference samples included in the main reference side; and~~

~~a filtering unit configured to apply an interpolation filter on the reference samples included in the main reference side to obtain the filtered reference samples.—~~

~~33. The apparatus of claim 32, wherein—~~

~~the determination unit is configured to determine the size of the main reference side as a sum of:~~

~~an integer part of the greatest non-integer value of the subpixel offset,~~

~~a size of a side of the current block, and~~

~~—— a half of the size of the interpolation filter.~~

~~34. The apparatus according to claim 33, wherein the side of the current block is a width of the current block if the intra prediction mode is greater than a vertical intra prediction mode, VER_IDX;~~

~~or~~

~~the side of the current block is a height of the current block if the intra prediction mode is lesser than a horizontal intra prediction mode, HOR_IDX.~~

~~35. The apparatus according to claim 33 or 34, wherein values of reference samples having positions in the main reference side that are greater than double the size of the side of the current block are set to be equal to a value of a sample having a sample position that is double the size of the current block.~~

~~36. The apparatus according to claim 32, wherein the determination unit is configured to determine the size of the main reference side as a sum of:~~

~~○ a size of a side of the current block,~~

~~○ a half of the length of the interpolation filter minus one, and~~

~~○ a maximum of:~~

~~▪ the size of the side of the block, and~~

~~▪ an integer part of the greatest non-integer value of the subpixel offset plus a half of the length of the interpolation filter.~~

~~37. The apparatus according to claim 32, wherein the determination unit is configured to determine~~

the size of the main reference side as a sum of:

~~Ø—a size of a side of the current block,~~

~~Ø—a half of the length of the interpolation filter minus one, and~~

~~Ø—a maximum of:~~

- 5 ~~▪—the size of the side of the block, and~~
- ~~▪—an integer part of the greatest non-integer value of the subpixel offset plus a half of the length of the interpolation filter plus one.~~

38. The apparatus of claim 36, wherein the determination unit is configured:—

10 ~~when the maximum of the two values M is equal to the size of a side of the block, not to perform right padding; or~~

~~when the maximum of the two values M is equal to the integer part of the greatest value of the subpixel offset plus the half of the length of the interpolation filter or to the integer part of the greatest non-integer value of the subpixel offset plus a half of the length of the interpolation filter~~
15 ~~plus one, to perform right padding.~~

39. The apparatus of any of claims 32 to 38, wherein the determination unit is configured to perform padding by replicating first and/or last reference samples of the main reference side to the left and/or to the right side respectively, in particular as follows: denoting the main reference side
20 as ref, and the size of the main reference side as refS, the padding is represented as:

~~ref[-1]=p[0], and/or~~

~~ref[refS+1]=p[refS],—~~

~~wherein ref[-1] represents a value of the left to the main reference side,~~

~~p[0] represents a value of the first reference sample of the main reference side,—~~

25 ~~ref[refS+1] represents a value of the right to the main reference side, and~~

~~p[refS] represents a value of the last reference sample of the main reference side.~~

40. A video encoder for encoding a plurality of pictures into a bitstream, comprising the apparatus according to any of claims 32 to 39.

30 41. A video decoder for decoding a plurality of pictures from a bitstream, comprising the apparatus according to any of claims 32 to 39.

~~42. A non-transitory computer-readable medium storing computer instructions for performing intra prediction, that when executed by one or more processors, cause the one or more processors to perform the method according to any one of claims 1 to 26.~~

1. A method of video coding, the method comprising:

performing an intra-prediction process of a block comprising samples to be predicted, wherein an interpolation filter is applied to reference samples of the block during the intra-prediction process of the block;

wherein the interpolation filter is selected on the basis of a subpixel offset between the reference samples and the samples to be predicted;

wherein a size of a main reference side used in the intra-prediction process is determined according to a length of the interpolation filter and an intra-prediction mode that provides, out of a set of available intra-prediction modes, the greatest non-integer value of said subpixel offset, wherein the main reference side comprises the reference samples; and

wherein the size of the main reference side is determined as a sum of:

an integer part of the greatest non-integer value of said subpixel offset,

a size of a side of the block, and

a half of the length of the interpolation filter.

2. The method of claim 1, wherein

the side of the block of predicted samples is a width of the block if the intra prediction mode is greater than a vertical intra prediction mode, VER_IDX;

or

the side of the block is a height of the block if the intra prediction mode is lesser than a horizontal intra prediction mode, HOR_IDX.

3. The method of claim 1 or 2, wherein, in the main reference side, values of reference samples with positions greater than a doubled size of said side of the block are set to be equal to a value of a sample located at the doubled size of said size of said side of the block.

4. The method of any of claims 1 to 3, wherein padding is performed by replicating first and/or last reference samples of the main reference side to the left and/or to the right side respectively, in particular as follows: denoting the main reference side as ref, and the size of the main reference side as refS, the padding is represented as:

ref[-1] = p[0], and/or

ref[refS+1] = p[refS],

wherein $\text{ref}[-1]$ represents a value of the left to the main reference side,
 $p[0]$ represents a value of the first reference sample of the main reference side,
 $\text{ref}[\text{refS}+1]$ represents a value of the right to the main reference side, and
 $p[\text{refS}]$ represents a value of the last reference sample of the main reference side.

- 5
5. The method of any one of claims 1 to 4, wherein the interpolation filter used in the intra-prediction processes is a finite impulse response filter and the coefficients of the interpolation filter are fetched from a look-up table.
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6. The method of any one of claims 1 to 5, wherein the interpolation filter used in the intra-prediction process is a 4 tap filter.
7. The method of claim 6, wherein coefficients, c_0 , c_1 , c_2 , and c_3 , of the interpolation filter depend on a non-integer part of the subpixel offset as follows:

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<u>Non-integer part of the subpixel offset</u>	<u>c_0</u>	<u>c_1</u>	<u>c_2</u>	<u>c_3</u>
<u>0 (integer)</u>	<u>0</u>	<u>64</u>	<u>0</u>	<u>0</u>
<u>1</u>	<u>-1</u>	<u>63</u>	<u>2</u>	<u>0</u>
<u>2</u>	<u>-2</u>	<u>62</u>	<u>4</u>	<u>0</u>
<u>3</u>	<u>-2</u>	<u>60</u>	<u>7</u>	<u>-1</u>
<u>4</u>	<u>-2</u>	<u>58</u>	<u>10</u>	<u>-2</u>
<u>5</u>	<u>-3</u>	<u>57</u>	<u>12</u>	<u>-2</u>
<u>6</u>	<u>-4</u>	<u>56</u>	<u>14</u>	<u>-2</u>
<u>7</u>	<u>-4</u>	<u>55</u>	<u>15</u>	<u>-2</u>
<u>8</u>	<u>-4</u>	<u>54</u>	<u>16</u>	<u>-2</u>
<u>9</u>	<u>-5</u>	<u>53</u>	<u>18</u>	<u>-2</u>
<u>10</u>	<u>-6</u>	<u>52</u>	<u>20</u>	<u>-2</u>
<u>11</u>	<u>-6</u>	<u>49</u>	<u>24</u>	<u>-3</u>
<u>12</u>	<u>-6</u>	<u>46</u>	<u>28</u>	<u>-4</u>

<u>13</u>	<u>-5</u>	<u>44</u>	<u>29</u>	<u>-4</u>
<u>14</u>	<u>-4</u>	<u>42</u>	<u>30</u>	<u>-4</u>
<u>15</u>	<u>-4</u>	<u>39</u>	<u>33</u>	<u>-4</u>
<u>16 (half-pel)</u>	<u>-4</u>	<u>36</u>	<u>36</u>	<u>-4</u>
<u>17</u>	<u>-4</u>	<u>33</u>	<u>39</u>	<u>-4</u>
<u>18</u>	<u>-4</u>	<u>30</u>	<u>42</u>	<u>-4</u>
<u>19</u>	<u>-4</u>	<u>29</u>	<u>44</u>	<u>-5</u>
<u>20</u>	<u>-4</u>	<u>28</u>	<u>46</u>	<u>-6</u>
<u>21</u>	<u>-3</u>	<u>24</u>	<u>49</u>	<u>-6</u>
<u>22</u>	<u>-2</u>	<u>20</u>	<u>52</u>	<u>-6</u>
<u>23</u>	<u>-2</u>	<u>18</u>	<u>53</u>	<u>-5</u>
<u>24</u>	<u>-2</u>	<u>16</u>	<u>54</u>	<u>-4</u>
<u>25</u>	<u>-2</u>	<u>15</u>	<u>55</u>	<u>-4</u>
<u>26</u>	<u>-2</u>	<u>14</u>	<u>56</u>	<u>-4</u>
<u>27</u>	<u>-2</u>	<u>12</u>	<u>57</u>	<u>-3</u>
<u>28</u>	<u>-2</u>	<u>10</u>	<u>58</u>	<u>-2</u>
<u>29</u>	<u>-1</u>	<u>7</u>	<u>60</u>	<u>-2</u>
<u>30</u>	<u>0</u>	<u>4</u>	<u>62</u>	<u>-2</u>
<u>31</u>	<u>0</u>	<u>2</u>	<u>63</u>	<u>-1</u>

wherein “Non-integer part of the subpixel offset” column is defined in 1/32 subpixel resolution.

8. The method of claim 6, wherein coefficients, c_0 , c_1 , c_2 , and c_3 , of the interpolation filter depend on a non-integer part of the subpixel offset as follows:

<u>Non-integer part of the subpixel offset</u>	<u>c_0</u>	<u>c_1</u>	<u>c_2</u>	<u>c_3</u>
<u>0 (integer)</u>	<u>16</u>	<u>32</u>	<u>16</u>	<u>0</u>
<u>1</u>	<u>15</u>	<u>29</u>	<u>17</u>	<u>3</u>
<u>2</u>	<u>15</u>	<u>29</u>	<u>17</u>	<u>3</u>
<u>3</u>	<u>14</u>	<u>29</u>	<u>18</u>	<u>3</u>
<u>4</u>	<u>13</u>	<u>29</u>	<u>18</u>	<u>4</u>
<u>5</u>	<u>13</u>	<u>28</u>	<u>19</u>	<u>4</u>
<u>6</u>	<u>13</u>	<u>28</u>	<u>19</u>	<u>4</u>

<u>7</u>	<u>12</u>	<u>28</u>	<u>20</u>	<u>4</u>
<u>8</u>	<u>11</u>	<u>28</u>	<u>20</u>	<u>5</u>
<u>9</u>	<u>11</u>	<u>27</u>	<u>21</u>	<u>5</u>
<u>10</u>	<u>10</u>	<u>27</u>	<u>22</u>	<u>5</u>
<u>11</u>	<u>9</u>	<u>27</u>	<u>22</u>	<u>6</u>
<u>12</u>	<u>9</u>	<u>26</u>	<u>23</u>	<u>6</u>
<u>13</u>	<u>9</u>	<u>26</u>	<u>23</u>	<u>6</u>
<u>14</u>	<u>8</u>	<u>25</u>	<u>24</u>	<u>7</u>
<u>15</u>	<u>8</u>	<u>25</u>	<u>24</u>	<u>7</u>
<u>16 (half-pel)</u>	<u>8</u>	<u>24</u>	<u>24</u>	<u>8</u>
<u>17</u>	<u>7</u>	<u>24</u>	<u>25</u>	<u>8</u>
<u>18</u>	<u>7</u>	<u>24</u>	<u>25</u>	<u>8</u>
<u>19</u>	<u>6</u>	<u>23</u>	<u>26</u>	<u>9</u>
<u>20</u>	<u>6</u>	<u>23</u>	<u>26</u>	<u>9</u>
<u>21</u>	<u>6</u>	<u>22</u>	<u>27</u>	<u>9</u>
<u>22</u>	<u>5</u>	<u>22</u>	<u>27</u>	<u>10</u>
<u>23</u>	<u>5</u>	<u>21</u>	<u>27</u>	<u>11</u>
<u>24</u>	<u>5</u>	<u>20</u>	<u>28</u>	<u>11</u>
<u>25</u>	<u>4</u>	<u>20</u>	<u>28</u>	<u>12</u>
<u>26</u>	<u>4</u>	<u>19</u>	<u>28</u>	<u>13</u>
<u>27</u>	<u>4</u>	<u>19</u>	<u>28</u>	<u>13</u>
<u>28</u>	<u>4</u>	<u>18</u>	<u>29</u>	<u>13</u>
<u>29</u>	<u>3</u>	<u>18</u>	<u>29</u>	<u>14</u>
<u>30</u>	<u>3</u>	<u>17</u>	<u>29</u>	<u>15</u>
<u>31</u>	<u>3</u>	<u>17</u>	<u>29</u>	<u>15</u>

wherein “Non-integer part of the subpixel offset” column is defined in 1/32 subpixel resolution.

9. The method of claim 6, wherein coefficients, c_0 , c_1 , c_2 , and c_3 , of the interpolation filter depend on a non-integer part of the subpixel offset as follows:

<u>Non-integer part of the subpixel offset</u>	<u>c_0</u>	<u>c_1</u>	<u>c_2</u>	<u>c_3</u>
<u>0 (integer)</u>	<u>16</u>	<u>32</u>	<u>16</u>	<u>0</u>

<u>1</u>	<u>15</u>	<u>29</u>	<u>17</u>	<u>3</u>
<u>2</u>	<u>14</u>	<u>29</u>	<u>18</u>	<u>3</u>
<u>3</u>	<u>14</u>	<u>29</u>	<u>18</u>	<u>3</u>
<u>4</u>	<u>14</u>	<u>28</u>	<u>18</u>	<u>4</u>
<u>5</u>	<u>13</u>	<u>28</u>	<u>19</u>	<u>4</u>
<u>6</u>	<u>12</u>	<u>28</u>	<u>20</u>	<u>4</u>
<u>7</u>	<u>12</u>	<u>27</u>	<u>20</u>	<u>5</u>
<u>8</u>	<u>11</u>	<u>27</u>	<u>21</u>	<u>5</u>
<u>9</u>	<u>11</u>	<u>27</u>	<u>21</u>	<u>5</u>
<u>10</u>	<u>10</u>	<u>26</u>	<u>22</u>	<u>6</u>
<u>11</u>	<u>10</u>	<u>26</u>	<u>22</u>	<u>6</u>
<u>12</u>	<u>9</u>	<u>26</u>	<u>23</u>	<u>6</u>
<u>13</u>	<u>9</u>	<u>26</u>	<u>23</u>	<u>6</u>
<u>14</u>	<u>8</u>	<u>25</u>	<u>24</u>	<u>7</u>
<u>15</u>	<u>8</u>	<u>25</u>	<u>24</u>	<u>7</u>
<u>16 (half-pel)</u>	<u>7</u>	<u>25</u>	<u>25</u>	<u>7</u>
<u>17</u>	<u>7</u>	<u>24</u>	<u>25</u>	<u>8</u>
<u>18</u>	<u>7</u>	<u>24</u>	<u>25</u>	<u>8</u>
<u>19</u>	<u>6</u>	<u>23</u>	<u>26</u>	<u>9</u>
<u>20</u>	<u>6</u>	<u>23</u>	<u>26</u>	<u>9</u>
<u>21</u>	<u>6</u>	<u>22</u>	<u>26</u>	<u>10</u>
<u>22</u>	<u>6</u>	<u>22</u>	<u>26</u>	<u>10</u>
<u>23</u>	<u>5</u>	<u>21</u>	<u>27</u>	<u>11</u>
<u>24</u>	<u>5</u>	<u>21</u>	<u>27</u>	<u>11</u>
<u>25</u>	<u>5</u>	<u>20</u>	<u>27</u>	<u>12</u>
<u>26</u>	<u>4</u>	<u>20</u>	<u>28</u>	<u>12</u>
<u>27</u>	<u>4</u>	<u>19</u>	<u>28</u>	<u>13</u>
<u>28</u>	<u>4</u>	<u>18</u>	<u>28</u>	<u>14</u>
<u>29</u>	<u>3</u>	<u>18</u>	<u>29</u>	<u>14</u>
<u>30</u>	<u>3</u>	<u>18</u>	<u>29</u>	<u>14</u>
<u>31</u>	<u>3</u>	<u>17</u>	<u>29</u>	<u>15</u>

wherein “Non-integer part of the subpixel offset” column is defined in 1/32 subpixel resolution.

10. The method of any one of claims 1 to 9, wherein the interpolation filter is selected from a set of filters used for the intra-prediction process for a given subpixel offset.

11. The method of claim 10, wherein the set of filters comprises a Gauss filter and a Cubic filter.

12. The method of any one of claims 1 to 11, wherein the quantity of the interpolation filter is N, wherein the N interpolation filters are used for intra reference sample interpolation and $N \geq 1$ and is a positive integer.

13. The method of any one of claims 1 to 12, wherein the reference samples include samples not adjacent to the block.

14. An intra-prediction method for predicting a current block included in a picture, the method comprising:

determining a size of a main reference side used in the intra-prediction based on:

an intra-prediction mode that provides, among available intra-prediction modes, a greatest non-integer value of a subpixel offset between a target sample among target samples in the current block and a reference sample used for predicting said target sample in the current block, the reference sample being a reference sample among reference samples included in the main reference side, and

a size of an interpolation filter to be applied on the reference samples included in the main reference side;

applying an interpolation filter on the reference samples included in the main reference side to obtain filtered reference samples; and

predicting the target samples included in the current block based on the filtered reference samples, wherein the size of the main reference side is determined as a sum of:

an integer part of the greatest non-integer value of said subpixel offset,

a size of a side of the current block, and

a half of the size of the interpolation filter.

15. The method of claim 14, wherein

the side of the current block is a width of the current block if the intra prediction mode is greater than a vertical intra prediction mode, VER_IDX;

or

the side of the current block is a height of the current block if the intra prediction mode is lesser than

a horizontal intra prediction mode, HOR_IDX.

16. The method according to claim 14 or 15, wherein values of reference samples having positions in the main reference side that are greater than double the size of the side of the current block are set to be equal to a value of a sample having a sample position that is double the size of the current block.

17. The method of any of claims 14 to 16, wherein padding is performed by replicating first and/or last reference samples of the main reference side to the left and/or to the right side respectively, in particular as follows: denoting the main reference side as ref, and the size of the main reference side as refS, the padding is represented as:

ref[-1] = p[0], and/or

ref[refS+1] = p[refS],

wherein ref[-1] represents a value of the left to the main reference side,

p[0] represents a value of the first reference sample of the main reference side,

ref[refS+1] represents a value of the right to the main reference side, and

p[refS] represents a value of the last reference sample of the main reference side.

18. An encoder comprising processing circuitry configured to carry out the method according to any one of claims 1 to 17.

19. A decoder comprising processing circuitry configured to carry out the method according to any one of claims 1 to 17.

20. A program that causes a computer to perform the method according to any one of claims 1 to 17.

21. A decoder, comprising:

one or more processors; and

a non-transitory computer-readable storage medium coupled to the processors and storing programming for execution by the processors, wherein the programming, when executed by the processors, configures the decoder to carry out the method according to any one of claims 1 to 17.

22. An encoder, comprising:

one or more processors; and

a non-transitory computer-readable storage medium coupled to the processors and storing programming for execution by the processors, wherein the programming, when executed by the processors, configures the encoder to carry out the method according to any one of claims 1 to 17.

23. An apparatus for intra-prediction of a current block included in a picture, the apparatus comprising:

an intra-prediction unit configured to predict target samples included in the current block based on filtered reference samples, the intra-prediction unit comprising:

a determination unit configured to determine a size of a main reference side used in the intra-prediction based on:

an intra-prediction mode that provides, among available intra-prediction modes, a greatest non-integer value of a subpixel offset between a target sample among the target samples in the current block and a reference sample used for predicting said target sample in the current block, the reference sample being a reference sample among reference samples included in the main reference side, and

a size of an interpolation filter to be applied on the reference samples included in the main reference side; and

a filtering unit configured to apply an interpolation filter on the reference samples included in the main reference side to obtain the filtered reference samples,

wherein the determination unit is configured to determine the size of the main reference side as a sum of:

an integer part of the greatest non-integer value of said subpixel offset,

a size of a side of the current block, and

a half of the size of the interpolation filter.

24. The apparatus according to claim 23, wherein the side of the current block is a width of the current block if the intra prediction mode is greater than a vertical intra prediction mode, VER_IDX;

or

the side of the current block is a height of the current block if the intra prediction mode is lesser than a horizontal intra prediction mode, HOR_IDX.

25. The apparatus according to claim 23 or 24, wherein values of reference samples having positions in the main reference side that are greater than double the size of the side of the current block are set to be equal to a value of a sample having a sample position that is double the size of the current block.

26. The apparatus of any of claims 23 to 25, wherein the determination unit is configured to perform padding by replicating first and/or last reference samples of the main reference side to the left and/or to the right side respectively, in particular as follows: denoting the main reference side as ref, and the size of the main reference side as refS, the padding is represented as:

$\text{ref}[-1] = \text{p}[0]$, and/or

$\text{ref}[\text{refS}+1] = \text{p}[\text{refS}]$,

wherein $\text{ref}[-1]$ represents a value of the left to the main reference side,

$\text{p}[0]$ represents a value of the first reference sample of the main reference side,

$\text{ref}[\text{refS}+1]$ represents a value of the right to the main reference side, and

$\text{p}[\text{refS}]$ represents a value of the last reference sample of the main reference side.

27. A video encoder for encoding a plurality of pictures into a bitstream, comprising the apparatus according to any of claims 23 to 26.

28. A video decoder for decoding a plurality of pictures from a bitstream, comprising the apparatus according to any of claims 23 to 26.

29. A non-transitory computer-readable medium storing computer instructions for performing intra prediction, that when executed by one or more processors, cause the one or more processors to perform the method according to any one of claims 1 to 17.