CLAIMS

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

determining a direction of at least one pixel of a block of pixels;

determining a metric for the at least one pixel of the block of pixels, wherein the metric is determined based on a comparison of pixel values for a subset of the pixels in the block to the at least one pixel and wherein the block of pixels is an MxN block of pixels, and wherein at least one of M or N is 2 or greater;

based on the metric and the direction, determining a filter for the at least one pixel of the block of pixels; and

generating a filtered image by applying the filter to the at least one pixel of the block of pixels.

2. The method of claim 1, wherein: the direction comprises one of a horizontal direction, a vertical direction, a 45-degree direction, and a 135-degree direction.

3. The method of claim 1, wherein determining the direction comprises comparing a measure of horizontal activity to a measure of vertical activity, and wherein the horizontal activity is determined based on comparing a pixel value of at least one pixel in the subset to a pixel value of a left neighboring pixel and a pixel value of a right neighboring pixel, wherein the left neighboring pixel and the right neighboring pixel are both in the block of pixels.

4. The method of claim 3, wherein the vertical activity is determined based on comparing a pixel value of at least one pixel in the subset to a pixel value of an upper neighboring pixel and a pixel value of a lower neighboring pixel, wherein the upper neighboring pixel and the lower neighboring pixel are both in the block of pixels.

5. The method of claim 1, wherein the subset of pixels comprises pixels not on the boundary of the MxN block.

6. The method of claim 1, wherein the block of pixels is a 4x4 block of pixels including sixteen pixels, and wherein the subset of pixels includes four pixels.

7. The method of claim 1,

wherein determining the metric comprises:

comparing the at least one pixel to a first neighboring pixel of the subset of pixels;

in response to a pixel value of the at least one pixel being greater than a pixel value of the first neighboring pixel, incrementing an edge metric variable;

in response to the pixel value of the at least one pixel being less than the pixel value of the first neighboring pixel, decrementing the edge metric variable.

8. The method of claim 7, wherein determining the metric further comprises:

comparing the at least one pixel to a second neighboring pixel of the subset of pixels;

in response to a pixel value of the at least one pixel being greater than a pixel value of the second neighboring pixel, incrementing the edge metric variable;

in response to the pixel value of the at least one pixel being less than the pixel value of the second neighboring pixel, decrementing the edge metric variable.

9. The method of claim 8, wherein the first neighboring pixel and the second neighboring pixel comprise one of:

a left neighboring pixel and a right neighboring pixel;

a top neighboring pixel and a bottom neighboring pixel;

a bottom-left neighboring pixel and a top-right neighboring pixel; and

a top-left neighboring pixel and a bottom-right neighboring pixel.

10. The method of claim 1, wherein the method is performed by a video coding device comprising a video encoder.

11. The method of claim 1, wherein the method is performed by a video coding device comprising a video decoder.

12. A video coding device comprising:

a filter unit configured to:

determine a direction of at least one pixel of a block of pixels;

determine a metric for the at least one pixel of the block of pixels, wherein the metric is determined based on a comparison of pixel values for a subset of the pixels in the block to the at least one pixel and wherein the block of pixels is an MxN block of pixels, and wherein at least one of M or N is 2 or greater;

determine a filter for the at least one pixel of the block of pixels based on the metric and the direction; and

generate a filtered image by applying the filter to the at least one pixel of the block of pixels a memory configured to store a filtered result of the filter unit;

a memory configured to store a filtered result of the filter unit.

13. The video coding device of claim 12, wherein the direction comprises one of a horizontal direction, a vertical direction, a 45-degree direction, and a 135-degree direction.

14. The video coding device of claim 12, wherein the filter unit determines the direction by comparing a measure of horizontal activity to a measure of vertical activity, and wherein the horizontal activity is determined based on comparing a pixel value of at least one pixel in the subset to a pixel value of a left neighboring pixel and a pixel value of a right neighboring pixel, wherein the left neighboring pixel and the right neighboring pixel are both in the block of pixels.

15. The video coding device of claim 14, wherein the vertical activity is determined based on comparing a pixel value of at least one pixel in the subset to a pixel value of an upper neighboring pixel and a pixel value of a lower neighboring pixel, wherein the upper neighboring pixel and the lower neighboring pixel are both in the block of pixels.

16. The video coding device of claim 12, wherein the subset of pixels comprises pixels not on the boundary of the MxN block.

17. The video coding device of claim 12, wherein the block of pixels is a 4x4 block of pixels including sixteen pixels, and wherein the subset of pixels includes four pixels.

18. The video coding device of claim 12, wherein the filter unit is further configured to determine the metric by:

comparing the at least one pixel to a first neighboring pixel of the subset of pixels;

in response to a pixel value of the at least one pixel being greater than a pixel value of the first neighboring pixel, incrementing an edge metric variable;

in response to the pixel value of the at least one pixel being less than the pixel value of the first neighboring pixel, decrementing the edge metric variable.

19. The video coding device of claim 18, wherein the filter unit is further configured to determine the metric by:

comparing the at least one pixel to a second neighboring pixel of the subset of pixels;

in response to a pixel value of the at least one pixel being greater than a pixel value of the second neighboring pixel, incrementing the edge metric variable;

in response to the pixel value of the at least one pixel being less than the pixel value of the second neighboring pixel, decrementing the edge metric variable.

20. The video coding device of claim 19, wherein the first neighboring pixel and the second neighboring pixel comprise one of:

a left neighboring pixel and a right neighboring pixel;

a top neighboring pixel and a bottom neighboring pixel;

a bottom-left neighboring pixel and a top-right neighboring pixel; and

a top-left neighboring pixel and a bottom-right neighboring pixel.

21. The video coding device of claim 12, wherein the video coding device comprises a video encoder.

22. The video coding device of claim 12, wherein the video coding device comprises a video decoder.

23. An apparatus comprising:

means for determining a direction of at least one pixel of a block of pixels;

means for determining a metric for the at least one pixel of the block of pixels, wherein the metric is determined based on a comparison of pixel values for a subset of the pixels in the block to the at least one pixel and wherein the block of pixels is an MxN block of pixels, and wherein at least one of M or N is 2 or greater;

means for determining a filter for the at least one pixel of the block of pixels based on the metric and the direction; and

means for generating a filtered image by applying the filter to the at least one pixel of the block of pixels.

24. The apparatus of claim 23, wherein the direction comprises one of a horizontal direction, a vertical direction, a 45-degree direction, and a 135-degree direction.

25. The apparatus of claim 23, wherein the means for determining the metric comprises means for comparing a measure of horizontal activity to a measure of vertical activity, and where the means for comparing the measure of horizontal activity to the measure of vertical activity comprises means for comparing a pixel value of at least one pixel in the subset to a pixel value of a left neighboring pixel and a pixel value of a right neighboring pixel, wherein the left neighboring pixel and the right neighboring pixel are both in the block of pixels.

26. The apparatus of claim 25, wherein the means for comparing the measure of horizontal activity to the measure of vertical activity further comprises means for comparing a pixel value of at least one pixel in the subset to a pixel value of an upper neighboring pixel and a pixel value of a lower neighboring pixel, wherein the left neighboring pixel and the right neighboring pixel are both in the block of pixels.

27. The apparatus of claim 23, wherein the subset of pixels comprises pixels not on the boundary of the MxN block.

28. The apparatus of claim 23, wherein the block of pixels is a 4x4 block of pixels including sixteen pixels, and wherein the subset of pixels includes four pixels.

29. The apparatus of claim 23,

wherein the means for determining the metric comprises:

means for comparing the at least one pixel to a first neighboring pixel of the subset of pixels;

means for incrementing an edge metric variable in response to a pixel value of the at least one pixel being greater than a pixel value of the first neighboring pixel;

means for decrementing the edge metric variable in response to the pixel value of the at least one pixel being less than the pixel value of the first neighboring pixel.

30. The apparatus of claim 29,

wherein the means for determining the metric further comprises:

means for comparing the at least one pixel to a second neighboring pixel of the subset of pixels;

means for incrementing the edge metric variable in response to a pixel value of the at least one pixel being greater than a pixel value of the second neighboring pixel;

means for decrementing the edge metric variable in response to the pixel value of the at least one pixel being less than the pixel value of the second neighboring pixel.

31. The apparatus of claim 30, wherein the first neighboring pixel and the second neighboring pixel comprise one of:

a left neighboring pixel and a right neighboring pixel;

a top neighboring pixel and a bottom neighboring pixel;

a bottom-left neighboring pixel and a top-right neighboring pixel; and

a top-left neighboring pixel and a bottom-right neighboring pixel.

32. The apparatus of claim 23, wherein the apparatus comprises a video encoder.

33. The apparatus of claim 23, wherein the apparatus comprises a video decoder.

34. A computer-readable storage medium having stored thereon instructions that when executed cause one or more processors to:

determine a direction of at least one pixel of a block of pixels;

determine a metric for the at least one pixel of the block of pixels, wherein the metric is determined based on a comparison of pixel values for a subset of the pixels in the block to the at least one pixel and wherein the block of pixels is an MxN block of pixels, and wherein at least one of M or N is 2 or greater;

determine a filter for the at least one pixel of the block of pixels based on the metric and the direction; and

generate a filtered image by applying the filter to the at least one pixel of the block of pixels.

35. The computer-readable storage medium of claim 34, wherein the direction comprises one of a horizontal direction, a vertical direction, a 45-degree direction, and a 135-degree direction.

36. The computer-readable storage medium of claim 34, wherein the one more processors determine the direction by comparing a measure of horizontal activity to a measure of vertical activity and determine the horizontal activity based on comparing a pixel value of at least one pixel in the subset to a pixel value of a left neighboring pixel and a pixel value of a right neighboring pixel, wherein the left neighboring pixel and the right neighboring pixel are both in the block of pixels.

37. The computer-readable storage medium of claim 36, wherein the one or more processors determine the vertical activity based on comparing a pixel value of at least one pixel in the subset to a pixel value of an upper neighboring pixel and a pixel value of a lower neighboring pixel, wherein the upper neighboring pixel and the lower neighboring pixel are both in the block of pixels.

38. The computer-readable storage medium of claim 34, wherein the subset of pixels comprises pixels not on the boundary of the MxN block.

39. The computer-readable storage medium of claim 34, wherein the block of pixels is a 4x4 block of pixels including sixteen pixels, and wherein the subset of pixels includes four pixels.

40. The computer-readable storage medium of claim 34, having stored thereon additional instructions that when executed cause the one or more processors to determine the metric by:

comparing the at least one pixel to a first neighboring pixel of the subset of pixels;

in response to a pixel value of the at least one pixel being greater than a pixel value of the first neighboring pixel, incrementing an edge metric variable;

in response to the pixel value of the at least one pixel being less than the pixel value of the first neighboring pixel, decrementing the edge metric variable.

41. The computer-readable storage medium of claim 40 having stored thereon additional instructions that when executed cause the one or more processors to determine the metric by:

comparing the at least one pixel to a second neighboring pixel of the subset of pixels;

in response to a pixel value of the at least one pixel being greater than a pixel value of the second neighboring pixel, incrementing the edge metric variable;

in response to the pixel value of the at least one pixel being less than the pixel value of the second neighboring pixel, decrementing the edge metric variable.

42. The computer-readable storage medium of claim 41, wherein the first neighboring pixel and the second neighboring pixel comprise one of:

a left neighboring pixel and a right neighboring pixel;

a top neighboring pixel and a bottom neighboring pixel;

a bottom-left neighboring pixel and a top-right neighboring pixel; and

a top-left neighboring pixel and a bottom-right neighboring pixel.

43. The computer-readable storage medium of claim 34, wherein the one or more processors perform video encoding.

44. The computer-readable storage medium of claim 34, wherein the one or more processors perform video decoding.

CLAIMS

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

determining a direction of at least one pixel of a block of pixels;

determining a metric for the at least one pixel of the block of pixels, wherein the metric is determined based on a comparison of pixel values for a subset of the pixels in the block to the at least one pixel, wherein the block of pixels is an M×N block of pixels, and wherein at least one of M or N is 2 or greater;

based on the metric and the direction, determining a filter for the at least one pixel of the block of pixels; and

generating a filtered image by applying the filter to the at least one pixel of the block of pixels.

2. The method of claim **1**, wherein the direction comprises one of a horizontal direction, a vertical direction, a 45-degree direction, or a 135-degree direction.

3. The method of claim **1**, wherein determining the direction comprises comparing a measure of horizontal activity to a measure of vertical activity,

wherein the horizontal activity is determined based on comparing a pixel value of at least one pixel in the subset to a pixel value of a left neighboring pixel and a pixel value of a right neighboring pixel, and

wherein the left neighboring pixel and the right neighboring pixel are both in the block of pixels.

4. The method of claim **3**, wherein the vertical activity is determined based on comparing a pixel value of at least one pixel in the subset to a pixel value of an upper neighboring pixel and a pixel value of a lower neighboring pixel, and wherein the upper neighboring pixel and the lower neighboring pixel are both in the block of pixels.

5. The method of claim **1**, wherein the subset of pixels comprises pixels not on the boundary of the M×N block.

6. The method of claim **1**, wherein the block of pixels is a 4×4 block of pixels including sixteen pixels, and wherein the subset of pixels includes four pixels.

7. The method of claim **1**,

wherein determining the metric comprises:

comparing the at least one pixel to a first neighboring pixel of the subset of pixels;

in response to a pixel value of the at least one pixel being greater than a pixel value of the first neighboring pixel, incrementing an edge metric variable; and

in response to the pixel value of the at least one pixel being less than the pixel value of the first neighboring pixel, decrementing the edge metric variable.

8. The method of claim **7**, wherein determining the metric further comprises:

comparing the at least one pixel to a second neighboring pixel of the subset of pixels;

in response to a pixel value of the at least one pixel being greater than a pixel value of the second neighboring pixel, incrementing the edge metric variable; and

in response to the pixel value of the at least one pixel being less than the pixel value of the second neighboring pixel, decrementing the edge metric variable.

9. The method of claim **1**, wherein the first neighboring pixel and the second neighboring pixel comprise one of:

a left neighboring pixel and a right neighboring pixel;

a top neighboring pixel and a bottom neighboring pixel;

a bottom-left neighboring pixel and a top-right neighboring pixel; or

a top-left neighboring pixel and a bottom-right neighboring pixel.

10. The method of claim **1**, wherein the method is performed by a video coding device comprising a video encoder.

11. The method of claim **1**, wherein the method is performed by a video coding device comprising a video decoder.

12. A video coding device comprising:

a filter unit configured to:

determine a direction of at least one pixel of a block of pixels;

determining a metric for the at least one pixel of the block of pixels, wherein the metric is determined based on a comparison of pixel values for a subset of the pixels in the block to the at least one pixel, wherein the block of pixels is an M×N block of pixels, and wherein at least one of M or N is 2 or greater;

determine a filter for the at least one pixel of the block of pixels based on the metric and the direction; and

generate a filtered image by applying the filter to the at least one pixel of the block of pixels; and

a memory configured to store a filtered result of the filter unit.

13. The video coding device of claim **12**, wherein the direction comprises one of a horizontal direction, a vertical direction, a 45-degree direction, or a 135-degree direction.

14. The video coding device of claim **12**, wherein the filter unit determines the direction by comparing a measure of horizontal activity to a measure of vertical activity,

wherein the horizontal activity is determined based on comparing a pixel value of at least one pixel in the subset to a pixel value of a left neighboring pixel and a pixel value of a right neighboring pixel, and

wherein the left neighboring pixel and the right neighboring pixel are both in the block of pixels.

15. The video coding device of claim **14**, wherein the vertical activity is determined based on comparing a pixel value of at least one pixel in the subset to a pixel value of an upper neighboring pixel and a pixel value of a lower neighboring pixel, and wherein the upper neighboring pixel and the lower neighboring pixel are both in the block of pixels.

16. The video coding device of claim **12**, wherein the subset of pixels comprises pixels not on the boundary of the M×N block.

17. The video coding device of claim **12**, wherein the block of pixels is a 4×4 block of pixels including sixteen pixels, and wherein the subset of pixels includes four pixels.

18. The video coding device of claim **12**, wherein the filter unit is further configured to determine the metric by:

comparing the at least one pixel to a first neighboring pixel of the subset of pixels;

in response to a pixel value of the at least one pixel being greater than a pixel value of the first neighboring pixel, incrementing an edge metric variable; and

in response to the pixel value of the at least one pixel being less than the pixel value of the first neighboring pixel, decrementing the edge metric variable.

19. The video coding device of claim **18**, wherein the filter unit is further configured to determine the metric by:

comparing the at least one pixel to a second neighboring pixel of the subset of pixels;

in response to a pixel value of the at least one pixel being greater than a pixel value of the second neighboring pixel, incrementing the edge metric variable; and

in response to the pixel value of the at least one pixel being less than the pixel value of the second neighboring pixel, decrementing the edge metric variable.

20. The video coding device of claim **19**, wherein the first neighboring pixel and the second neighboring pixel comprise one of:

a left neighboring pixel and a right neighboring pixel;

a top neighboring pixel and a bottom neighboring pixel;

a bottom-left neighboring pixel and a top-right neighboring pixel; or

a top-left neighboring pixel and a bottom-right neighboring pixel.

21. The video coding device of claim **12**, wherein the video coding device comprises a video encoder.

22. The video coding device of claim **12**, wherein the video coding device comprises a video decoder.

23. An apparatus comprising:

means for determining a direction of at least one pixel of a block of pixels;

means for determining a metric for the at least one pixel of the block of pixels, wherein the first metric is determined based on a comparison of pixel values for a subset of the pixels in the block to the at least one pixel, wherein the

block of pixels is an M×N block of pixels, and wherein at least one of M or N is 2 or greater;

means for determining a filter for the at least one pixel of the block of pixels based on the metric and the direction; and

means for generating a filtered image by applying the filter to the at least one pixel of the block of pixels.

24. The apparatus of claim **23**, wherein the direction comprises one of a horizontal direction, a vertical direction, a 45-degree direction, or a 135-degree direction.

25. The apparatus of claim **23**, wherein the means for determining the metric comprises means for comparing a measure of horizontal activity to a measure of vertical activity,

wherein the means for comparing the measure of horizontal activity to the measure of vertical activity comprises means for comparing a pixel value of at least one pixel in the subset to a pixel value of a left neighboring pixel and a pixel value of a right neighboring pixel, and

wherein the left neighboring pixel and the right neighboring pixel are both in the block of pixels.

26. The apparatus of claim **25**,

wherein the means for comparing the measure of horizontal activity to the measure of vertical activity further comprises means for comparing a pixel value of at least one pixel in the subset to a pixel value of an upper neighboring pixel and a pixel value of a lower neighboring pixel, and wherein the left neighboring pixel and the right neighboring pixel are both in the block of pixels.

27. The apparatus of claim **23**, wherein the subset of pixels comprises pixels not on the boundary of the M×N block.

28. The apparatus of claim **23**, wherein the block of pixels is a 4×4 block of pixels including sixteen pixels, and wherein the subset of pixels includes four pixels.

29. The apparatus of claim **23**,

wherein the means for determining the metric comprises:

means for comparing the at least one pixel to a first neighboring pixel of the subset of pixels;

means for incrementing an edge metric variable in response to a pixel value of the at least one pixel being greater than a pixel value of the first neighboring pixel; and

means for decrementing the edge metric variable in response to the pixel value of the at least one pixel being less than the pixel value of the first neighboring pixel.

30. The apparatus of claim **29**,

wherein the means for determining the metric further comprises:

means for comparing the at least one pixel to a second neighboring pixel of the subset of pixels;

means for incrementing the edge metric variable in response to a pixel value of the at least one pixel being greater than a pixel value of the second neighboring pixel; and

means for decrementing the edge metric variable in response to the pixel value of the at least one pixel being less than the pixel value of the second neighboring pixel.

31. The apparatus of claim **30**, wherein the first neighboring pixel and the second neighboring pixel comprise one of:

a left neighboring pixel and a right neighboring pixel;

a top neighboring pixel and a bottom neighboring pixel;

a bottom-left neighboring pixel and a top-right neighboring pixel; or

a top-left neighboring pixel and a bottom-right neighboring pixel.

32. The apparatus of claim **23**, wherein the apparatus comprises a video encoder.

33. The apparatus of claim **23**, wherein the apparatus comprises a video decoder.

34. A non-transitory, computer-readable storage medium having stored thereon instructions that when executed cause one or more processors to:

determine a direction of at least one pixel of a block of pixels;

determine a metric for the at least one pixel of the block of pixels, wherein the metric is determined based on a comparison of pixel values for a subset of the pixels in the block to the at least one pixel, wherein the block of pixels is an M×N block of pixels, and wherein at least one of M or N is 2 or greater;

determine a filter for the at least one pixel of the block of pixels based on the metric and the direction; and

generate a filtered image by applying the filter to the at least one pixel of the block of pixels.

35. The non-transitory, computer-readable storage medium of claim **34**, wherein the direction comprises one of a horizontal direction, a vertical direction, a 45-degree direction, and a 135-degree direction.

36. The non-transitory, computer-readable storage medium of claim **34**, wherein the one more processors determine the direction by comparing a measure of horizontal activity to a measure of vertical activity and determine the horizontal activity based on comparing a pixel value of at least one pixel in the subset to a pixel value of a left neighboring pixel and a pixel value of a right neighboring pixel, and wherein the left neighboring pixel and the right neighboring pixel are both in the block of pixels.

37. The non-transitory, computer-readable storage medium of claim **36**, wherein the one or more processors

determine the vertical activity based on comparing a pixel value of at least one pixel in the subset to a pixel value of an upper neighboring pixel and a pixel value of a lower neighboring pixel, and wherein the upper neighboring pixel and the lower neighboring pixel are both in the block of pixels.

38. The non-transitory, computer-readable storage medium of claim **34**, wherein the subset of pixels comprises pixels not on the boundary of the M×N block.

39. The non-transitory, computer-readable storage medium of claim **34**, wherein the block of pixels is a 4×4 block of pixels including sixteen pixels, and wherein the subset of pixels includes four pixels.

40. The non-transitory, computer-readable storage medium of claim **34**, having stored thereon additional instructions that when executed cause the one or more processors to determine the metric by:

comparing the at least one pixel to a first neighboring pixel of the subset of pixels;

in response to a pixel value of the at least one pixel being greater than a pixel value of the first neighboring pixel, incrementing an edge metric variable; and

in response to the pixel value of the at least one pixel being less than the pixel value of the first neighboring pixel, decrementing the edge metric variable.

41. The non-transitory, computer-readable storage medium of claim having stored thereon additional instructions that when executed cause the one or more processors to determine the metric by:

comparing the at least one pixel to a second neighboring pixel of the subset of pixels;

in response to a pixel value of the at least one pixel being greater than a pixel value of the second neighboring pixel, incrementing the edge metric variable; and

in response to the pixel value of the at least one pixel being less than the pixel value of the second neighboring pixel, decrementing the edge metric variable.

42. The non-transitory, computer-readable storage medium of claim **41**, wherein the first neighboring pixel and the second neighboring pixel comprise one of:

a left neighboring pixel and a right neighboring pixel;

a top neighboring pixel and a bottom neighboring pixel;

a bottom-left neighboring pixel and a top-right neighboring pixel; or

a top-left neighboring pixel and a bottom-right neighboring pixel.

43. The non-transitory, computer-readable storage medium of claim **34**, wherein the one or more processors perform video encoding.

44. The non-transitory, computer-readable storage medium of claim **34**, wherein the one or more processors perform video decoding.