

MDK Movidius Computer Vision (MvCV) Library

MDK Kernel Performance Report

v1.2

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| 1 Introduction | |
|----------------|---|
| | |
| 2 Methodology | 4 |
| | |
| 3 Results | |



1 Introduction

This report gives a brief outline of kernel performance on Myriad 2.

2 Methodology

Performance is measured for a kernel being called for 512 output pixels. The final run length in SHAVE clock cycles is then given as a CC/Pixel number, by dividing the total number of clock cycles for the function call by 512.

3 Results

Though most of the results displayed in the table below are for software kernels only, as specified in the "HW also" column, some of these are also for Hardware. Unless otherwise noted kernels have 8-bit input/output and fp16 internal precision.

| Kernel Name | INA/ .l | ASM | C Optimized | 0.1 |
|----------------------------------|---------|------------|-------------|----------|
| | HW also | CC / Pixel | CC/Pixel | Category |
| absoluteDiff | _ | 0.49 | 0.71 | MvCV |
| accumulateFp16MaxPool3s2withReLU | _ | 3.10 | 3.07 | MvCV |
| accumulateSquare | _ | 1.02 | _ | MvCV |
| accumulateWeighted | _ | 1.01 | _ | MvCV |
| aggregateAllPaths64 | _ | 0.50 | 0.85 | MvCV |
| arithmeticAdd | _ | 0.22 | _ | MvCV |
| arithmeticAddmask | _ | 0.49 | _ | MvCV |
| arithmeticSub | _ | 0.21 | _ | MvCV |
| arithmeticSubFp16ToFp16 | _ | 0.40 | _ | MvCV |
| arithmeticSubmask | _ | 0.49 | _ | MvCV |
| bilateral5x5 | _ | 32.18 | _ | MvCV |
| bilinearInterpolation_u16 | _ | 2.34 | _ | MvCV |
| bitwiseAnd | _ | 0.21 | 0.52 | MvCV |
| bitwiseAndMask | _ | 0.28 | _ | MvCV |
| bitwiseNot | _ | 0.15 | _ | MvCV |
| bitwiseOr | _ | 0.21 | 0.45 | MvCV |
| bitwiseOrMask | _ | 0.28 | _ | MvCV |
| bitwiseXor | | 0.21 | _ | MvCV |



| Warran N | 104/ -1 | ASM | C Optimized | 0-1 |
|--------------------------|---------|------------|-------------|----------|
| Kernel Name | HW also | CC / Pixel | CC/Pixel | Category |
| bitwiseXorMask | _ | 0.28 | _ | MvCV |
| boxFilter | _ | 169.85 | _ | MvCV |
| boxFilter11x11 | _ | 2.89 | _ | MvCV |
| boxFilter13x13 | _ | 3.47 | _ | MvCV |
| boxFilter15x15 | _ | 4.01 | _ | MvCV |
| boxFilter3x3 | _ | 0.69 | _ | MvCV |
| boxFilter5x5 | Yes | 1.44 | 7.12 | MvCV |
| boxFilter7x7 | Yes | 1.95 | 6.39 | MvCV |
| boxFilter9x9 | _ | 2.40 | _ | MvCV |
| canny | _ | 135.97 | _ | MvCV |
| censusMatching16 | _ | 0.51 | _ | MvCV |
| censusMatching32 | _ | 0.50 | 4.34 | MvCV |
| censusMatching64 | _ | 0.50 | _ | MvCV |
| censusMatching65 | _ | 0.50 | _ | MvCV |
| censusMatchingPyr | _ | 1.86 | _ | MvCV |
| censusMin16 | _ | 32.03 | 59.03 | MvCV |
| censusMin64 | _ | 42.02 | _ | MvCV |
| censusMin65 | _ | 130.02 | _ | MvCV |
| censusMin7 | _ | 14.02 | 19.08 | MvCV |
| censusTransform5x5 | _ | 11.23 | _ | MvCV |
| censusTransform7x7 | _ | 10.97 | _ | MvCV |
| censusTransform11x11 | _ | 72.92 | 136.01 | MvCV |
| channelExtract | Yes | 0.28 | 0.36 | MvCV |
| computeAD32 | _ | 0.36 | 0.4 | MvCV |
| computeCombinedCost64 | _ | 0.37 | 0.73 | MvCV |
| convertFrom12BppTo8Bpp | _ | 0.27 | 1.89 | MvCV |
| convolution11x11 | _ | 16.34 | _ | MvCV |
| convolution15x1 | _ | 3.07 | _ | MvCV |
| convolution1x15 | _ | 3.06 | - | MvCV |
| convolution1x5 | _ | 1.19 | _ | MvCV |
| convolution1x5Fp16ToFp16 | _ | 1.16 | _ | MvCV |
| convolution1x7 | _ | 2.06 | 93.73 | MvCV |
| convolution1x7Fp16ToFp16 | _ | 1.78 | _ | MvCV |

5



| Kernel Name | HW also | ASM | C Optimized | Catagomi |
|------------------------------|----------|------------|-------------|----------|
| | HVV also | CC / Pixel | CC/Pixel | Category |
| convolution1x9 | _ | 2.31 | _ | MvCV |
| convolution3x3 | Yes | 2.19 | 5.62 | MvCV |
| convolution3x3Fp16ToFp16 | _ | 2.26 | _ | MvCV |
| convolution5x1 | _ | 1.19 | _ | MvCV |
| convolution5x1Fp16ToFp16 | _ | 1.16 | _ | MvCV |
| convolution5x5 | Yes | 4.31 | 13.5 | MvCV |
| convolution5x5Fp16ToFp16 | _ | 4.25 | 12.63 | MvCV |
| convolution5x5s4hhhh | _ | 18.54 | 20.11 | MvCV |
| convolution7x1 | _ | 2.07 | _ | MvCV |
| convolution7x1Fp16ToFp16 | - | 1.91 | _ | MvCV |
| convolution7x7 | _ | 7.29 | _ | MvCV |
| convolution7x7Fp16ToFp16 | _ | 7.31 | _ | MvCV |
| convolution7x7Fp16ToU8 | - | 7.30 | 28.8 | MvCV |
| convolution9x1 | - | 2.32 | _ | MvCV |
| convolution9x9 | - | 11.33 | _ | MvCV |
| convolution9x9Fp16ToFp16 | - | 11.27 | _ | MvCV |
| convolution9x9s8hhhh | - | 90.32 | 79.3 | MvCV |
| convSeparable11x11 | - | 4.39 | _ | MvCV |
| convSeparable11x11Fp16ToFp16 | _ | 4.25 | _ | MvCV |
| convSeparable3x3 | Yes | 1.03 | _ | MvCV |
| convSeparable3x3Fp16ToFp16 | _ | 1.03 | 1.92 | MvCV |
| convSeparable5x5 | Yes | 1.83 | _ | MvCV |
| convSeparable5x5Fp16ToFp16 | - | 1.76 | 6.75 | MvCV |
| convSeparable7x7 | Yes | 2.61 | _ | MvCV |
| convSeparable7x7Fp16ToFp16 | _ | 2.53 | _ | MvCV |
| convSeparable9x9 | _ | 3.37 | _ | MvCV |
| convSeparable9x9Fp16ToFp16 | _ | 3.29 | _ | MvCV |
| cornerMinEigenVal | _ | 38.15 | 243.1 | MvCV |
| cornerMinEigenVal_patched | _ | 175.00 | _ | MvCV |
| cvtColorKernelRGBToYUV | Yes | 14.44 | _ | MvCV |
| cvtColorKernelRGBToYUV422 | Yes | 4.17 | _ | MvCV |
| cvtColorKernelYUV422ToRGB | Yes | 3.16 | _ | MvCV |
| cvtColorKernelYUVToRGB | Yes | 2.65 | _ | MvCV |



| Kernel Name | I mar . I | ASM | C Optimized | Category |
|-------------------------------|-----------|------------|-------------|----------|
| | HW also | CC / Pixel | CC/Pixel | |
| cvtColorNV21toRGB | _ | 2.52 | _ | MvCV |
| cvtColorRGBfp16ToLumaU8 | _ | 0.66 | 1.16 | MvCV |
| cvtColorRGBfp16ToUV420U8 | _ | 2.27 | _ | MvCV |
| cvtColorRGBtoChromaNV12 | _ | 1.13 | _ | MvCV |
| cvtColorRGBtoLuma | _ | 0.66 | _ | MvCV |
| cvtColorRGBtoLumaNV12 | _ | 0.78 | _ | MvCV |
| cvtColorRGBtoNV21 | _ | 2.41 | _ | MvCV |
| cvtColorRGBtoUV | - | 2.16 | _ | MvCV |
| cvtColorRGBtoUV420 | - | 2.27 | _ | MvCV |
| dilate | _ | 36.54 | _ | MvCV |
| dilate3x3 | _ | 1.89 | _ | MvCV |
| dilate5x5 | _ | 6.75 | _ | MvCV |
| dilate7x7 | - | 17.44 | 12.91 | MvCV |
| equalizeHist | - | 3.03 | _ | MvCV |
| erode3x3 | - | 3.03 | _ | MvCV |
| erode5x5 | - | 7.62 | _ | MvCV |
| erode7x7 | - | 18.18 | _ | MvCV |
| fast9M2 | _ | 18.43 | _ | MvCV |
| flipKernel | _ | 0.28 | 0.56 | MvCV |
| gauss | - | 2.72 | _ | MvCV |
| gauss1x5_u16in_u32out | _ | 1.63 | 3.55 | MvCV |
| gaussHx2 | _ | 1.01 | _ | MvCV |
| gaussHx2_fp16 | - | 0.59 | _ | MvCV |
| gaussVx2 | _ | 1.03 | _ | MvCV |
| gaussVx2_fp16 | _ | 1.03 | _ | MvCV |
| hammingDistance | _ | 0.13 | 0.11 | MvCV |
| harrisResponse | Yes | 13.75 | _ | MvCV |
| histogram | _ | 4.55 | _ | MvCV |
| integralImageSumM2 | _ | 1.28 | _ | MvCV |
| integralImageSumFloatM2 | _ | 1.73 | _ | MvCV |
| integrallmageSquareSumM2 | _ | 2.16 | 7.27 | MvCV |
| integralImageSquareSumFloatM2 | _ | 3.06 | 4.17 | MvCV |
| integrallmageSumU16U32 | _ | 1.29 | _ | MvCV |



| Kernel Name | HW also | ASM | C Optimized | Catago |
|--------------------------|---------|------------|-------------|----------|
| | HW also | CC / Pixel | CC/Pixel | Category |
| interpolatePixelBilinear | _ | 39.00 | _ | MvCV |
| jpegGetBlockY420 | _ | 39.00 | 34 | MvCV |
| lookupTable10to16 | Yes | 3.79 | _ | MvCV |
| lookupTable10to8 | Yes | 1.55 | _ | MvCV |
| lookupTable12to16 | Yes | 3.79 | _ | MvCV |
| lookupTable12to8 | Yes | 3.78 | _ | MvCV |
| lookupTable8to8 | Yes | 1.71 | _ | MvCV |
| matrixVectorMultfp16x4 | _ | 0.33 | 1.17 | MvCV |
| maximumV3 | _ | 0.52 | 0.8 | MvCV |
| maxTest3x3_fp16 | _ | 36.23 | _ | MvCV |
| meanStdDev | _ | 0.54 | 0.64 | MvCV |
| medianFilter11x11 | Yes | 149.72 | _ | MvCV |
| medianFilter13x13 | Yes | 169.58 | _ | MvCV |
| medianFilter15x15 | Yes | 184.03 | _ | MvCV |
| medianFilter3x3 | Yes | 74.35 | _ | MvCV |
| median Filter 5x5 | Yes | 92.83 | _ | MvCV |
| medianFilter7x7 | Yes | 110.46 | _ | MvCV |
| medianFilter9x9 | Yes | 130.51 | _ | MvCV |
| minKernel | _ | 115.00 | 165 | MvCV |
| minMaxKernel | _ | 0.97 | _ | MvCV |
| minMaxPos | _ | 2.30 | 27.37 | MvCV |
| minTest3x3_fp16 | _ | 36.23 | _ | MvCV |
| nonMax3x3_fp32 | _ | 14.01 | _ | MvCV |
| pixelPos | _ | 0.34 | _ | MvCV |
| pyrdown | _ | 1.09 | _ | MvCV |
| scharr_fp16 | _ | 3.20 | 6.08 | MvCV |
| sLaplacian3x3 | _ | 0.66 | _ | MvCV |
| sLaplacian3x3Fp16ToFp16 | _ | 0.66 | _ | MvCV |
| sLaplacian5x5 | _ | 2.28 | _ | MvCV |
| sLaplacian5x5Fp16ToFp16 | _ | 2.52 | 5.41 | MvCV |
| sLaplacian7x7 | _ | 5.68 | _ | MvCV |
| sLaplacian7x7Fp16ToFp16 | _ | 6.77 | _ | MvCV |
| sobel | Yes | 3.64 | _ | MvCV |
| | | 1 | 1 | |



| Kernel Name | HW also | ASM | C Optimized | Catago |
|----------------------------|----------|------------|-------------|----------|
| | nvv also | CC / Pixel | CC/Pixel | Category |
| ssdPointLine7x7U8U32 | _ | 31.30 | 41.07 | MvCV |
| sumOfAbsDiff11x11 | - | 4.43 | _ | MvCV |
| sumOfAbsDiff5x5 | _ | 2.02 | _ | MvCV |
| sumOfSquaredDiff11x11 | _ | 6.07 | 34.93 | MvCV |
| sumOfSquaredDiff5x5 | _ | 3.03 | _ | MvCV |
| sumOfSquaredDiff7x7U8ToU32 | _ | 6.41 | _ | MvCV |
| thresholdBinaryRange | - | 0.21 | _ | MvCV |
| thresholdBinaryU8 | _ | 0.21 | 0.27 | MvCV |
| thresholdFilter | _ | 2.52 | 6.29 | MvCV |
| thresholdKernel | _ | 0.91 | _ | MvCV |
| warpMeshSample8bit | _ | 2.64 | 14.46 | MvCV |
| whiteBalanceBayerGBRG | _ | 0.81 | 13.02 | MvCV |
| whiteBalanceRGB | _ | 1.52 | 3.69 | MvCV |
| awbStatsSaturated | _ | 0.74 | _ | MvISP |
| awbStatsSaturatedU32 | _ | 0.74 | _ | MvISP |
| combDecimDemosaic | - | 1.82 | _ | MvISP |
| combDecimDemosaicAwbGains | _ | 2.53 | _ | MvISP |
| genChromaFp16 | _ | 1.16 | _ | MvISP |
| genChromaRGB16 | _ | 2.43 | _ | MvISP |
| genChromaSS | _ | 3.67 | _ | MvISP |
| genDnsRefFp16 | _ | 3.53 | _ | MvISP |
| genLumaFp16 | _ | 0.90 | _ | MvISP |
| genLumaU8Fp16 | _ | 0.79 | - | MvISP |
| greyDesat | _ | 3.31 | _ | MvISP |
| histogramStat | _ | 9.11 | - | MvISP |
| localTM | _ | 5.35 | - | MvISP |
| mixMedian | _ | 1.40 | _ | MvISP |
| pixelPacker10b | _ | 0.89 | _ | MvISP |
| pixelUnpacker | _ | 1.91 | _ | MvISP |
| pixelUnpackerMipi10b | _ | 0.77 | _ | MvISP |
| pixelUnpackerWB | _ | 1.66 | - | MvISP |
| purpleFlare | _ | 4.54 | _ | MvISP |
| randNoiseFp16 | _ | 1.29 | _ | MvISP |



| Kernel Name | HW also | ASM | C Optimized | Cotogomi |
|-------------------------|---------|------------|-------------|----------|
| | | CC / Pixel | CC/Pixel | Category |
| scale05BilinHV_Fp16U8 | _ | 0.90 | _ | MvISP |
| scale05BilinHV_U16ToU16 | _ | 0.66 | _ | MvISP |
| scale05BilinHV_U8ToU8 | _ | 0.58 | _ | MvISP |
| scale05BilinHVFp16 | _ | 0.35 | _ | MvISP |
| scale05Lanc6HV | _ | 3.35 | _ | MvISP |

