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Assignment: Week 1

Course: CS5330

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Answer

1. The difference between an interleaved image representation and a planar image representation in memory:
   1. For each consecutive pixel the interleaved image representation stores distinct color data at adjacent memory addresses in the same buffer.
   2. For all pixels the planar image representation stores monochromatic image data in continuous memory blocks.

Example of interleaved image Example of planar image

|  |
| --- |
| B N-1 |
| G N-1 |
| R N-1 |
| … |
| … |
| B2 |
| G2 |
| R2 |
| B1 |
| G1 |
| R1 |
| B0 |
| G0 |
| R0 |

|  |
| --- |
| B N-1 |
| … |
| B2 |
| B1 |
| B0 |
| G N-1 |
| … |
| G2 |
| G1 |
| G0 |
| R N-1 |
| … |
| R2 |
| R1 |
| R0 |

1. A filter could do:
   1. Image processing: blurred or deblurred or smooth the image. This could be done through:
      1. Exposure: multiply by a scaler
      2. Color balance: multiply each channel by different value
      3. Color negative: 255 - value
   2. Feature extraction: some filters are designed to accentuate the specific feature of the image. That could be done through multiplying each channel or color by a value then sum the result ( . For example, we could try to find the coefficient of f such that the purple color pop or something like that.
2. A couple of ways of handling boundary issues (the edges of the image) when applying a filter:
   1. Valid convolution (valid padding): only place the filter that is inside the image. The result; however, is a smaller spatial image.
   2. Same convolution (same padding): out put size will be the same and this is done through padding.
3. If you have a 3x3 filter, there are 9 operations per pixel required for convolution. This is because this is a grey scale image and so the calculation would be row \* width. If this is the colored image, it would be row \* width \* color channel.
   1. 5x5 filter, there are 25 operations per pixel required for convolution.
   2. 7x7 filter, there are 49 operations per pixel required for convolution.
   3. 1x11 filter, there are 11operations per pixel required for convolution.

This suggests that the operations per pixel grows quadratically O(n^2)

1. if you do full convolution between the following two filters:

\*

The answer is (detailed is in the photo attached here too)

A paper with writing on it

Description automatically generated